



Interoperability Guide

MAINTENANCE RELEASE 80

Copyright notice & disclaimers

Copyright © 2000–2019 PortaOne, Inc. All rights reserved

**PortaSwitch® Interoperability Guide, September 2019
Maintenance Release 80
V1.80.01**

Please address your comments and suggestions to: Sales Department,
PortaOne, Inc. Suite #408, 2963 Glen Drive, Coquitlam BC V3B 2P7
Canada.

Changes may be made periodically to the information in this publication. The changes will be incorporated in new editions of the guide. The software described in this document is furnished under a license agreement, and may be used or copied only in accordance with the terms thereof. It is against the law to copy the software on any other medium, except as specifically provided for in the license agreement. The licensee may make one copy of the software for backup purposes. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopied, recorded or otherwise, without the prior written permission of PortaOne Inc.

The software license and limited warranty for the accompanying products are set forth in the information packet supplied with the product, and are incorporated herein by this reference. If you cannot locate the software license, contact your PortaOne representative for a copy.

All product names mentioned in this manual are for identification purposes only, and are either trademarks or registered trademarks of their respective owners.

Table of Contents

Preface	5
What is new in Maintenance Release 80?	6
1. Internet provisioning.....	7
Integration with Alcatel-Lucent Service Router	8
Integration with Bridgewater Service Controller	8
Integration with Cisco PDSN	9
Integration with Cisco SCE (Service Control Engine)	10
Integration with Huawei BRAS CX600 Router	10
Integration with the Juniper MX960 Router	11
Satellite data provisioning over Newtec Dialog platform	12
Traffic management via Sandvine SPB.....	15
2. LTE services	18
Integration with Adax EPC.....	19
Integration with Aricent HSS	19
Integration with Huawei EPC.....	20
Integration with NetNumber Titan HSS.....	21
Real-time content-based charging with Protei P-GW	22
Integration with YateHSS/HLR and YateUCN	23
Integration with ZTE EPC.....	24
3. MNO / MVNO solution	27
Acrobites Cloud Softphone	28
Integration with Acrobites Webs	29
Integration with AudioCodes Mobile Application	30
Integration with the BroadForward BFX Interface Gateway	34
Integration with the ECConnect EAP for mobile core provisioning.....	36
Integration with Qualution.....	39
Integration with Protei CAMEL gateway.....	40
Integration with Protei HLR / HSS and Protei PCRF.....	41
SMS processing via Protei SMSC	41
Voice over WiFi solution for roaming users	42
Integration with YateUCN CAMEL gateway	44
USSD services with Protei USSD gateway.....	44
4. M2M / IoT	46
Integration with Cisco ASR 5700.....	47
Integration with Cisco Jasper	48
5. IPTV Provisioning	50
Integration with Minerva IPTV platform.....	51
Integration with the MatrixStream IPTV platform	52
Integration with Telebreeze IPTV platform	53
6. Hosted IP PBX / IP Centrex solution	54
Integration with Mida Queue Manager.....	55

7. Unified interface for external systems data management
56

Data consolidation plug-ins57

Preface

This document provides information about interoperability between PortaSwitch® and the third-party equipment. It aims to help PortaSwitch® owners enhance their networks and facilitate service provisioning.

Where to get the latest version of this guide

The hard copy of this guide is updated upon major releases only, and does not always contain the latest material on enhancements that occur in-between minor releases. The online copy of this guide is always up to date, and integrates the latest changes to the product. You can access the latest copy of this guide at www.portaone.com/support/documentation/.

Conventions

This publication uses the following conventions:

- Commands and keywords are given in **boldface**.
- Terminal sessions, console screens, or system file names are displayed in `fixed width font`.



Exclamation mark draws your attention to important actions that must be taken for proper configuration.

NOTE: Notes contain additional information to supplement or accentuate important points in the text.



Timesaver means that you can save time by taking the action described here.



Tips provide information that might help you solve a problem.



Archivist explains how the feature worked in previous releases.



Gear points out that this feature must be enabled on the Configuration server.

Trademarks and copyrights

PortaBilling®, PortaSIP® and PortaSwitch® are registered trademarks of PortaOne, Inc.

What is new in Maintenance Release 80?

Added:

- The [SMS processing via Protei SMSC](#) chapter.

Updated:

- The [Satellite data provisioning over Newtec Dialog platform](#) chapter.

1. Internet provisioning

Integration with Alcatel-Lucent Service Router

PortaBilling® is integrated with the Alcatel-Lucent Service Router (SR), used by service providers worldwide for providing broadband Internet services.

In this configuration, the Alcatel-Lucent SR is deployed as a DSL access point within a service provider's network. It communicates with PortaBilling® via the RADIUS protocol to authorize end users when they connect to the Internet. When an Internet session is established, the Alcatel-Lucent SR periodically sends interim (also called keep-alive) accounting requests with information about the current transferred data volume. When an end user's balance is not sufficient for using the service or their Internet quota is reached, PortaBilling® sends the Alcatel-Lucent SR a CoA (change of authorization) request. The Alcatel-Lucent SR then switches the session to a hotlined state – i.e. redirects the end user to a defined website.

PortaBilling® acts as an OCS (Online Charging System). It communicates with the Alcatel-Lucent SR via the RADIUS protocol for real-time session authorization and rating. PortaBilling® also provisions Alcatel-Lucent SR information about the bandwidth speed (for example, 1 Mbps or 10 Mbps) and Internet quota allocated to a particular customer. The bandwidth options and quota amounts are defined by the product configuration in PortaBilling®.

This integration extends the variety of equipment that PortaOne's clients can use for broadband Internet service provisioning. Service providers who have already chosen the Alcatel-Lucent SR and are looking for a flexible and reliable billing system, can explore the advantages of choosing PortaBilling®.

Integration with Bridgewater Service Controller

PortaBilling® is integrated with Bridgewater, a service controller for WiMAX networks.

WiMAX services with Amdocs

PortaBilling® supports the following billing models for WiMAX via Bridgewater:

- Preset bandwidth with unlimited data transfer amount, fixed recurrent fee.
- Preset data transfer quota, fixed recurrent fee.

In both cases, the user connects to the ASN gateway, which sends requests to and receives authorization from Amdocs Service Controller. Amdocs uses account information from its DB, which in turn, is pre-populated and kept current by PortaBilling®.

Account provisioning

PortaBilling® can automatically provision WiMAX accounts into Amdocs. It means that:

- An account created in PortaBilling® will be automatically created in Amdocs with a Profile¹ assigned that corresponds to the PortaBilling® product.
- When an account is suspended due to non-payment or reaches a credit limit in PortaBilling®, the account is automatically blocked in Amdocs.
- When an account is unsuspended or balance returns below a credit limit, the account is automatically unblocked.
- When an account is terminated in PortaBilling®, it gets removed from Amdocs.

Integration with Cisco PDSN

CDMA operators can use PortaBilling® to provision, bill and monitor mobile broadband services controlled by Cisco PDSN (Packet Data Serving Node for CDMA networks). To do this, Cisco PDSN connects to PortaBilling® via RADIUS.

Integration and operation flow

The integration of PortaBilling® with Cisco PDSN is similar to its integration with NAS – the principles of integration are almost the same. Though PDSN is used only for CDMA networks, the main difference between services provided via PDSN and a “traditional” NAS is the user’s mobility. Users may not be stationary and thus switching from one base station to another while the original Internet session is connected. PortaBilling® ensures that even if there are various individual sub-sessions, a single xDR is produced at the end.

¹ Profiles are to be predefined on Bridgewater side as part of the setup process.

Provisioning

To set Cisco PDSN for PortaBilling® you need to carry out settings on the Configuration server and on the administrative web interface (tariffs, nodes, etc.)

Integration with Cisco SCE (Service Control Engine)

PortaBilling® is integrated with Cisco SCE, a network element specifically designed for carrier-grade deployments that require high-capacity stateful application and session-based classification and control of application-level IP traffic, per subscriber.

This solution facilitates content-based charging and allows the ISP to granularly track Internet usage, permitting varied pricing schemes for truly differentiated IP service offerings, while at the same time keeping costs low.

Consider a few examples of services that you could offer using this solution:

- Offer *high speed Internet* service to your business customers but disallow bandwidth-consuming peer-to-peer (P2P) applications.
- Provide residential customers with standard Internet speed, but offer enhanced latency-sensitive services such as online gaming, by assigning a high priority for identified users of this service.

PortaBilling® currently works with the Cisco SCE integrated with PDSN nodes that already allow CDMA operators to raise their mobile broadband services to new heights. In the future, this solution can be enhanced to support various equipment bundled with Cisco SCEs, thereby benefitting ISPs that provide other Internet services.

Integration with Huawei BRAS CX600 Router

PortaBilling® is integrated with the Huawei BRAS CX600 Router used by service providers to provide broadband Internet access.

The Huawei BRAS CX600 Router is deployed at the edge of the service provider network and acts as an aggregation point through which end users connect to the broadband Internet. It communicates with PortaBilling® via the RADIUS protocol to authorize end users and manage their Internet sessions.

Once an end user starts an Internet session, the Huawei BRAS CX600 Router performs the session authorization in PortaBilling® to verify that the end user has sufficient balance and is allowed to use the service. PortaBilling® also provides information to the Huawei BRAS CX600 Router about bandwidth speed (for example, 1 Mbps or 10 Mbps) allocated to a particular end user.

When the Internet session is established, the Huawei BRAS CX600 Router periodically provides session usage information to PortaBilling®, i.e. sends interim (also called keep-alive) accounting requests with information about the current volume of transferred data. When an end user's balance is not sufficient to use the service, PortaBilling® sends the Huawei BRAS CX600 Router a POD (Packet of Disconnect) request. The Huawei BRAS CX600 Router then switches the session to a hotlined state – i.e. redirects the end user to the service provider's portal.

PortaBilling® acts as an OCS (Online Charging System) performing such functions as authentication, authorization and accounting of end users' sessions.

This integration extends the variety of equipment that service providers can use for broadband Internet service provisioning.

Integration with the Juniper MX960 Router

PortaBilling® is integrated with the Juniper MX960 Router. ISPs use this router as a broadband remote access server (BRAS). It operates as a broadband network gateway (BNG).

With the Juniper MX960 Router you can provide high-speed (e.g. 50/100 Mbps and higher) Internet services via Ethernet cable. An administrator must first configure the router and create service policies in PortaBilling®. Then, when a user connects to the Internet, PortaBilling® authorizes them and sends their service configuration (defined in the service policy) to the Juniper MX960 via the RADIUS protocol.

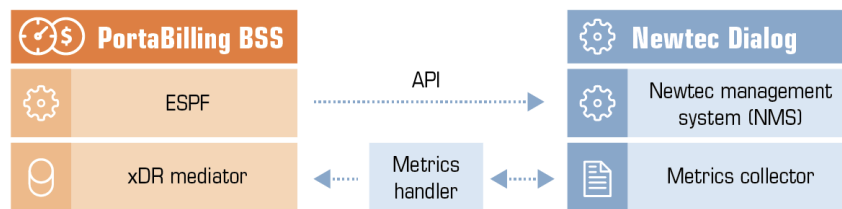
PortaBilling® operates as an OCS (online charging system) for user authorization and charging. It is also used as an administrative interface for product management and bandwidth throttling (i.e. slowing and speeding). When an Internet quota is used up or expires, PortaBilling® sends a change of authorization (CoA) request that instructs the router to change the configuration.

Upon request, the Juniper MX960 either reduces Internet speed and / or hotlines the user to the captive portal for replenishment. Upon payment, PortaBilling® instructs the router to resume speed.

This integration extends the variety of equipment that PortaOne's clients can use for broadband Internet service provisioning.

Satellite data provisioning over Newtec Dialog platform

PortaBilling® is integrated with Newtec Dialog, a multiservice satellite communications platform. This integration allows service providers to offer prepaid data services over the satellite using PortaBilling® as the BSS system.



PortaBilling® interacts with these two components of the Newtec Dialog platform:

- The network management system (NMS) – is used to provision satellite modems and control user access to the network. The user can have either default or restricted access to the network. NMS manages network access using corresponding service profiles. A restricted service profile is used to block internet access (e.g. the account quota / service wallet is used up) and a default service profile is used to resume it (e.g. upon service wallet top-up).

PortaBilling® provisions Newtec NMS via the ESPF with this data to automate subscriber provisioning and service management: the service profile ID, a device model and MAC address and the CPE profile details.

- The metrics collector – is used to measure and report a subscriber's service usage. A subscriber is identified by their modem ID and their service usage is measured every 5 minutes. The collected data is retrieved by PortaBilling® for further import, charging and quota control.

This is how it works:

An administrator defines the speed limits for default and restricted service profiles in NMS. Let's say John Doe subscribes for satellite Internet. An administrator creates an account for John Doe in PortaBilling® and assigns a satellite modem to it. PortaBilling® provisions John Doe's satellite modem details to Newtec NMS. Upon provisioning, NMS returns the modem ID which is assigned as an alias to John Doe's account in PortaBilling®. And that's what is used to charge him for Internet usage.

John Doe begins to use the Internet. The metrics collector measures the total amount of data transferred for the previous 5 minutes. PortaBilling® retrieves this collected data every 5 minutes, processes it and charges John for the traffic he uses.

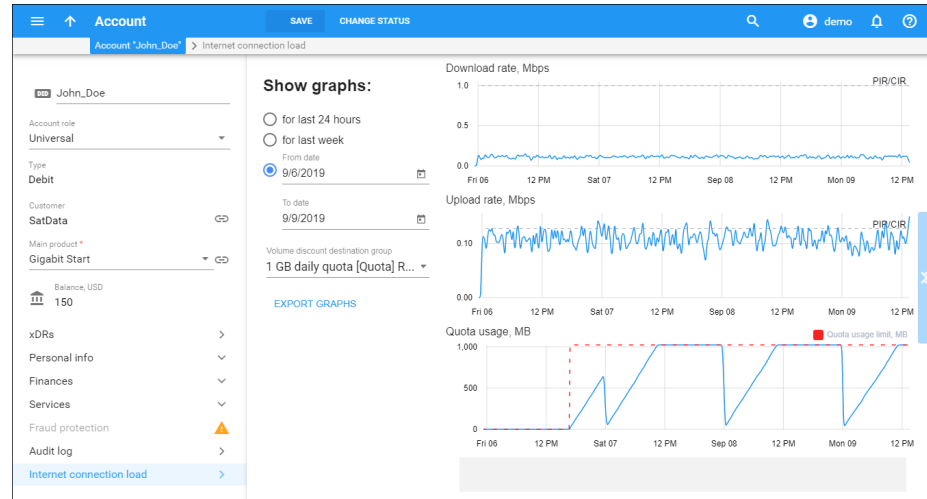
When John Doe uses up his service wallet, PortaBilling® provisions the restricted service profile ID to NMS which then restricts John's service usage. Once he tops up his service wallet again, NMS applies the default service profile and service resumes for his account.

Data usage statistics

An administrator can view the data usage statistics on the Internet connection load panel for John's account in PortaBilling®.

Let's say John Doe uses a daily quota of 1GB and complains that the Internet did not work for one day. The administrator checks John Doe's upload / download rate graphs and quota usage statistics for the last week and sees that John Doe did not have a functioning connection to the Internet for one day. Further investigation shows that the Internet was unavailable due to the provider's connectivity issues.

As compensation, the administrator provides John Doe with free internet for one day.



Service usage graphs are available as a separate plug-in. Please contact the PortaOne® support team for assistance with plug-in installation.

Configuration:

To provide satellite data services, configure the following in NMS:

- Create two service profiles: one for default access, another one for restricted access.
- Define the speed limits for default and restricted service profiles.

Then in PortaBilling® configure the following:

- Install the NMS provisioning plug-in. Contact PortaOne Support for assistance;
- Create Internet access policies and specify Newtec attributes (default service profile ID and restricted service profile ID);
- Configure quotas and / or service wallets to define the amount of provided data;
- Create Internet access products. Assign quotas / service wallets, subscriptions and service policies to them;
- Create a CPE profile with satellite modem details and upload modems to the CPE inventory (device model, number of ports, server IP, etc.);
- Configure an xDR mediation utility for service usage import and processing;
- Configure ESPF to enable data provisioning.

This integration enables you to provide satellite data services and manage these services from a single place. This reduces your administrators' manual work and helps prevent revenue leakage (e.g. an account is out of funds but the administrator has forgotten to block the service).

Traffic management via Sandvine SPB

PortaBilling® is integrated with Sandvine SPB (Subscriber Policy Broker). Sandvine SPB is a component of the Sandvine DPI (Deep Packet Inspection) solution. It enables CSPs to shape traffic on a per-subscriber basis by applying different access policies to them (e.g. prioritize VoIP traffic to ensure sound quality for calls). CSPs can analyze and measure network traffic, study user behavior on the network (e.g. which sites customers visit most often) and collect various statistics data (e.g. the percentage of content types consumed). MVNOs and CSPs that rent the network infrastructure can use Sandvine SPB to authenticate users and control their activity on the network.

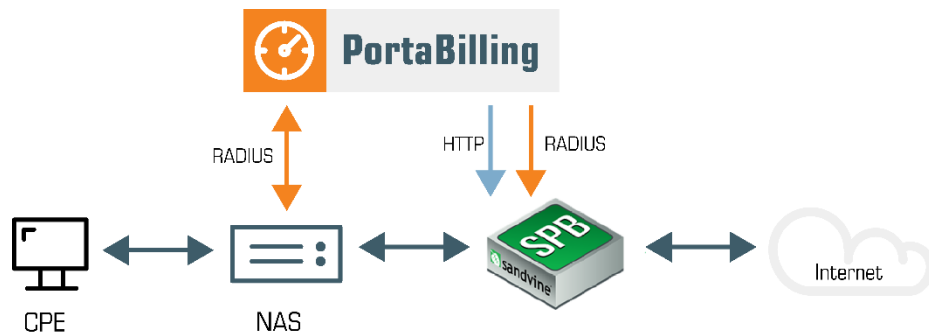
PortaBilling® provisions Sandvine SPB with this subscriber data:

- Account details: username, IP address / netmask, service provider identifier;
- Service configuration details: Internet access policy name, upload / download speed limits, captive portal URL.

This automates subscriber management and service activation.

To authenticate subscribers and apply service policies to them, Sandvine SPB must identify their username and the IP address associated with it. In network deployments with *static* IP allocation (e.g. fiber-based networks for point-to-point connections), PortaBilling® stores this data and provisions it to Sandvine SPB via the ESPF (External System Provisioning Framework). In networks with *dynamic* IP allocation, the subscriber's IP address is initially unknown. PortaBilling® receives a subscriber's IP in a RADIUS request from NAS and then provisions it to Sandvine SPB via RADIUS. This enables you to manage subscribers and their service availability on virtually any network.

This is how it works:



When an administrator creates a new customer in PortaBilling®, PortaBilling® sends the provisioning request to Sandvine SPB to create the new subscriber and assign a corresponding Internet access policy to it.

If there's already a subscriber in Sandvine SPB with the same name, their Internet access policy configuration is overridden by the PortaBilling® data received.

When a user connects to the Internet, their device is allocated a dynamic IP address. The NAS sends the Start accounting RADIUS request to PortaBilling®. PortaBilling® extracts the user's IP address from the Framed-IP-Address attribute and provisions it to the Sandvine SPB via RADIUS.

Sandvine SPB now controls a user's traffic usage according to their access policy (e.g. denies access to websites with pirate videos). When a user's session is over, NAS sends the Stop accounting request to PortaBilling® which then passes the RADIUS provisioning request to Sandvine SPB to clear the user's IP address.

When the user's status changes (e.g. they're blocked or their services are suspended due to non-payment), PortaBilling® updates their status in Sandvine SPB. The user is redirected to the captive portal URL. Similarly, when a user's access policy parameters change (e.g. new speed limits are applied), their data is updated in Sandvine SPB.

Configuration:

To provision Sandvine SPB, configure the access policies in Sandvine and set up a hotline portal and the IP assignment rules.

In PortaBilling® configure the following:

1. Enable the Sandvine adaptor on the Configuration server.
2. Create all NASs that PortaBilling® communicates with as nodes.
3. Create a special node for Sandvine SPB. Specify the IP address of the Sandvine server to provision the user IP addresses via RADIUS in the PoD server configuration.
4. Configure Internet access policies with the same names as those defined in Sandvine SPB.
5. Create Internet access products. Include the Mobile network provisioning service with the products to trigger subscriber data provisioning.
6. Configure the ESPF to provision subscriber data to Sandvine SPB.

This integration enables CSPs to manage traffic effectively. They can:

- Monitor network performance and ensure quality service to subscribers.
- Introduce policy enforcement per subscriber based on subscription plans (e.g. premium customers receive more

bandwidth and higher Internet speed while residential users enjoy regular speed limits).

- Facilitate security on the network by detecting and blocking unwanted traffic / protocols (e.g. BitTorrent) and cyber threats.
- Collect various statistics data.

2. LTE services

Integration with Adax EPC

PortaBilling® is integrated with Adax EPC, which enables CSPs to provide Internet Access services to their customers within LTE networks.

The integration covers two aspects:

- Integration with Adax P-GW;
- Integration with Adax HSS.

Integration with Adax P-GW

PortaBilling® operates as the online charging system (OCS) that communicates with the Packet Data Network Gateway (P-GW) using the Diameter (Gy) protocol for real-time user authorization and rating.

When a user establishes an Internet session, P-GW sends an authorization request to PortaBilling®. During the session, P-GW sends recurring interim credit control requests that report on the volume of traffic already consumed. Based on that information, PortaBilling® verifies that the user can continue to use the service. If the user runs out of funds, they cannot access paid Internet content (e.g. YouTube.)

Adax EPC supports rating groups and AVPs such as Validity-Time and Volume-Quota-Threshold. This enables ISPs to introduce different business models and ensure correct charging for all of them.

Integration with Adax HSS

Adax HSS is the centralized database of user subscription information. It includes user identification data (SIM card IMSI, MSISDN), user registration states, user profiles with QoS parameters and other attributes (e.g. static IP address). PortaBilling® provisions SIM card data to Adax HSS and thus enables wireless operators to authenticate their subscribers across the LTE network and allocate the corresponding service policy to them.

To trigger provisioning to Adax HSS, an administrator configures the External Systems Provisioning Framework (ESPF) and enables the Mobile network provisioning service within a product for LTE service.

Integration with Aricent HSS

PortaBilling® is integrated with the Aricent HSS – LTE core network element that contains all subscriber data, such as:

- the account identification (the phone number (MSISDN) and SIM card, identified by IMSI), and
- profile information (e.g. static IP address, quality of service information).

This integration enables wireless operators to provision subscriber information defined within PortaBilling® to Aricent HSS, where a SIM card is activated by Aricent HSS and the LTE service becomes available for the subscriber.

To make this happen, an administrator enables the **Mobile Network Provisioning** service for a product and assigns it to an account with an associated SIM card. PortaBilling® then provisions the new subscriber information to Aricent HSS via the External System Provisioning Framework (ESPF). When an administrator makes changes for an account (e.g. blocking, changing a product), PortaBilling® automatically synchronizes this data with Aricent HSS.

This feature extends the list of LTE equipment that wireless operators can use for organizing their network infrastructure. For those operators that want to switch from legacy billing systems to PortaBilling®, the integration with Aricent HSS ensures the seamless migration of subscriber information.

Integration with Huawei EPC

To enable ISPs to provide Internet Access services to their users within the LTE network, PortaBilling® is integrated with Huawei EPC.

PortaBilling® provides a single place for customer information and balance and service configuration management by provisioning user data to the HSS and PCRF.

In network terms, PortaBilling® operates as the OCS that performs real-time user authorization and rating. Communication with the SAE-GW is managed via the Diameter (Gy) interface. The same interface is used to disconnect an Internet session when a user is out of funds or exceeds their credit limit or when redirecting the user to a hotlining portal.

The Huawei UGW9811 supports the following features:

- Traffic categorization into rating groups
- Credit Control for Multiple Services per session
- Hotlining
- Server-Initiated Credit Re-Authorization (RAR)
- Online Centralized Session charging with units reservation SCUR, DCCA

- Real-time billing for period-switch

This integration extends the variety of existing LTE equipment for service providers who are interested in becoming active players in the wireless telecommunications industry.

Integration with NetNumber Titan HSS

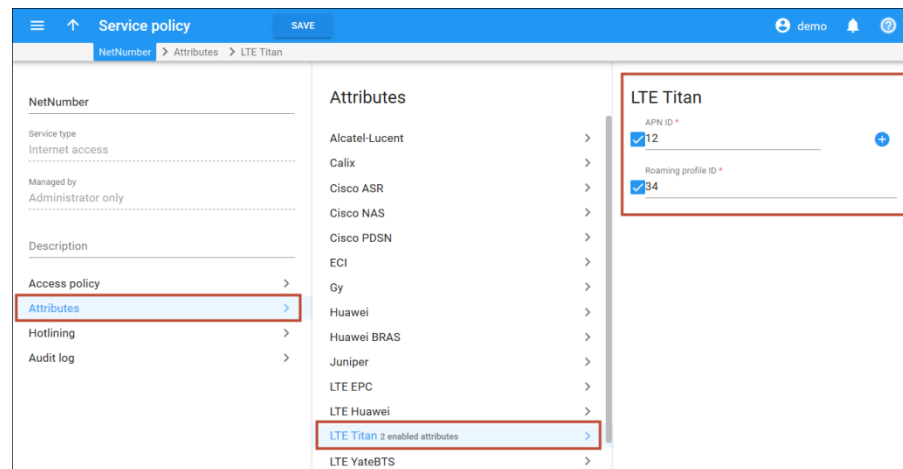
PortaBilling® is integrated with NetNumber Titan HSS. This is the centralized subscriber database for LTE service provisioning that stores:

- subscriber information (phone number (MSISDN), SIM card IMSI), and
- profile information (Regular upload / download limits for Internet access, APN (Access Point Name) ID, Roaming profile ID).

Wireless operators can now provision subscriber data in NetNumber Titan HSS. This enables them to provide their subscribers with the LTE service.

To make this happen, an administrator configures the following:

- in NetNumber Titan HSS – defines the APN(s) and Roaming profile(s);
- in PortaBilling® – specifies the preconfigured APN ID(s) and Roaming profile ID(s) for the Internet access policy;



- defines upload / download limits for Internet access;

The screenshot shows the 'Service policy' configuration page. The 'Access policy' tab is active. On the left, the 'NetNumber' section shows 'Service type' as 'Internet access', 'Managed by' as 'Administrator only', and a 'Description' field. The 'Access policy' section on the right shows a weekly schedule grid with 'Regular' selected. Below the grid, the 'Regular' policy is configured with a download rate of 25 Mbps and an upload rate of 15 Mbps, both set to 'Unlimited'.

- enables the **Mobile Network Provisioning** service for the LTE product and adds the Internet access policy and assigns it to an account with an associated SIM card.

PortaBilling® provisions the NetNumber Titan HSS via the External System Provisioning Framework (ESPF). When an administrator makes changes for an account in PortaBilling® (e.g. blocks or changes a product / Internet access policy, etc.), PortaBilling® immediately synchronizes the updated data to the NetNumber Titan HSS.

This feature extends the list of LTE equipment that wireless operators can use for organizing their network infrastructure.

Real-time content-based charging with Protei P-GW

PortaBilling® is integrated with Protei Packet Data Network Gateway (P-GW) for real-time content-based charging on mobile networks: GPRS, 3G and LTE.

PortaBilling® provides a single place for subscriber management and service configuration and functions as the OCS (Online Charging System). It communicates with Protei P-GW via the Diameter Gy interface for user authorization and rating.

Protei P-GW performs policy control and reports traffic usage to the OCS. It supports content-based charging via rating groups with configurable speed limits. This enables you to differentiate among the types of Internet traffic, control the bandwidth and charge differently for each traffic type. For example, access to email and the self-care portal are free of charge – while online gaming, YouTube, etc. are available for a price. This gives you flexibility in service configuration and thereby increases your competitiveness in the market.

To control user access to the Internet and perform content-based charging, Protei P-GW communicates with the PCRF (Policy and Charging Rules Function). When a user connects to the Internet, Protei P-GW obtains the user's service policy in the PCRF and then sends the Credit Control Request (CCR-Initial) message to authorize the user in PortaBilling®. Upon authorization, PortaBilling® allocates a service unit quota for the requested rating group and responds with the Credit Control Answer (CCA-Initial) message. The user can now use the Internet according to their service policy. Periodically, the P-GW reports about the volume of consumed traffic to PortaBilling® so that when a user's quota is depleted or runs out of funds, their session is either hotlined or disconnected.

Thus, to configure content-based charging for Internet access services, do the following:

- Configure the service policies, rating groups and hotline portal URL in the PCRF.
- In PortaBilling®, define quotas and create Internet access policies where you configure Protei-related attributes and define hotlining URL. Bundle them in the Internet access products for accounts.
- Configure the ESPF to provision user data to the PCRF.

This integration with Protei P-GW expands the variety of available equipment for CSPs to build their network infrastructure. PortaBilling® is already integrated with Protei core components such as **PCRF**, **HLR / HSS** and **SCP (Diameter-CAMEL gateway)**. Together, these integrations provide a ready-to-use ecosystem that minimizes the time necessary to launch mobile services on the market.

Integration with YateHSS/HLR and YateUCN

Wireless operators can use PortaBilling® to provision their subscriber information to HSS and / or bill their subscribers for the LTE service. The integration of PortaBilling® with EPC components produced by Yate, i.e. YateHSS/HLR for subscriber data provisioning and YateUCN for real-time charging, allows wireless operators to use Yate products exclusively to organize and build their network infrastructure.

Integration with YateHSS/HLR

YateHSS/HLR functions as a centralized subscriber database that stores and manages subscriber information for LTE service provisioning.

Using PortaBilling®, you can provision subscriber details such as subscriber's phone number (MSISDN), SIM card IMSI and profile details (e.g. LTE service, quality of service information) to activate SIM cards in YateHSS/HLR. This registers subscribers on the mobile network and gives them access to the LTE service.

To provision subscriber details to YateHSS/HLR, an administrator creates a product for the LTE service and enables the **Mobile Network Provisioning** service for it. When a new mobile account is created, PortaBilling® sends the subscriber information to YateHSS/HLR via the External System Provisioning Framework (ESPF).

With PortaBilling® you can also update YateHSS/HLR with any subscriber changes (e.g. account is blocked or is assigned a new product).

Integration with YateUCN EPC

The PortaBilling® integration with YateUCN – an LTE EPC component – enables you to provide LTE service and charge your mobile subscribers for it in real time.

With this integration, PortaBilling® operates as an OCS (online-charging system) and communicates with the YateUCN EPC using the Diameter (Gy) protocol for real-time user authorization and rating. It also instructs the YateUCN EPC to redirect users to a hotlining portal if and when they run out of funds / lack available quota.

YateUCN EPC supports rating groups. This enables you to introduce content-based charging. For example, you can charge users for watching YouTube videos or visiting social networks although traffic for using your self-care portal always comes free of charge.

Integration with ZTE EPC

PortaBilling® supports the provisioning of LTE / 3G services to ZTE EPC (Evolved Packet Core) and provides quota control for these services. You can combine PortaBilling® as both the online charging system and the SIM card provisioning system with ZTE equipment.

Integration with ZTE P-GW

The ZTE Packet Data Network Gateway (P-GW) is the point of entry to the LTE network. PortaBilling® is integrated with ZTE P-GW as the OCS (Online Charging System) to perform real-time user authorization and charging. This enables wireless operators to provide full-scale LTE services to subscribers.

PortaBilling® communicates with the ZTE P-GW via Diameter (Gy) to authorize user sessions and either disconnect a session or redirect a user to a hotline portal when they run out of funds or exceed their allocated quota.

ZTE P-GW supports rating groups. This enables you to introduce content-based billing wherein you charge users differently depending on the type of Internet traffic they consume. For example, you charge users for online games and to watch YouTube, while regular browsing, using email and having access to their self-care portal are free of charge.

Integration with ZTE HSS and SPR

When an administrator makes changes for an account in PortaBilling® (to create, block or change a product / their Internet access policy, etc.), PortaBilling® immediately provisions the updated data to the ZTE HSS (Home Subscriber Server) or the ZTE SPR (Subscription Profile Repository). HSS then provides centralized user authentication across the network and SPR manages users' service policies. This way, user data is always up-to-date in ZTE.

PortaBilling® can also independently serve as the B/OSS system for LTE services. It manages customer data (including unified balance), service configuration details, product / rate tables, etc. for LTE just as for other services. Therefore, by using PortaBilling® as a unified platform, you reduce your administration costs and improve the user experience.

Multiple add-on products provisioning for LTE

In LTE networks deployed with ZTE equipment, services for subscribers are activated based on the PAKID value. The PAKID value defines which Internet quota is available for a subscriber and is taken from the accounts' product configuration provisioned by PortaBilling®.

By provisioning several PAKID values via add-on products, you can allocate multiple Internet quotas within ZTE EPC for subscribers and then allow them to modify their product configuration a la carte. PortaBilling® provisions a PAKID value to ZTE SPR as soon as a subscriber assigns an add-on product and ZTE SPR allocates the corresponding quota for the subscriber. As a result, the subscriber receives the service based on the combination of the PAKID values and according to add-on precedence.

Consider the following example:

Smart Net is an LTE service provider. They offer a 1 GB Internet quota for their basic service and the following additional service packages:

- 2 GB “Turbo” quota available within 24 hours and
- 5 GB of “Regular Internet access” quota available within 30 days.

These service packages are configured as the following add-on products in PortaBilling®:

- “Turbo” add-on product with high precedence level and
- “Regular Internet access” add-on product with medium precedence level.

John Doe has basic LTE service. In a week, he uses all the allocated 1 GB Internet quota so he is then redirected to his self-care portal. There he signs up for both service packages. His product configuration now includes the “Turbo” add-on product with an expiration date of 24 hours and the “Regular Internet access” add-on product with an expiration date of 30 days. Thus, John Doe uses the “Turbo” quota first and once it expires, he uses the “Regular Internet access” quota.

To configure add-on product provisioning to ZTE EPC, include the LTE service and Internet access policy with the PAKID value defined in the product configuration.

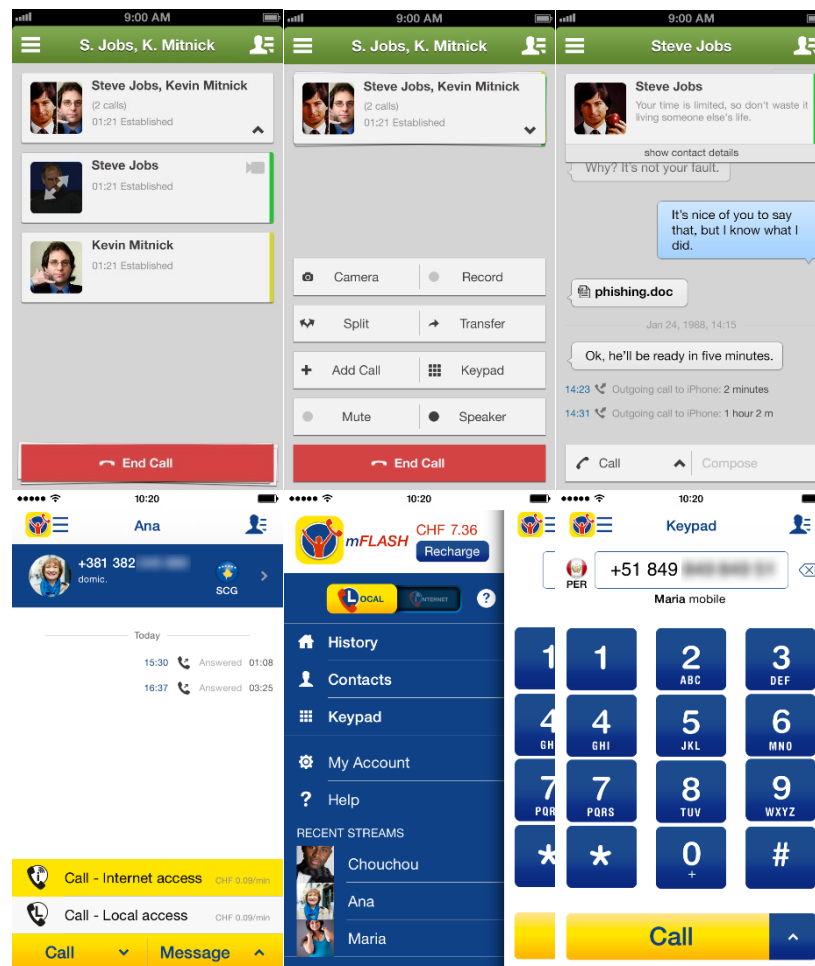
Add-on product provisioning for ZTE EPC enables ISPs to provide various service packages to their customers, making them more competitive in the market while growing their customers’ loyalty.

Alternatively, for quota control organized within ZTE EPC, you can deploy PortaBilling® as the online charging system (OCS) in your LTE network. Thereby you gain advanced control over your service provisioning by receiving information about monthly quotas, service wallets, and current usage bars and rollovers in one single location.

3. MNO / MVNO solution

Acrobits Cloud Softphone

Service providers can use Acrobits Cloud Softphone to deploy a premium quality, customized mobile app for iOS and Android devices. Cloud Softphone is fully integrated with PortaSwitch® to enable seamless calling and advanced features such as on-line balance display. PortaOne and Acrobits engineering teams work in sync to provide a best-of-breed, innovative and reliable platform for mobile services. In less than one day, service providers can launch their own white-label smartphone app via the iOS App Store and Google Play, with settings and features set specifically for their service.



Acrobits Cloud Softphone is a highly configurable SIP client designed specifically for VoIP service providers. The following features are available:

- centralized configuration management
- incoming and outgoing calls

- applying and managing tariffs
- possibility to perform calls via mobile network and Wi-Fi
- option to quickly private-brand app
- push notification feature— users can receive calls even when the app is closed
- Web service-based callback for maximum battery efficiency
- instant messaging
- presence feature provides option to check availability of those on your contact list to chat
- HD sound
- balance checker
- customizable ringtones
- Bluetooth support

To simplify customer management, Acrobits iOS/Android softphone apps offer one-touch provisioning with QR codes generated by PortaSwitch® online signup portal.

For detailed description of how to use the service form the mobile application, please refer to the **Unified PortaSwitch® Handbook Collection**.

Integration with Acrobits Webs

PortaSwitch® is integrated with Acrobits Webs – a solution that allows end users to communicate with each other directly from their web browsers, e.g. make voice and video calls, send messages, exchange files and share screens. Acrobits Webs is available for use on mobile, tablet and desktop devices.

In its integration with PortaSwitch®, Acrobits Webs acts as a WebRTC gateway, enabling communication between WebRTC and SIP endpoints.

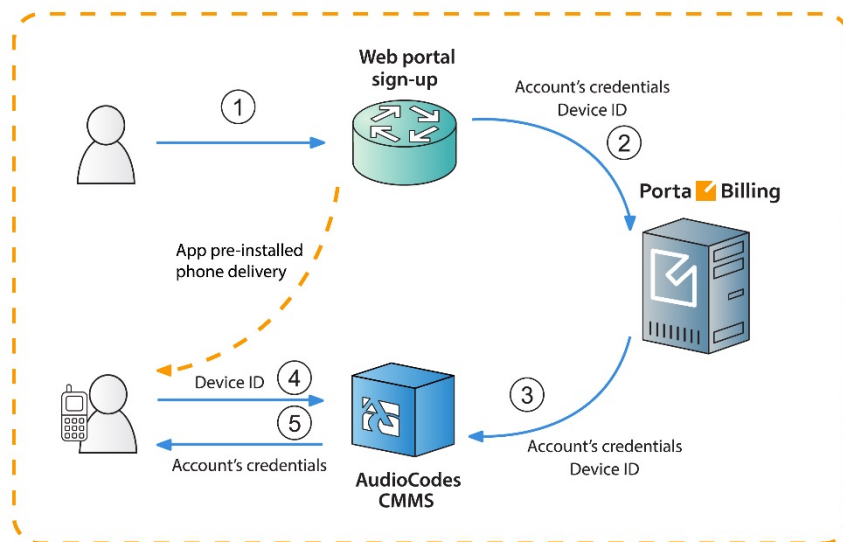
When a WebRTC endpoint initiates a call, it connects to a mediation component – a WEBIS server – that converts session control messages received from the WebRTC client into SIP messages (and vice versa). The WEBIS server then forwards these SIP messages to PortaSwitch® which is responsible for their further processing.

Note that Acrobits Webs is not provided as a part of the PortaSwitch® solution. For more details about integration with Acrobits Webs, please contact support@acrobits.cz.

Integration with AudioCodes Mobile Application

PortaBilling® can provision the AudioCodes mobile application for service providers and their resellers. Auto-provisioning makes the configuration of services quick and convenient for end users while saving time and expense for service providers.

This multi-featured AudioCodes mobile application provides a wide range of services: voice and video calls, SMS, IM and more. To provision the application, PortaBilling® is in constant interaction with the AudioCodes CMMS (Clients' Management Server) which is responsible for customized profiles, user level control, time-based licensing and other functions. CMMS, in turn, is in constant interaction with users' mobile phones and tablets, so when a user's information is changed on the PortaBilling® side (e.g. user's credentials), it is quickly updated on the user's side, too.



MVNOs

The AudioCodes mobile application registration and configuration process for the MVNO business model is detailed in the following example:

John Doe wants to subscribe to EasyCall's services. **(1)** He visits the service provider's website and makes a request for a new mobile phone and a list of services to be provided with that phone (e.g. call forwarding, voicemail, etc.). **(2)** A new account is created for John Doe in PortaBilling® that contains information such as account ID, password, IMEI (device ID), etc. **(3)** At the next stage, PortaBilling creates the

account in the AudioCodes CMMS with all of the required parameters – the account’s credentials, IMEI, etc. The phone with the installed AudioCodes mobile application is then sent to the user. John Doe receives his new phone and switches on the AudioCodes application. (4) It automatically connects to the CMMS, provides the IMEI (device ID) and requests the user’s credentials. (5) The AudioCodes CMMS parses this information and provides those credentials. Thus, the mobile application is configured, John Doe has avoided having to manually set it up and the requested services can be used immediately.

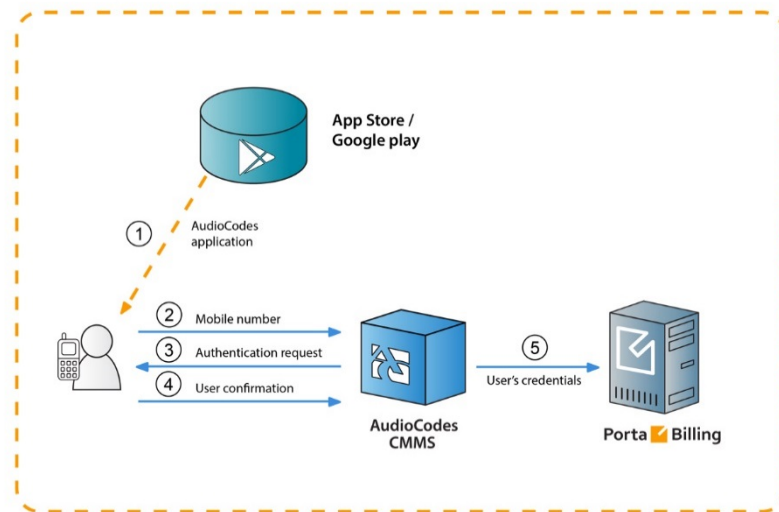
NOTE: AudioCodes CMMS is compatible with Android and iOS only.

OTT service providers

The business model for downloading the AudioCodes mobile application from the App Store or from Google play is applicable to a wide circle of service providers. For this model, creation of a new account in PortaBilling® is initiated by registration of a new user in AudioCodes mobile application. The whole process is described in this following example:

The TelePlus service provider will provide voice calls, messaging and other custom services via their own SIP mobile application. TelePlus obtains the mobile application from AudioCodes and brands it as TelePlus.

(1) John Doe downloads the TelePlus application. The first time he runs it, the application requests his mobile number. (2) He inputs his number and the application sends it to the CMMS server. (3) The server generates a special security code and texts it to John Doe via SMS to confirm that the owner of that number indeed made the request. (4) John Doe enters this security code which is then passed to CMMS. (5) The server accepts the code and sends the request to PortaBilling® with the user’s credentials. Then a new account is created in PortaBilling® with John Doe’s mobile number used as the account ID. Starting from this moment, PortaBilling® charges John Doe for service usage.



The account information configuration and the updates for the AudioCodes mobile application occur immediately and automatically. Auto-provisioning decreases the workload on the service provider and ensures continuous and smooth service provision, leading to user satisfaction with service quality.

Customized provisioning

Service providers can fine-tune the application's configuration for individual customers who belong to different business models and then automatically provision it to them.

AudioCodes profiles determine which services to deliver to which customers within the applications. Each profile comprises a set of services and application settings defined for a particular customer. Customers who share the same business model or have similar profiles are also identified within the AudioCodes' CMMS by either the service provider's or reseller's company domain name. These can be used for statistics purposes.

By configuring additional parameters in PortaBilling® such as domain and profile name and then passing them to the CMMS in the provisioning request, service providers gain advanced control over services available for a customer within the mobile application.

Consider the following example:

You provide services to your customers under your domain name *mycompany.com*.

John Doe is one of your residential customers whose service bundle includes domestic calls and SMSs. EasyCall Ltd. is one of your IP Centrex customers whose service bundle includes voice and video calls and conferencing services.

You want to auto-provision the customized AudioCodes mobile application to both of them. To do this, configure two different AudioCodes profiles: “Residential” and “Business.” In PortaBilling®, assign them to John Doe and EasyCall Ltd., respectively, as custom fields. Then, after PortaBilling® provisions the CMMS, the customers’ applications are provisioned with specific settings that improve their usage experience.

To customize the AudioCodes mobile application auto-provisioning, do the following:

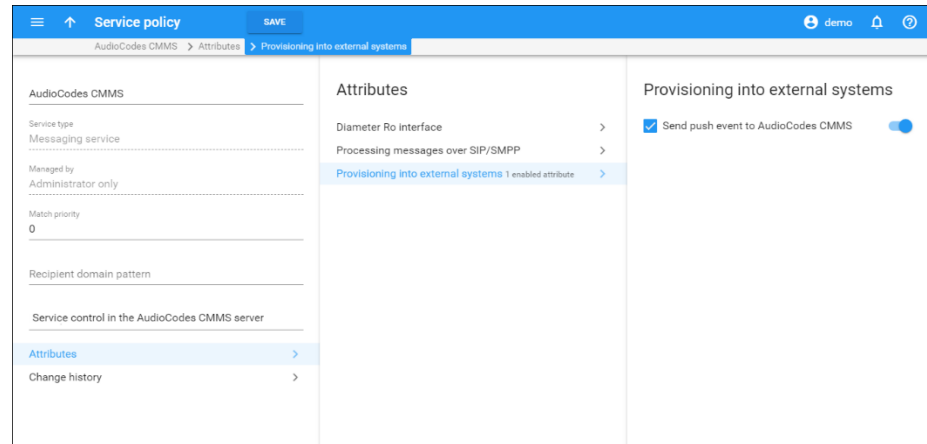
- Configure the custom fields *profileName* and *domain*
- Assign them to the requisite customer class
- Specify the custom fields’ values for a particular customer on the **Edit Customer** page.

Messaging service management in AudioCodes CMMS

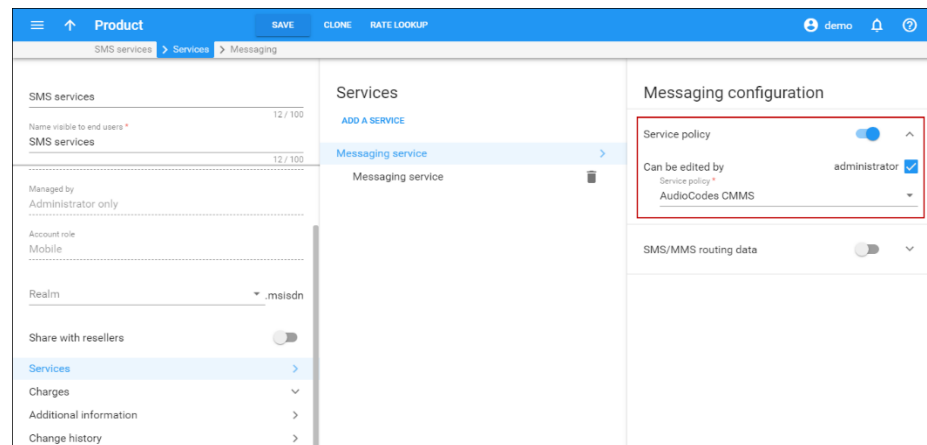
With PortaBilling® API you can effectively manage messaging service availability for accounts provisioned in AudioCodes. When an account’s service wallet is empty or expires, a PortaBilling® sends a corresponding request to the AudioCodes CMMS server and the messaging service is suspended. Likewise, it is resumed upon topping up the service wallet.

To configure messaging service management within the AudioCodes CMMS server, do the following:

1. Configure a service policy for messaging services and enable the **push_events** option within.



2. Assign a service policy to the product. Note that service policies directly defined for accounts are not considered.



Of course, a user must have a service wallet for the particular messaging service assigned.

Integration with the BroadForward BFX Interface Gateway

Among the variety of wireless networks in the telecommunications market, networks such as 2.5G, 3G and CDMA are still popular. For 3G networks CAMEL is the main protocol, that enables communication for Intelligent Network (IN) architectures. For North American CDMA networks, this role is fulfilled by the WIN (Wireless Intelligent Network) protocol.

You can penetrate this segment of wireless networks or preserve service provisioning in a CDMA network by using PortaBilling®, and all the while deploying new generation network services (e.g. LTE).

The CDMA network solution includes PortaBilling® operating as an OCS (Online Charging System) for real-time call authorization and rating and the BFX Interface Gateway as the entry point to your network.

In this deployment, the BFX Interface Gateway operates as the mediation component performing the conversion of WIN messages into Diameter (Ro) messages. Thus, the BFX Interface Gateway communicates with the MSC using WIN, while it communicates with PortaBilling® using Diameter (Ro).

When a user places a call, the following occurs:

The MSC (Mobile Switching Center) performs the call authorization in PortaBilling® that verifies that the customer's balance is sufficient to call the desired destination. The MSC uses the WIN protocol, therefore its call authorization request is sent via the BFX Interface Gateway where it is converted to Diameter (Ro) and then delivered to PortaBilling®. PortaBilling® locks in the funds to cover the initial period of the call and sends a confirmation message to the MSC. This message also passes via the BFX Interface Gateway where it is converted to WIN and then delivered to the MSC.

When the user's initial call period finishes and their overdraft protection is configured in PortaBilling®, the BFX Interface Gateway sends a request to lock in the funds for subsequent periods.

Once the user hangs up or runs out of sufficient funds to continue the call, the BFX Interface Gateway sends instructions to the MSC to disconnect the call and sends a Credit Control Request – Terminate (CCR-Terminate) message to PortaBilling® to report the end of the call. PortaBilling® then produces a CDR record for this call.

Destination number translation and provisioning

In addition to basic call processing, PortaBilling® can translate service numbers dialed by end users into actual numbers and provision them to the MSC.

This is how it works:

For example, a user dials 411 for directory assistance. The BFX Interface Gateway passes this number to PortaBilling® in a Credit Control Request – Initiate (CCR-I) message. PortaBilling® translates the dialed 411 into an actual number (e.g. 12055576061) and returns this number back to the BFX Interface Gateway in a Credit Control Answer – Initiate (CCA-I) message. The BFX Interface Gateway then delivers this number to the MSC to connect the call.

For number translation and provisioning to take place, do the following:

- Configure the dialing rules for the customer.
- Create the service policy and enable the **Provision CLD** and **Rise MSCC result code** options;
- Assign the service policy to the accounts' product.

The integration of PortaBilling® with the BFX Interface Gateway may be of special interest for service providers who aim to penetrate the mobile communications market as MVNOs or MVNEs, since it expands the range of equipment they can use for organizing their network infrastructure.

Integration with the ECConnect EAP for mobile core provisioning

PortaBilling® is integrated with the ECConnect EAP platform – the provisioning solution for MVNOs, which operate on the Optus network in Australia.

PortaBilling® provisions the ECConnect EAP via the ESPF (External System Provisioning Framework) with the following data:

- SIM card details (ICCID);
- subscriber details (MSISDN, service configuration, billing status);
- ECConnect-related information such as “phoneid” and “clientid.” These are the unique IDs of a subscriber’s record and phone number in the ECConnect EAP;
- Subscriber location details to control their Internet access in the roaming networks.

ECConnect EAP then provisions the Optus mobile core to activate the SIM and grant access to the services for your mobile subscribers.

This is how it works:

Your administrator uploads SIM cards and configures their rate plans and mobile service profiles in the ECConnect EAP. The rate plans must match the PortaBilling® products.

In PortaBilling® the administrator does the following:

- configures products that correspond to the rate plans defined in the ECConnect EAP (e.g. domestic and roaming ones) and enables the Mobile network provisioning service to trigger provisioning;

- uploads SIM cards;
- configures custom fields for customer and account records to store EConnect-related information such as “clientid” and “phoneid,” and
- configures the ESPF to provision subscriber data.

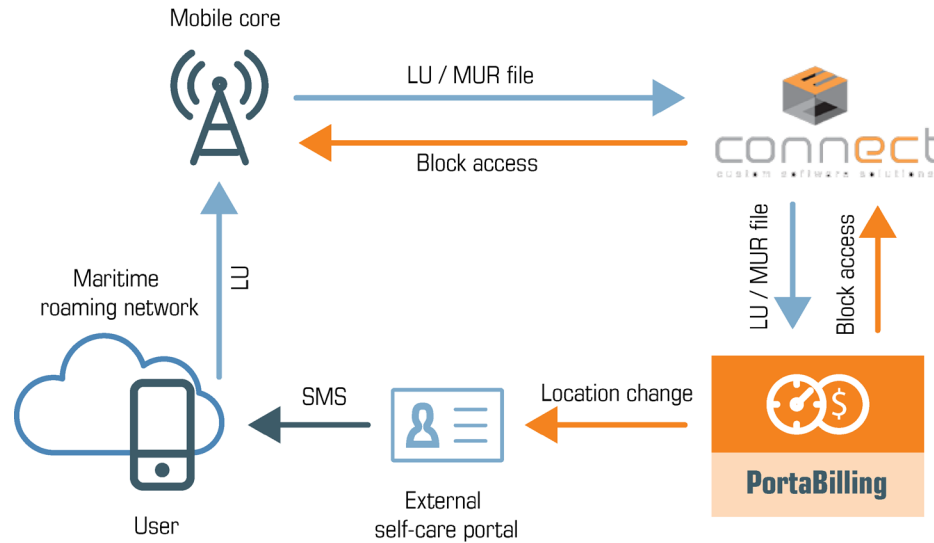
When John Doe signs up for the mobile service bundle, a new customer is created in PortaBilling® and a SIM card is assigned to this customer’s account. PortaBilling® sends a provisioning request with SIM card details and subscriber data to EConnect EAP. EConnect EAP processes the request and generates the “phoneid” and “clientid” values for the subscriber. Then EConnect EAP triggers the API call to the Optus mobile core to activate the SIM card. John Doe can now enjoy the service.

Whenever John’s account status changes in PortaBilling®, (e.g. he runs out of funds or his account is suspended), PortaBilling® updates the Optus mobile core via the EConnect to stop John’s services until he tops up the balance. The provisioning request now includes the “phoneid” and “clientid” values to update the service availability status for John in the Optus mobile core.

If John decides to update his phone number with a different one or change his SIM card, his new details update automatically in the Optus mobile core without his service being stopped. This ensures the data integrity in the entire network infrastructure.

Location-based control of Internet access

Roaming users can connect to networks where mobile data usage is extremely expensive, e.g. on board a cruise ship or in an airplane. To prevent users from high overdraft and bill shock, MVNOs can block Internet access to roaming users when their location changes to Aerospace or Maritime.



This is how it works:

User location information can be obtained from the LU (Location Update) and MUR (Mediated Usage Records) files. LU files are created when a user's phone registers on a roaming network. The mobile core receives the LU file and sends it to PortaBilling® via the EConnect EAP. However, LU files can become delayed or even get lost. Therefore, MUR files are also used to identify a user's location. The mobile core generates MUR files when a user starts the Internet session and it sends them to PortaBilling® via the EConnect EAP. MUR files are sent every 15 minutes, which speeds up user location identification.

PortaBilling® reads the LU / MUR files and updates a user's location using the xDR mediation utility. A user's location and the date and time of its change are stored in custom fields for the user's account in PortaBilling®. If a user is located in the expensive zone identified as AEROSPACE or MARITIME, PortaBilling® sends the provisioning request to the mobile core via the EConnect EAP to block Internet access to them. However, SMS and voice call services remain available.

To notify a user about their location change and applicable rates for service usage, PortaBilling® communicates with the external self-care portal. PortaBilling® provisions the user's location to the external self-care portal, which sends an SMS notification to the user.

A user can manually unblock Internet service via the external self-care portal. In this case, the self-care portal updates the user's location in PortaBilling® via the API. PortaBilling® then provisions the mobile core via the EConnect EAP to unblock Internet access for the user.

To control Internet access based on user location, do the following:

- Create the custom fields for the account record (e.g. “location” and “timestamp”) to store the user’s location and the date and time of the last location change in PortaBilling®.
- In the ESPF handler config file, specify which locations to block Internet service for by default (e.g., AEROSPACE OR MARITIME) in the [RestrictedLocations] section.
- Configure the xDR mediator to read the LU / MUR files and update the user’s location. Please contact PortaOne support if you want assistance.
- Build or adjust your external self-care portal to communicate with PortaBilling®.

This integration is useful for Australian CSPs interested in becoming an MVNO. It provides a ready-to-use solution to roll out services virtually instantly and therefore become an active player in the telecommunications market.

Integration with Qualution

Qualution is the OSS (Operation Support System) used by some North American MVNOs to manage service provisioning on the MVNE side (e.g. they may use it for SIM card management and the like). It operates as middleware between PortaBilling® and the mobile network.

PortaBilling® is integrated with Qualution via API and performs real-time management of users’ volume discount plan usage. As soon as an MVNO subscriber exceeds their allocated quota, PortaBilling® sends a notification to Qualution via the API.

NOTE: To perform real-time management of users’ volume discount plan usage, every account in PortaBilling® must have an individual volume discount plan assigned to them via product.

If several volume discount plans apply to the same service and destination group, PortaBilling® will send notification to Qualution only after the last one is used up (e.g. if a user has a quota of 100 domestic SMS and another quota for 50 domestic SMS, the notification will be sent immediately after the user sends 150 SMS).

This integration widens the pool of the potential business partners and enlarges the service provider’s opportunities for how to organize their network infrastructure.

Integration with Protei CAMEL gateway

As an OCS (Online Charging System), PortaBilling® can be integrated with 2.5 / 3G and 4G mobile networks. In 2.5 and 3G networks, the CAMEL protocol is the de-facto standard for real-time charging.

In this case, PortaBilling® can interoperate with mobile operator networks via the Protei CAMEL gateway.

In this configuration, the Protei CAMEL gateway is deployed within a service provider's network and acts as a mediation component between PortaBilling® and a mobile operator's network, converting the CAMEL protocol to the Diameter protocol and vice versa.

This allows PortaBilling® to communicate with the MSC (Mobile Switching Center) – a switching node that routes calls and messages to and from other telecommunication networks, including PSTN, ISDN and other mobile operators' networks – for real-time calls and SMS authorization and rating.

When a customer makes a call, MSC performs the call authorization in PortaBilling® to verify that the customer has sufficient balance and is allowed to call that destination. Since MSC uses the CAMEL protocol, its call authorization request is sent via the Protei CAMEL gateway, where it is converted to Diameter Ro and then delivered to PortaBilling®. PortaBilling® locks in the funds to cover the initial period of the call and sends a confirmation message to MSC. This message also passes via the Protei CAMEL gateway where it is converted to CAMEL and then delivered to MSC.

When the period is over, MSC sends a request to lock in the funds for the subsequent period, etc. When the call is over, MCS sends a Credit Control Request - Terminate (CCR-Terminate) message to PortaBilling® to report the end of the call. PortaBilling® produces a CDR record for this call. In the message exchange between MCS and PortaBilling® all the protocol conversion – from CAMEL to Diameter and from Diameter to CAMEL – is done using the Protei CAMEL gateway.

A similar procedure is followed when a customer sends an SMS.

This kind of integration allows service providers interested in entering the mobile market to integrate with mobile operator's networks that use the CAMEL (Phase 1, 2 and 3) protocol to communicate with a billing system for real-time call authorization and rating.

Integration with Protei HLR / HSS and Protei PCRF

In order to operate as full MVNOs / MVNEs on the mobile market, service providers often encounter a prerequisite (raised from the hosted MNO) to deploy such equipment as HLR / HSS and PCRF within their own networks. The joint solution developed by PortaOne, Inc. and PROTEI can easily help you meet this requirement.

PortaBilling® guarantees its integration with Protei HLR / HSS and Protei Policy Controller (PCRF) core network elements. As a provisioning system, PortaBilling® synchronizes subscriber information defined within the system with Protei HLR / HSS, and policy / service quality parameters with Protei PCRF.

To enable provisioning to Protei HLR/HSS and Protei PCRF, an administrator enables the **Mobile Network Provisioning** service for a product. For example, the administrator creates a product and configures voice calls, messaging and / or Internet access services for it. The administrator configures the corresponding service policies and enables the **Mobile Network Provisioning** service for this product. Upon assigning this product to an account with an associated SIM card, PortaBilling® provisions account and policy / service quality parameters to Protei HLR / HSS and Protei PCRF. When the administrator makes changes for an account (creating, blocking, etc.) or product, PortaBilling® immediately provisions the updated data to Protei HLR / HSS or Protei PCRF.

This integration helps service providers meet the MNO's requirements necessary to operate as full MVNOs / MVNEs. It also allows service providers to manage their subscribers and associated services independently, thereby achieving more autonomy from the host MNO.

SMS processing via Protei SMSC

CSPs can provide SMS services to their mobile subscribers and charge them for SMS delivery in real-time using PortaBilling® and Protei SMS center (SMSC).

PortaBilling® functions as an OCS and communicates with Protei SMSC via the Diameter Ro interface with the direct debiting authorization mode.

When John Doe sends an SMS, Protei SMSC sends the CCR (Credit Control Request) Diameter message of the Event_Request type to authorize John's account in PortaBilling®. Upon successful authorization,

PortaBilling® sends a CCA (Credit Control Answer) message back to Protei SMSC and immediately charges John's account for the SMS. The SMSC then delivers John's message to the recipient.

PortaBilling® controls John's balance and service quotas to deny SMS service when he has no funds or exceeds the allocated quota and to resume it when funds are replenished or a quota is renewed.

CSPs can also deliver SMS notifications to subscribers about various billing events (e.g. exceeding a credit limit or a balance top up). PortaBilling® communicates with Protei SMSC for SMS notification delivery via PortaSIP®.

Following the example above, to notify John about reaching his credit limit or making a successful password change, PortaBilling® creates a notification and sends it to PortaSIP®. PortaSIP® sends it to Protei SMSC via the SMPP protocol. The SMSC then delivers the SMS to John's phone.

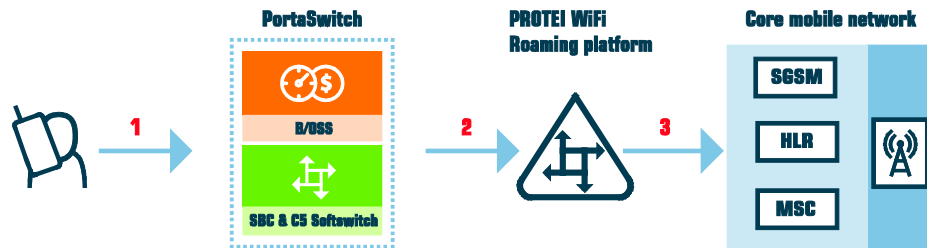
With this integration, CSPs receive a cost effective solution to provide SMS services out-of-the-box. They also improve the customer experience since SMS notifications are a convenient way to notify subscribers about their activities in a timely manner.

Voice over WiFi solution for roaming users

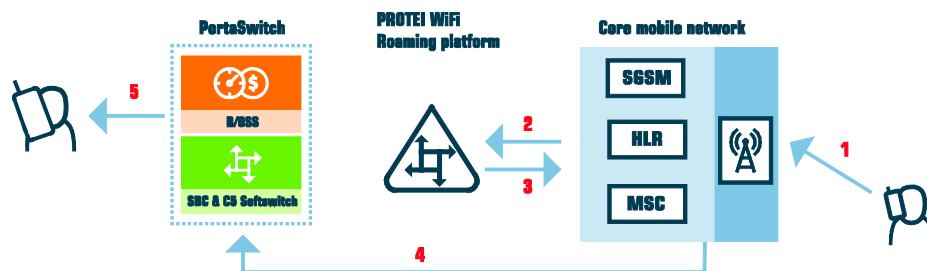
To stay competitive, wireless operators need to permit their customers to use their services even when they are traveling outside of their home networks. Introducing roaming service support, however, is costly and cumbersome, both for you and for your users. With PortaSwitch® you can deploy roaming services using WiFi and a mobile application at no cost and with no extra charges to your users.

The voice over WiFi solution, introduced with this release, includes PortaSwitch® and the PROTEI WiFi Roaming platform, which updates the users' mobile carrier about their current location. Thus, when a user is in roaming, all incoming calls to them arrive to PortaSwitch®, which then delivers them to the user's mobile application.

This is how it works in more detail:



When a user connects to WiFi and the mobile application registers with PortaSwitch® (1), PortaSwitch® forwards the user's registration to the PROTEI WiFi Roaming platform (2). The PROTEI WiFi Roaming platform passes the user's current location to the user's mobile carrier within the LU (Location Update) message (3).



When someone dials the user's phone number (1), the mobile carrier addresses the PROTEI WiFi Roaming platform with a PRN (Provide Roaming Number) message (2). The PROTEI WiFi Roaming platform responds with the user's local roaming number and prefix (3) based upon which their mobile carrier routes the call to PortaSwitch® via SIP (4). PortaSwitch® then processes the call and delivers it to the user's mobile application (5).

To instruct PortaSwitch® to forward user registrations to the PROTEI WiFi Roaming platform, define its IP address for the **third_party_registrars** option on the Configuration server web interface.

PortaSwitch® operates in the high-availability mode; therefore, it forwards user registrations in the “fire-and-forget” mode. In case of an unlikely network connectivity issue between PortaSwitch® and PROTEI WiFi Roaming platform, the registration will be updated when the application renews it in a few minutes.

With this solution, you introduce roaming service support at no cost, allow your customers to receive incoming calls free of charge and make outgoing calls at reduced rates. This increases your competitiveness in the market and improves customer experience.

Integration with YateUCN CAMEL gateway

PortaBilling® is integrated with YateUCN as the CAMEL gateway to enable CSPs to provide voice calls in 3G networks.

In this integration, YateUCN acts as the mediation component between the mobile core and PortaBilling® and also converts messages from CAMEL to Diameter Ro and back. Thus, YateUCN communicates with the mobile core via CAMEL and via Diameter Ro with PortaBilling®.

Let's have a closer look at how the call flow works:

When a user makes a call, MSC (Mobile Switching Center) performs a call authorization in PortaBilling®. MSC sends the CAMEL request to YateUCN, which converts it to a Diameter CCR-I (Credit Control Request – Initiate) message and then delivers it to PortaBilling®. Once PortaBilling® authorizes the call, YateUCN performs a reverse conversion to send the response back to MSC.

During the call, MSC sends periodic requests to update the session and lock in another portion of funds to cover the call. When the user hangs up or is left with insufficient funds to cover and continue the call, MSC sends a CCR-T request to report the end of the call. PortaBilling® then produces an xDR record and updates the user's balance. The entire communication between PortaBilling® and MSC is done using YateUCN.

YateUCN is compatible with 3G and LTE networks since it implements the functions and protocols of both core layers. PortaBilling® is also integrated with **YateUCN EPC** to introduce LTE services to subscribers and perform real-time billing for their usage. It is also integrated with **YateHSS/HLR** for SIM card provisioning.

Thus, both Yate and PortaBilling® solutions provide flexibility for organizing your network infrastructure. They also offer an opportunity to upgrade 2G and 3G network solutions to the next generation.

USSD services with Protei USSD gateway

PortaBilling® is integrated with the Protei Unstructured Supplementary Service Data (USSD) gateway to provide customer care services to mobile subscribers in GSM networks. A subscriber sends a USSD message to request information (e.g. a balance check) or an action (voucher activation) by dialing a service code. In order to retrieve the requested data, the Protei USSD gateway interacts with PortaBilling® via API. PortaBilling® acts as the BSS.

Here, in more detail, is how it works:

You configure the service menu in the Protei USSD gateway and provide the service codes to your subscribers upon signup. Let's say that John Doe wants to check his account balance. He dials a short USSD code – *123#. The USSD gateway accepts his message and requests his balance information from PortaBilling® via the API. PortaBilling® identifies John's account and returns his balance amount in the API response to the USSD gateway. John Doe then receives the USSD message, "Your current balance is 43.25 USD."

By using the Protei USSD gateway in their network infrastructure, service providers automate their customer care services. This improves the customer experience and also reduces the administrative load.

4. M2M / IoT

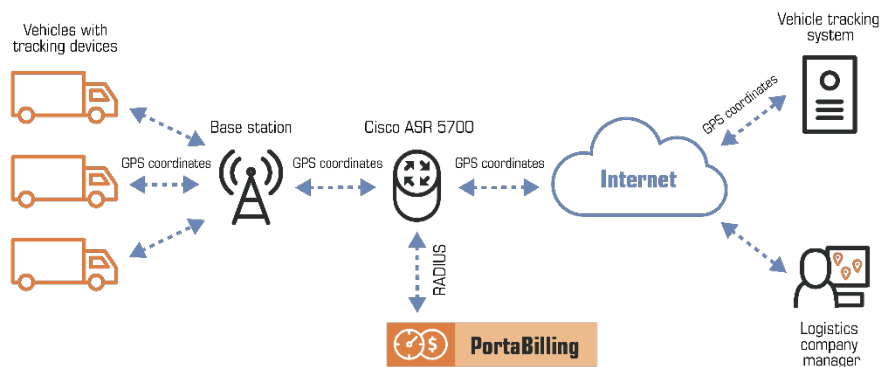
Integration with Cisco ASR 5700

PortaBilling® is integrated with the Cisco ASR 5700. This is a GPRS Gateway Support Node (GGSN) that routes data traffic between a mobile network and an IP-based network (the Internet). This integration enables wireless operators to deliver M2M connectivity services, bill customers for their Internet usage and control session availability.

Cisco ASR 5700 performs the functions of a network access server (NAS). It communicates with the PortaBilling® OCS (Online Charging System) via the RADIUS protocol to authorize M2M devices and send accounting requests. PortaBilling® can then perform real-time charging for Internet access services.

Consider the following example:

A logistics company wants to track their vehicles. Each vehicle has a device with a SIM card to send GPS coordinates over the Internet. When a device establishes a data session, Cisco ASR 5700 sends an authorization request to PortaBilling® to verify that the account (which represents a device in PortaBilling®) has sufficient funds / quota and is permitted to use the service. It periodically sends interim (also called keep-alive) accounting requests with information about the volume of consumed traffic. Based on that information, PortaBilling® verifies whether a device can continue to send data. If there are no funds (or quota), Internet access is no longer available and the GPS coordinates cannot be sent.



NOTE: Cisco ASR 5700 does not support PoD (Packet of Disconnect) and CoA (Change of Authorization) requests. To avoid overdrafts, use an external application to check the account's (device) balance / quota and disconnect an Internet session.

This integration enables wireless operators to extend the variety of equipment for providing M2M connectivity services.

Integration with Cisco Jasper

PortaBilling® is integrated with Cisco Jasper, the automated connectivity management platform. This integration enables you to deliver IoT connectivity services to all of your subscribers so that they can connect any device via their SIM card.

Within your infrastructure, PortaBilling® serves as the service and revenue management system. It provisions the account and SIM card information to Cisco Jasper, manages customer balances, collects billing information and issues invoices.

Cisco Jasper handles communication with the mobile network to activate SIM cards for your subscribers.

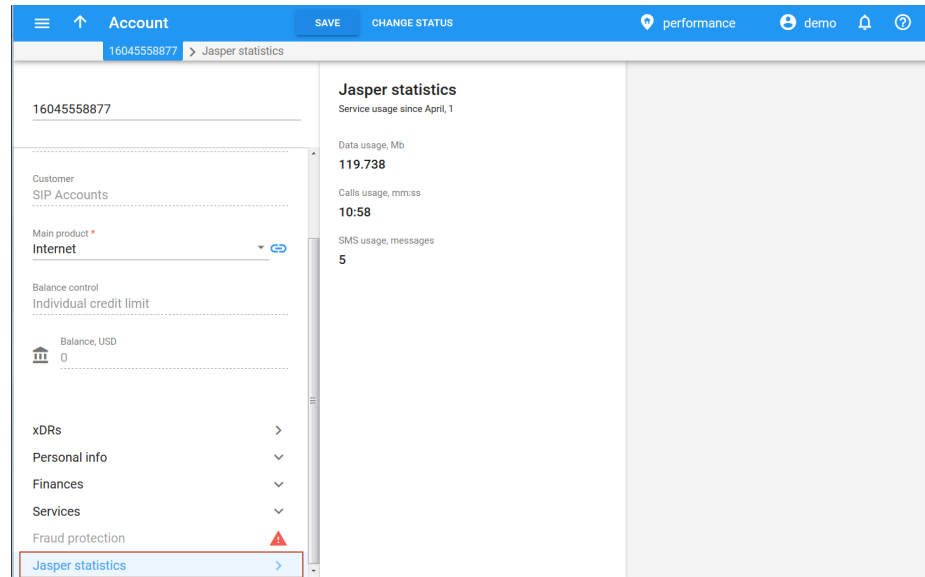
This is how it works:

When an administrator creates a customer and assigns a SIM card to the customer's account in PortaBilling®, PortaBilling® provisions the customer data to Cisco Jasper. It instructs Cisco Jasper to activate the SIM card associated with the account and to assign the rate plan to it. When an administrator or distributor blocks / terminates the account, PortaBilling® instructs Cisco Jasper to deactivate the account's SIM card.

When the subscriber uses up all of the allocated Internet quota, PortaBilling® receives notification from Cisco Jasper and changes the account's product to block service availability. The SIM card is consequently deactivated in Cisco Jasper.

As soon as the subscriber purchases additional quota, their account is assigned a new product in PortaBilling® and their SIM card is reactivated in Cisco Jasper meaning the subscriber can once again access the Internet.

The Jasper statistics panel displays the subscriber's service usage details from Cisco Jasper on the PortaBilling® web interface.



The panel contains information about the services used by a user within the current month: the total amount of data transferred, voice calls made and SMSs sent. If the user has exceeded the allocated quota, the administrator sees the corresponding notification in PortaBilling®.

Usage details are displayed for the current month and are updated on demand – when you open the page, the data is retrieved from Jasper.

To configure provisioning to Cisco Jasper, do the following:

- Enable the Jasper module on the Configuration server;
- Configure the External System Provisioning Framework (ESPF), and
- Enable the Mobile service provisioning service feature for the products you use for granting and denying service usage to subscribers. Make sure the product names match the names of the rate plans in the Jasper Call Control Center.
- To display the service usage details from Cisco Jasper, install the integration plug-in available in PortaBilling®. Please contact the PortaOne® support team for assistance with how to install the integration plug-in.

Cisco Jasper partners with 550+ mobile networks worldwide, enabling you to provide IoT connectivity to your subscribers across several networks. This allows you to expand your services into other markets while your business grows.

5. IPTV Provisioning

Integration with Minerva IPTV platform

PortaBilling® is a converged real-time billing system, service provisioning environment and CRM used for rating and invoicing any type of service you provide to customers, including centralized funds management and consolidated bills.

For IPTV service provisioning, PortaBilling® is integrated with the Minerva IPTV platform. With this solution, service providers are able to:

- Configure channel packages and provide them to customers within a product configuration;
- Charge recurring fees to customers by using subscriptions;
- Manage customers' service packages so that while Minerva's channel packages only include sets of IPTV channels, service packages can include both channel sets and additional services such as the VOD catalogue, WHDVR or Caller ID presentation.

IPTV service activation is completed by using the External System Provisioning Framework (ESPF) in PortaBilling®. This makes it easy to provide IPTV service to your customers while eliminating additional manual work.

An IPTV service is activated for the subscriber when:

- A new account assigned to the IPTV product is created in PortaBilling®.
- An already existing account assigned to the IPTV product is unblocked in PortaBilling®.
- A product assigned to an already existing account is changed to a new product with IPTV.

The key assets of integration with Minerva that occur when an account in PortaBilling® corresponds to a customer in Minerva are:

1. When a customer is suspended in PortaBilling®, therefore the account is either blocked or switched to a product that no longer includes IPTV services. Their "subscriber" record is maintained in Minerva although it is disabled.
2. When a customer is terminated in PortaBilling®, the account is deleted in Minerva.
3. PortaBilling® adds information to the customer's bill about services provided and charges incurred.

This interoperation between PortaBilling® and the Minerva IPTV platform enables service providers to provide triple-play services to their users and therefore increase their revenue stream.

Integration with the MatrixStream IPTV platform

For today's service providers, "triple play" is not just a buzzword – rather, it is the only way to remain competitive while retaining their customer base. Combined solutions provided by PortaOne in conjunction with the MatrixStream IPTV platform can be used to add IPTV to your service portfolio and expand your business growth.

The IPTV service is activated in PortaBilling® by using the External System Provisioning Framework (ESPF), which therefore simplifies service provisioning to end users and reduces manual work for your administrators.

When a new or existing customer signs up for the IPTV service, the available channel information (based on the assigned subscription) is provisioned into the IPTV delivery platform via an extensible XML API. If a customer's product configuration changes, or a customer is blocked (e.g. due to non-payment), PortaBilling® transfers this information to the IPTV delivery platform.

An IPTV service is activated for the subscriber when:

- A new account assigned to the IPTV product is created in PortaBilling®.
- An already existing account assigned to the IPTV product is unblocked in PortaBilling®.
- A product assigned to an already existing account is changed to a new product with IPTV.

The key assets of this integration are the following:

1. An account in PortaBilling® corresponds to a subscriber in MatrixStream.
2. When a customer is suspended in PortaBilling® or the account is blocked or switched to a product that no longer includes IPTV services, his "subscriber" record continues to be maintained in MatrixStream although it is disabled.
3. When a customer is terminated in PortaBilling®, the account is deleted in MatrixStream.
4. PortaBilling® provides information to the customer's bill about services provided and charges incurred.

In this way, service providers extend their service provisioning portfolio while remaining competitive in the market.

Integration with Telebreeze IPTV platform

PortaBilling® is integrated with the Telebreeze IPTV platform (<https://telebreeze.com/>). The interoperation between PortaBilling® and Telebreeze enables you to:

- Define various channel packages in Telebreeze and bundle them into products for your customers. As soon as you create an account in PortaBilling® and assign a product that includes the IPTV service, the customer is created in Telebreeze and a corresponding channel package activated for them.
- Configure a variety of channel packages and manage customer service configurations using add-on products.
- Charge recurring fees to customers for IPTV channel packages via subscriptions.
- Manage customer information and service availability using the PortaBilling® web interface. Any changes in customer information are provisioned to Telebreeze. Customer services remain available as long as there are sufficient funds to cover them or their product configuration includes the IPTV service. If a customer is terminated in PortaBilling®, their record in Telebreeze is also deleted.

Thus, the key assets of this integration are as follows:

1. An account in PortaBilling® corresponds to a customer in Telebreeze.
2. Telebreeze channel packages are defined within PortaBilling® products.
3. Customers are charged for IPTV services via subscriptions. Video-on-demand and pay-per-view services are solely handled by Telebreeze. PortaBilling® receives balance update records and produces xDRs.
4. Customers are authenticated in Telebreeze by either device ID or Telebreeze login / password. This information is defined in a customer's custom fields.

NOTE: Do not change the account ID in PortaBilling® since the Telebreeze customer ID will not be updated and therefore further customer management will become inaccessible.

Integration with yet another IPTV platform expands your IPTV provisioning capabilities and enables you to provide full-scale triple-play services to customers.

6. Hosted IP PBX / IP Centrex solution

Integration with Mida Queue Manager

PortaSwitch® is integrated with the Mida Queue Manager. This application is used for call queuing and routing of incoming phone calls. It allows all call queues to be customized to have their own set of messages, working hours, timeouts, overflows and routing algorithms.

A call queue in the Mida Queue Manager is linked to an IP PBX phone line that receives all incoming calls. PortaSwitch® routes the calls from an IP PBX phone line to the Mida Queue Manager, where they are queued. The Mida Queue Manager distributes these calls in a predefined fashion among the dedicated phone lines on this IP PBX.

In PortaSwitch®, the Mida Queue Manager is configured as a vendor with two connections. The **Calls to vendor via SIP** connection delivers calls from the IP PBX to the Mida Queue Manager. The **Calls from vendor via SIP** connection delivers calls from the Mida Queue Manager to this IP PBX. All call queue configuration settings are defined via the Mida Queue Manager.

This integration allows service providers to offer advanced call queue features to their IP PBX customers.

7. Unified interface for external systems data management

Data consolidation plug-ins

Let's say you use PortaBilling® for customer management and a NMS (Network Management System) for monitoring network performance, circuit management and configuration, etc. When checking customer information (e.g. during troubleshooting) you must login to both PortaBilling® *and* to the NMS.

Instead of managing two systems separately, you can integrate the NMS with PortaBilling®. Create an integration plug-in, install it in PortaBilling® and operate with the NMS from the PortaBilling® web interface.

Each time you open customer data, PortaBilling®:

- dynamically retrieves the network information related to the customer from the NMS via the API, and
- displays the consolidated data on the web interface.

The NMS data is then displayed on the custom panel.

When you modify the information (e.g. change bandwidth limits or reconfigure a router), the data is automatically sent to the NMS.

An integration plug-in is a set of application files that contain the logic for a new custom panel (e.g. fields, types, default values). While installing the plug-in, specify whether the panel appears in the main navigation menu or at a specific entity level (e.g. customer, reseller). Upon installing the plug-in, the custom panel for system operation appears in PortaBilling®. This way, you can integrate PortaBilling® with any external system that supports the REST API.

Consider the following example:

Asgard Telecom has a contract management system (CMS) to store and manage customer contracts. They require:

- real-time interaction between the CMS and PortaBilling®, and
- the ability to manage the contracts (e.g. Contracts feature) via the PortaBilling® web interface.

Asgard Telecom implements a plug-in for the Contracts feature. After the plug-in installation, a new Contracts panel is available at the customer level. It permits the customer contract details to be managed. When an administrator saves a contract, the plug-in pushes the data to the CMS via the API. Each time an administrator opens the Contracts panel, the data is retrieved from the CMS.

The top screenshot shows the 'Customer' interface for 'Asgard Telecom'. The left sidebar contains a list of tabs: 'Contracts', 'Fraud protection', 'Services', 'Credit limit, USD', 'Balance, USD', 'Currency', 'Postpaid', 'Balance control', 'Customer class', 'Business model', and 'Asgard Telecom'. The 'Contracts' tab is selected. The main area displays a list of contracts with columns 'Name' and 'Group'. The list contains three entries: 'W Telecom' (Wholesale), 'Z Telecom' (Wholesale), and 'X Telecom' (Wholesale). A red dashed arrow points from the 'Contracts' tab in the sidebar to the 'Contracts' list in the main area.

The bottom screenshot shows the 'Add' form for a new contract. The left sidebar is the same as the top screenshot. The main area displays the 'Add' form for a new contract. The form has fields for 'Name *', 'Group *', 'Escalation period, months *', 'Base fee *', 'Notify before end date, days', 'Notify about last month', 'Start date *', 'End date *', and 'Escalations list'. The 'Name' field is filled with 'W Telecom' and the 'Group' field is filled with 'Wholesale'. The 'Escalation period' is 6 months, 'Base fee' is 3, 'Notify before end date' is 7 days, and 'Notify about last month' is checked. The 'Start date' is 12/20/2017 and the 'End date' is 12/21/2020. The 'Escalations list' has 10 items. A red dashed arrow points from the 'Contracts' tab in the sidebar to the 'Add' form in the main area.

This solution allows you to integrate PortaBilling® with the external systems and manage all of the data from a single place. Aside from improving workflow, it gives you additional flexibility with introducing individual business solutions using PortaBilling®.

Please contact the PortaOne® support team for assistance with how to install integration plug-ins.