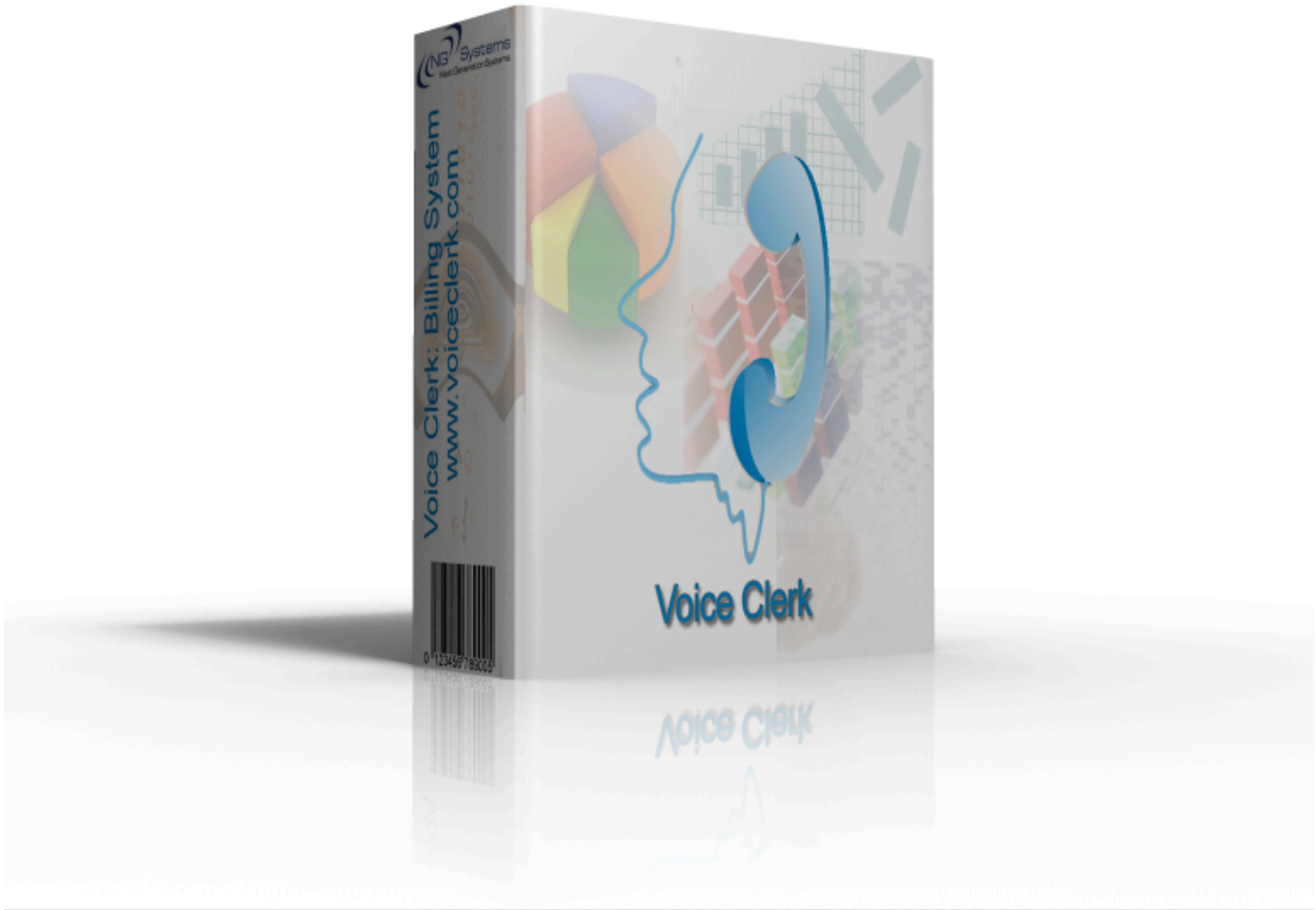
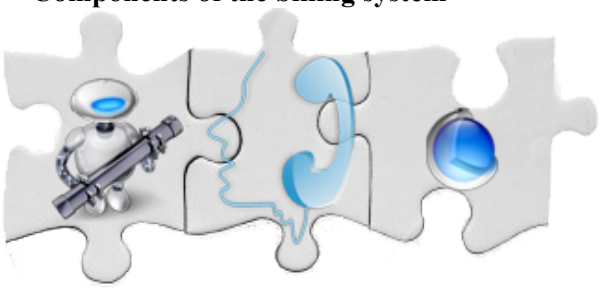


The main purpose of the professional VoIP billing system - Voice Clerk by NG Systems is to charge and limit the calls of a certain company's employees, aiming at the optimization of the expenses for phone calls in its inner infrastructure. The system allows collecting and storing information about the committed incoming and outgoing calls, trough the organization, calculating their cost, blocking or notifying the users, who have reached an administratively assigned limit and generating a variety of different reports about the expenses. Unlike the other existing systems on the market today, the incoming data about the calculations is received from the VoIP router, that manages the incoming and outgoing calls (via the RADIUS protocol) or it can be gathered directly from the Call Data Record (CDR) database of Cisco Call Manager™ (CCM).

Components of the billing system



Web Interface	Voice Clerk	Core

The benefits that make our system the only one fulfilling the needs of the middle size and big organizations:

- The reports and the outgoing data in the system are developed with the help of a professional accountant
- Unique system, that is capable for supporting and billing calls in a national measure, with over 50 offices in one reliable, centralized and united billing system
- Banking institutions with over 2000 employees and 50 regional offices in the whole country making more than 1,000,000 calls every month
- Tracing calls with zero duration
- The only system at the market with a special version of call centers (Voice Clerk Call Center Edition) and billing campaign billing module
- A quick ROI – the clients who have integrated our system in their organization reported a 70% optimization of their phone call bills. The client returns his investment in the billing software after the first 3 months
- The system is integrated for working offline with the SRST of the Cisco routers and it does not allow any data loss
- Easy to update for personal needs of the client – making specific reports or other additional functional requirements of the customer

Customers who trusted the Voice Clerk Billing System:

UniCredit Leasing

DSK Bank

Allianz Bulgaria

Bulins

Agile support options: SL1, SL2, SL3

With the growing needs of our customers, we give three different support options, corresponding to the international quality standard ITIL. The client may choose between different demands and expected reliabilities of the service. In the bottom table are described the given levels of support, which can fully optimize the work of the system administrator.

Support options: SLA-1, SLA-2, SLA-3

Option	SLA-1	SLA-2	SLA3
Description	Support of Voice Clerk billing systems with VPN access. Software bugs and problems determination and solving	Support of Voice Clerk billing systems, configuration of tariff settings trough VPN access.	Support of Voice Clerk billing system, tariff settings configuration, support of user changes trough VPN access.
Reaction time	Analyze, problem determination and solving within 8 hours	Analyze, problem determination and solving within 8 hours	Analyze, problem determination and solving within 8 hours
Weekly coverage (hours per day/ days per week)	8/5 CET	24/5 CET	24/7 CET
Hours included	Unlimited - until problem resolving.	Unlimited - until problem resolving.	Unlimited - until problem resolving.

Table of contents

Document purpose

The present document contains a short description of the architecture of Voice Clerk® from user's angle, the basic modules that set up the system, information about the platforms on which the system's working on and methods and technologies used in developing it. The information about the upper topics is intentionally presented in a short and easy to understand way, because the main purpose of this document is to present you the functionality of the product. Here these topics are referred to, because of the fact that the usage of proven information technologies, methodical approach in developing, open and flexible architecture and a modern realization are not less important for the contemporary business than the pure functionality and like a part of its workspace and inner architecture, they speak of its innovation, quality, power and reliability not less than the functions that it offers the customer.

In this documents along with the basic functions of the system and the extra functionalities, which are also an inseparable part of it (like the user interface that is used for remote administration, rating properties and generation of references and reports about the taken calls), are also presented the system's extra modules, that are not needed by every customer, but may be exceptionally useful for others. The functionalities that are realized as an optional modules are marked in the text. The possible updates that are in process of developing or implementation are also mentioned in this description.

This document contains a description about a constantly advancing and perfecting system. The information and the presented photos of the system's interface are liable to changes. This document remains open for future technical editing.

Introduction

The main purpose of Voice over IP (VoIP) accounting system Voice Clerk ® by NG Systems is to rate and limit the calls of the employees in a particular company. It collects and stores data about the held incoming and outgoing calls, calculating their cost, blocking the user that have reached a administratively assigned limit and generating various references and reports about the expenses. The input data about the calculations is taken from the VoIP routers, who manage the incoming and outgoing calls (through the RADIUS protocol), or they can be taken directly from the Call Detail Record (CDR) database.

The module approach, with which is developed Voice Clerk and its flexibility, allows it, not just to work as FreeRADIUS server module, but also to operate in many different modes.

The system is made with a universal architecture, that allows support and work with a PBX central phone exchanges of other manufacturers like Cisco, Siemens ®, Ericsson ® and others. The product is developed on the module principle and makes easy adding support of new manufacturers, or specific reports for the client. The open architecture allows quick and high-grade integration of the specific terms and requirements of the customer. We must also mark off that the system is working on architectures with high security and reliability (like Linux, FreeBSD and others) and is implemented with the usage of unique combination of proven methods and technologies and innovations, which revolutionize the modern software development and build its future!

The product contains two basic modules:

Core

The core of the system cares for the manipulation of the input data (such as RADIUS accounting packets or CDRs from the CCM database), calculating the cost of the outgoing (and in some cases the incoming) calls, checking for reached call limits and sending notifications and/or banning the calls (eventually for certain destinations like international calls), storing the data about the calls in a database and other main functions.

The core of the product works on a UNIX like operation systems, that have proven their stability, and the main part of it is realized like a module of the FreeRADIUS server (http://www.freeradius.org), which is one of the best in its field. It's developed on Perl programming language, using software technologies that guarantee its quality, efficiency and flexibility and make the processes of support and updating easy. The module method allows it to work in other regimes and systems, not only as a module of the RADIUS server. The combination of proven technologies used in the core are the main reason for its reliability and stability and allow its integration (even in one-server-only installations) in large geographically-located organizations, with many regional offices using many VoIP routers, connected in different ways with various operators, without any delay in the voice network and guarantee that the problem situations with loss of accounting information would be something very exceptional.

Web interface

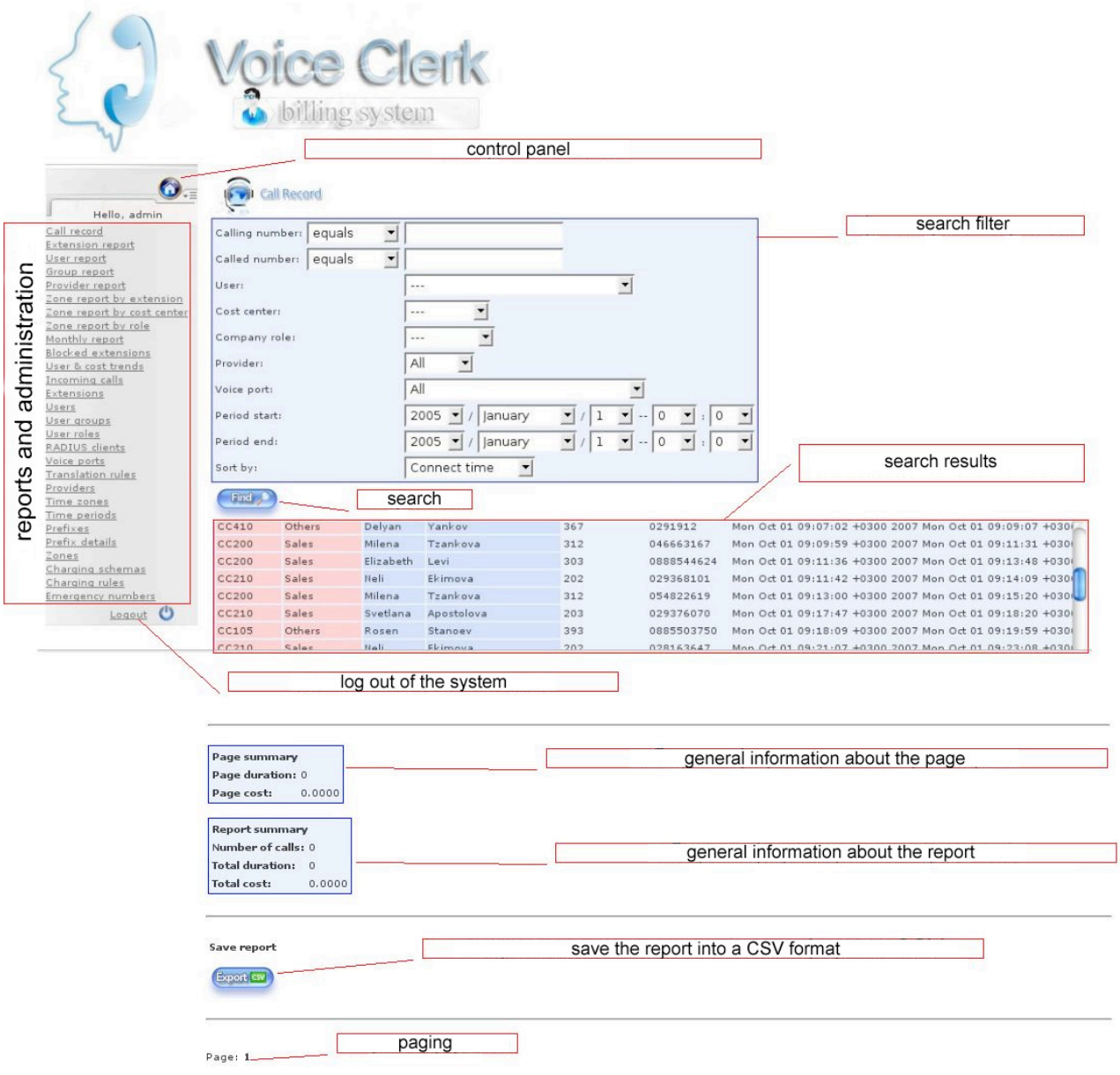
The system has a the most innovative web interface, that allows remote administration and configuration of the system, doing a variety of reports and references and saving them in files, which can be modified afterwards with software such as Microsoft Excel and others. The web interface allows the modification of nearly all of the work parameters of the system, which minimizes the number of situations when the administrator should use other means for a manual connection to the server, using SSH and others. With it you can easily edit the system properties (like routers, interfaces, etc.), the billing properties (operators, billing schemes, charged time zones, etc.), management of users and the access levels that they have to the system and visualization and export reports with a different level of detail, trends, analysis of the change in the expenses for larger periods, etc. The interface is realized on the programming language Ruby – a modern, dynamic language, using the framework for web development RubyOnRails (http://www.rubyonrails.org). The technologies that are used during its development are product of the evolution of the web programming during the years and are combined with different methods, which by them guarantee the creation of reliable, powerful and secure application, easy to support and update. The RubyOnRails framework allows us to add reports and functions for a particular client easily, without any quality loss, because it automatically creates tests, that immediately show if there are any errors, because of the change. Also the framework itself supports nearly all database management systems (DBMS) like Oracle ®, MS® SQL ServerTM, PosrgreSQL ®, MySQL® and has integrated means for creation of Web Services (with the use of SOAP or XML-RPC), sending e-mail or adding AJAX and other Web 2 technologies.

From generating reports, user management, tariff settings, adding gateways, restarting and reloading the configuration of the RADIUS server, the web interface offers fast, easy to use and accessible way to manage the system.

… Expert comments

"Rails is the most well thought-out web development framework I've ever used. And that's in a decade of doing web applications for a living. I've built my own frameworks, helped develop the Servlet API, and have created more than a few web servers from scratch. Nobody has done it like this before."
-James Duncan Davidson, Creator of Tomcat and Ant

"... Rails has become a standard to which even well-established tools are comparing themselves to."
-Martin Fowler, Author of Refactoring, PoEAA, XP Explained


Voice Clerk
billing system
control panel
Hello, admin
Call Record
reports and administration
Call record
Extension report
User report
Group report
Provider report
Zone report by extension
Zone report by cost center
Zone report by role
Monthly report
Blocked extensions
User & cost trends
Incoming calls
Extensions
Users
User groups
User roles
RADIUS clients
Voice ports
Translation rules
Providers
Time zones
Time periods
Prefixes
Prefix details
Zones
Charging schemas
Charging rules
Emergency numbers
Logout
Calling number: equals
Called number: equals
User:
Cost center:
Company role:
Provider: All
Voice port: All
Period start: 2005 / January / 1 -- 0 : 0
Period end: 2005 / January / 1 -- 0 : 0
Sort by: Connect time
Find
search filter
search
search results
CC410 Others Delyan Yankov 367 0291912 Mon Oct 01 09:07:02 +0300 2007 Mon Oct 01 09:09:07 +030
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CC210 Sales Neli Ekimova 202 029368101 Mon Oct 01 09:11:42 +0300 2007 Mon Oct 01 09:14:09 +030
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CC210 Sales Svetlana Apostolova 203 029376070 Mon Oct 01 09:17:47 +0300 2007 Mon Oct 01 09:18:20 +030
CC105 Others Rosen Stanoev 393 0885503750 Mon Oct 01 09:18:09 +0300 2007 Mon Oct 01 09:19:59 +030
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Page summary
Page duration: 0
Page cost: 0.0000
general information about the page
Report summary
Number of calls: 0
Total duration: 0
Total cost: 0.0000
general information about the report
Save report
Export csv
save the report into a CSV format
Page: 1
paging

Basic Voice Clerk functionalities

In this sections of the document follows a description of the functionalities that our product offers to the customer. It's divided into three sections – the first one depicts the core functions, after them those of the web interface and the last one describes the possibilities which don't belong in any of the two categories, they are optional, or still in a process of developing. Some, more complex, resources of the system are listed as a basic functionality and a group of sub-functions, closely connected to it and in some cases the sub-functions are just mentioned in the context of the basic one and is described in detail further down the presentation.

Voice Clerk core functions

Outgoing call billing

With properly configured tariff settings, the difference between the calculations made with Voice Clerk and the invoices from the operators is under 0.1%.

The product has a powerful integrated sub-system for calculating the cost of the outgoing calls, which when configured right does really precise calculations of the expenses. The calculation of the cost of the calls is done right after the accounting information is entered in the system – arriving of an Accounting –RADIUS stop packet, or data from the CDR database of CCM etc. While performing the calculations of the cost for every call, each of the call's parameters is taken account of for the right calculation. Some of the important ones are:

1. From which router and router interface the call got out and what was its destination, on the basis of which the system estimates through which operator the call went and what tariff plans should be applied in the calculation of the cost

2. From the information about the outgoing router and interface, the system not only finds the operator, but can also apply or remove the translations of the numbers, which are applied to the router and other components of the voice network (for more information check the section "Translation Rules")

3. The time zone in which the call was made – was it charged or not (for more information check the section "Time zones")

4. Zoning – in most cases the operators are billing in the same way a group of destinations. Voice Clerk allows this type of configuration (for more information check the section "Zoning")

5. Charging schemes – the system supports the whole lot of charging schemes, offered by the operators. Schemes like “charging at the beginning of the call”, “charging at certain time interval”, etc. (for more information check the section “Charging Schemes”)

When all the parameters of the call are processed and the attributes mentioned above are determined begins the application of zero or more charging schemes with their costs. These dependencies are defined by the charging rules, which are set like this: “for a call with a destination in certain zone, held in the certain time zone, these particular charging schemes, every one with its certain cost, are applied”, etc. (for more information check the section “Charging rules”). After the accomplishment of the upper calculations a request is assembled, which adds the information about the call with its calculated cost in the database and after that the processing of the certain call is finished and starts the processing of the next call, or the system goes in a stand-by mode, until the data about the next call arrives

Translation rules

Voice Clerk is usually integrated in already built, working voice networks and the way it works should be tuned corresponding to the existing configuration. Often on the voice routers and the other components of the voice transfer network are configured translations as on the internal as well as on the external phone numbers. In such cases, in order every sub-systems of the product to work right, the translations applied by the router must be removed, or other specific changes have to be done. An example of such a translation is the prefix, when calling a foreign line. When a certain user wants to choose a foreign number, he usually should add 0 (zero) or 9 (nine) before the number. It is certain that Voice Clerk must remove this prefix in order to correctly define the destination of the call. In other cases, mostly when we have many single offices in a big organization, every one of which has one or more routers, the internal numbers in every section may be with three digits and in the global numbering plan of the organization, for every office or router there must be added a prefix of one or more digits. Often the interior numbers may be called directly, i.e. they're available via certain operator for direct calls from the outside and every change in the numbering plan would be difficult or even impossible. Voice Clerk has a powerful sub-system for applying or removing translations, which is taking care of the right procession of the numbers, so that they would be identified correctly and it would be unnecessary to force any changes to the configuration of the existing network.

The translating sub-system has the option to connect groups of translation rules in the interface of every single router. When applying the rules the direction of the call is also taken care of: incoming or outgoing and on which number should be the rule applied to: the dialing, or the dialed. For every rule connected to the certain router interface, for the particular direction of the call and an exact dialing/dialed number, a regular expression is set – a term, whose execution would lead to the application of the rule. The system accepts every correctly phrased Perl regular expression as an application term. In this way the system administrator can tune many rules from this type: “if the call went trough interface BRI 0/0/0 of router with an IP address 192.168.111.1 and is outgoing and the dialed number starts with '00', remove the leading zero (i.e. it can be a prefix for a foreign line)” or “add '21' before each three-digit dialing numbers in outgoing call through interface 0/1/0 of router with an IP address 192.168.111.5”, etc. There are practically endless possibilities.

For every single number, when there is a call direction, interface, gateway and a number identical to the regular expression, the system may apply the following translations:

- Adding an extra digit at the end of the number
- Adding an extra digit at the beginning of the number
- Removing particular number of digits from the beginning of the number
- Removing particular number of digits from the end of the number
- Substitution (in the terms of the regular expression)
- Taking the value of the number, which the router returns as Vendor Specific Attribute (VSA), before the application of the translations upon it
- Taking the value of the number, which the router returns as Vendor Specific Attribute (VSA), after the application of the translations upon it

Billing calls going through VoIP operators

Voice Clerk supports billing of calls going through VoIP operators (such as Orbitel). The odd thing in this case is that the call comes out from an interface, which is connected to other (here called "primary" operator), but with a defined prefix, added before the number (i.e. 01001 for Orbitel). If the dialed number starts with the exact prefix, the VoIP provider takes the place of the primary operator and the cost-calculation algorithm continues to work as usual.

Voice Clerk supports all type of operators:
•POTS operators (example BTC) connected to the ISDN interfaces of the router
•Mobile operators cards, located in GSM gateways, which are connected either to the router or trunked to the CCM
•Specific prefix (example Orbitel – 01001)

Zoning

Most of the operators group many destinations in zones with the same cost and Voice Clerk is not an exception in this case. Sometimes the groups of prefixes, that are billed different from the local calls, calls to mobile operators, corporative GSM groups, etc. are configured as individual zones, other than those defined by the providers (i.e. "International zone 1" including selected countries, etc.).

Time zones

Every provider may define specific peak and off-peak time zones. Each time zone, on its hand, may consist of one or more time periods, like those basic types of periods and the combinations of them:

- time interval (i.e. 07:00 – 21:00 and 21:00 – 07:00)
- day of the week
- fixed date in the year (i.e. 03.03.2008)

The so-defined time periods and the combinations of them, allow the precise tuning of the time zones of every operator. In future it's planned to implement functionality, which allows working with periodical happenings (i.e. 3rd March every year, etc.).

Charging schemes

Generally, the charging schemes set the method to calculate the cost of a particular call for the different subintervals of its duration. The algorithm set in the realization allows the definition of different types of billing such as:

- Introductory fee
- Fixed billing for set subintervals (i.e. 0-30sec. duration calls are billed as a 30sec call, etc.)
- Different billing depending on the duration of the call

In the calculation of the cost of a single call, usually there are applied several schemes for the different intervals of its duration and in the end the results of their appliance are summed in order to form the cost of the whole call. The administrator may define arbitrary complex schemes (depending on the way, the operators are billing), which when applied on a particular call, may describe the following example: The introductory fee, from 0 to 60 seconds is fixed at 15sec. and after 60sec (the end of the call) it's calculated with 1sec precision, etc. In the system there should be defined only the different schemes for all the operators, zones, etc. and even the cost that is applied by the scheme in a single case is indicated in the billing rules. The last highly lowers the number of needed schemes and leads to simplification of the administration and the evasion of repetitions.

Charging rules

The charging rules define the connection between the zones (of the operators), the time zones and the charging schemes and set the exact cost, which must be applied in the particular scheme in the current zone in the time of the call. With their use, the administrator achieves unsurpassed flexibility and can configure different billing, depending on each of the parameters of the call.

Re-calculation of the prices with date in the past

Sometimes, there is a need to recalculate the prices of already calculated calls, in order to correct some mistakes in the configuration or when there is a change in the billing plans of the operators and the administrator was not informed in due time. Voice Clerk supports the possibility of recalculation of the prices of the calls with date in the past, which gives the chance to solve the problem situations mentioned above.

Limitation of the outgoing calls

The core can set limits to the users, to restrict the calls to specific destinations (i.e. international calls) and/or to send notifications (via e-mail or other) to the user and/or administrator, who have reached the specific limit.

Note: Limitation based on the calls trough the GSM gateways, which are directly trunked to the CCM is in process of developing

For the purpose of limitation, the following types of users are supported:

- Blocked –The user is blocked (administratively or has reached his limit) and can't make any calls, except ones to assigned emergency numbers (for more information check section "Emergency numbers")
- Unlimited – The user is not a subject to any restrictions
- Normal – Normal user with set limit, whose reaching is monitored by the system. On every user there can be set different type of limit.
- Special – Special limit that sets restriction to a certain destination
- Option for sending notifications when the limit is reached

Notification for administratively reached limit

The product has the option to send notifications (by e-mail and other) to administratively assigned address and/or to the specific user, when the certain limit is reached.

Reporting calls with zero duration

The system can be configured to store information about unsuccessful tries to connect, i.e. calls with zero duration. This option can be turned on on a global level (for all users) or just for a particular internal numbers.

It gives the opportunity to keep track of the work of a call center, etc.

Storing information about the incoming calls

If needed, the core can be tuned to report incoming calls too. The option may be turned on only for certain internal numbers or globally for all users. In short time, a development of the option to bill incoming calls is planned, which would be useful for the consulting agencies or other clients offering services with additional value.

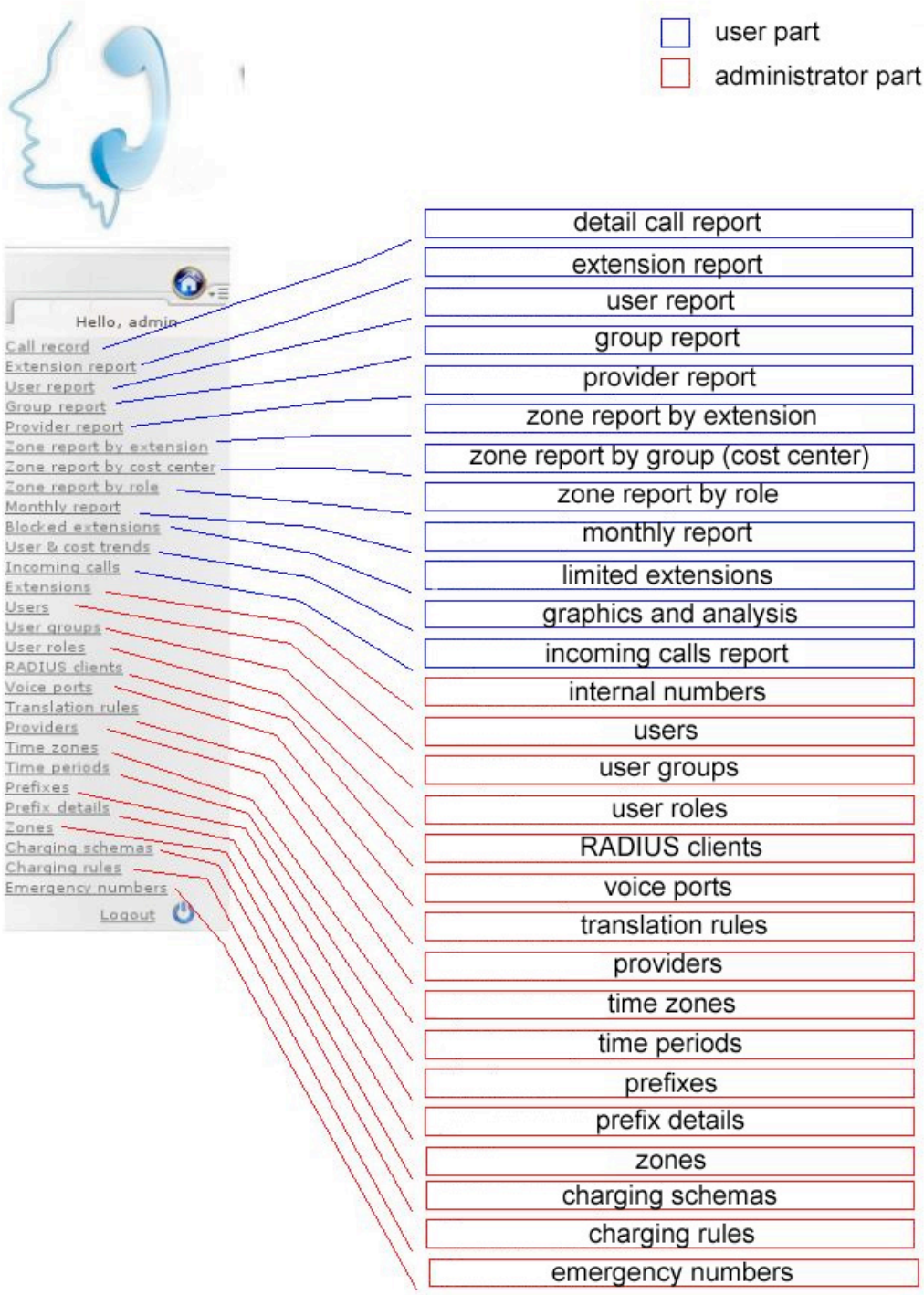
Automatic addition of users based on the information coming from the router

The product has the possibility to automatically add users, in administratively set groups, when they make their first call, based on the information coming from the router, CCM®, etc.

Emergency numbers

The system has the possibility of adding unlimited number of "emergency" numbers, from the viewpoint of limitation. The calls to these numbers are always possible, even for blocked users and users with reached limit. As an emergency numbers are usually (and implicitly) added those of the police, fire-brigade, emergency medical help, etc., but as an emergency numbers can also be configured the numbers of the employees in the company, who must be accessible at any time i.e. administrators, directors, etc.

Web interface functionalities



The web interface has the option not only to generate many reports, but also the administration of the system, tuning the whole configuration database and user management. This makes possible creating, editing, deleting and reviewing the configuration attributes, as well as creating a logical relationships between them. Except the configuration files of the RADIUS server itself, the other file that must be edited manually is the one for tuning the connection to the database. The whole other administrative information is in the base and can be managed over the interface. Development of functionalities that allow editing of the files mentioned above, through a user-friendly interface, is planned. Because of the main purpose of the web interface for doing reports, the management of the system and the administration database, in this section at some points there are described not only its user functions, but also some details about its structure and the organization of the database. Here is a brief description of the basic screens, menus and functions of the web interface:

System preferences

The web interface of Voice Clerk offers a quick and easy way to tune the system parameters of the product. These are some of the functions accessible for the user:

- Administration of voice routers, GSM gateways, etc. For every router there is information about its IP address, name, key and a description. We plan developing a functionality, which allows adding this information directly into the configuration of the RADIUS server, which eliminates the need of editing the clients.conf file, when adding new routers.
- Administration of voice ports (router interfaces). This option allows not only to create and administrate the interfaces, but also to command their logical relationships with the particular routers, operators and translation rules.
- Interface for administrating the translations. For more information about the translations, check “Number translation” in the “Functions of the core of Voice Clerk”. The web interface can create and administrate all types of rules mentioned there.
- Management of emergency numbers
- Restarting the RADIUS server, starting price and call recalculation processes, etc.

Tariff settings

The tariff settings are bound up with the system ones, but as they are related to the parameters of the voice network and so on, the tariff settings are totally related to the billing of the calls. As we described briefly in the previous sections, the algorithm of calculating the costs and its components, here we will list only the options, which the interface allows editing:

- Menu operators concede the option to create and configure the operators, which are connected to the organization. For each operator there is added its name, an optional short description, flag if it is a VoIP provider or not and its operator prefix. Here you can also associate the providers to their time zones.

- Time zones and periods. These options allow setting of the needed time zones and connecting them to the periods, that define them.

- Management of the prefixes of the destinations and their attributes. The prefixes and the attributes are stored in two separated databases, because mostly we have many prefixes with similar properties. The interface has the option to add attributes to the destinations (name of a city or country, description, type depending on the distance – local, national, international and flag if it is a prefix of a mobile operator) and association of one or more prefixes to the certain attribute. In process of developing there are different tools, which make the definition of zones and other activities automatically, using the Meta information about these attributes.

- The zoning menu is used for creation and definition of operating zones. When creating a new zone, it is entered its name, defined operator and a description. The so created zone can be associated to one or more prefixes.

- The charging schemes menu gives the interface to edit the billing schemes and the fields for entering a name, description, beginning and end of the part of the duration of the call, to which the scheme is applied, its duration as well as on what subintervals (how precise) should be the billing done (check section "Billing schemes")

- The charging rules menu define the relations, that select the different schemes and costs that must be added to the call for a particular operator or time zone. The selection of a zone, time zone and a scheme, addition of a name, description and the cost that should be applied in the certain condition are chosen from a drop-down menu.

Administration of internal numbers, users and their groups and roles

The management of users, the groups they are organized into, their internal phone numbers and their access to the interface are implemented in a flexible and functional way, that allows the easy administration and makes it easy to depict the extant organization structure of the client. In this point there are not only listed the options and menus, that allow management of users, phone numbers, groups, etc. but also some features about object relations, which describe them and the logic of the so-realized architecture. This is done in order to clear up the flexibility and the options of the system to depict real organization structures and generating different references, based on the defined objects.

- The internal numbers menu implements the administrator interface for the IP telephones in the organization. For every phone it's kept particular information: internal number, limit, flags if the zero duration or the incoming calls are recorded, description, type of limitation (blocked, unlimited, normal, etc.)
- In Voice Clerk the object "user" has the meaning as of a physical person (employee) – owner of one or more phone numbers, as well as a user of the system, who, depending of his access rights (roles), can enter it and perform certain actions (generation of references, review of the calls, administration, etc.). For every user the system stores his real name, username, e-mail address and some administration details as password, when the user is created and when was the last time his profile were edited. Except data about the users in the "Users" menu there are the connections between them and the other objects: one or more telephones (one of which is selected as "primary"), belonging to one or more groups (one of which is selected as "primary") and the administrative access rights. The list of users that is

visualized when the menu is selected, shows the main properties of the users (username, name of the employee, primary phone number, etc.) and they are all accessible for editing or a detail view for each user.

- User groups. Each user can be a member of a random amount of groups, one of which is selected as "primary". For each group there is a defined name, description and administrative number. The way these attributes are used and their significance from user's view may vary. In some organizations the group has the meaning of a department in which the user works and the administrative number is an accounting identifier for the department, while in other cases each user may be a member of i.e. three groups – the first one is the department, the second is the user's position in the department (director, manager, etc.) and the third is for his duties and the administrative number is used as an indicator for semantic difference between the different types of groups. The flexibility set in the architecture allows the easy integration of Voice Clerk in the administration structure of an organization and generation of subsets in the reports, based on defined signs and rules.

Based on role access control RBAC (Role Based Access Control), the product supports a flexible scheme for controlling the access to the system, which allows the precise restriction management of the users in it. The interface gives the option to configure the administrative roles and associating them with users. The so implemented RBAC access system allows setting of different levels and types of users, specific for the client. The default types in the product are:

The user authentication system integrated in the product, in most cases is more powerful, than needed and usually is not used. It's important to be noted, that when requested its more complex functionalities can be activated, such as - sending e-mail and confirmation of the registration, remembering the username and password of the client computer, automatically log in from it and etc.

- Administrator with full monitoring rights, who can change every parameter of the system
- System administrator with rights to change the system properties
- Billing administrator with rights to change the billing properties
- User with rights to see only details about his calls
- Director of one or more groups, who can monitor the calls, administrate the users, their limits, etc. for the particular groups
- Usually, when connected to the system, the unregistered user is given a "phone book" interface, where they can search the number of a certain colleague, but this is optional (can be defined a special access role just for it)

Reports and references

In this section there are listed some of the basic types of references, that can be visualized and exported to CSV file by the system. We won't pitch on the more specific reports, which we have made for a particular clients, but we take notice that the technologies and methods, used in the implementation of the interface, allow the extremely quick realization of references, needed by the customer, that reflect the correct principals of accounting, applied to the organization. The web interface of the product allows the generation of many types of references, filtering and grouping in periods, users, etc:

- A brief user report. When each user enters the system, he, their duration and cost give a brief report for the number of the phone calls made. Usually the users can only see the information about their own phone calls.
- A detail report. This is the basic reference, given by the interface. In it there is information about all calls, corresponding to the filtering criteria. As you can see, often, the selection of a certain row in a more general reference leads to a more detail one with a certain filtering criteria in it. The detail list of the calls visualizes the main data about the call: group or groups of the user (if the dialing number is connected to one), name of the user, dialing and dialed number, duration of the call, beginning and end of the call, cost, IP address of the RADIUS / Voice Clerk server, IP address of the router and name of the interface (port), the call went through, provider, zone, time zone and call destination. Before the table with the result there is a search field, that allows filtering of the calls based on dialing/dialed numbers, if they're between certain numbers, user name, beginning and end of the period in which the call was made, etc. The results can be sorted according to nearly all the parameters – time of beginning/end of the call, dialing/dialed number, duration, cost, etc. Because the results in report are usually many, the last ones are distributed into one or more pages and the user can switch between them using the number links in the end of the report. At the end of the report, before the page links, there is a visualized form, an export to CSV file button and two tables with summary information about the page and the whole report (sum of all calls, duration, cost).
- Internal number reference. This reference has the same options for visualization in pages, exporting the results to a CSV file and summary tables for the current page or the whole reference, as well as a detail list of the calls. But it visualizes the summary only about the dialing (internal) number. The report has a filtering form, based on group(s), dialing number, summary cost or duration of the call can sort user, defined period and the results. Each row in the table has these fields: group(s), username, dialing number, description and sums of the costs of the calls and their duration. In it there are clearly shown expenses for each phone number. Each row of the table has a connection to a detail list of the calls and after selecting there is a list of all the calls, made from the selected IP phone for the defined period or other filtering parameters.
- User reference. It is much more detailed than the “Internal number reference”, but shows summary of the cost and duration of the calls made by a certain user, instead of an IP phone. It has the same options to export to file, summary tables and paging, as well as a detailed form for searching and sorting. Selecting a particular user connects you to the “internal number reference” and automatically selects the user in the filtering form and shows summary of the calls of each of the phones of the user.
- Group reference. It shows summary of the expenses in the defined groups in the system. It also

has the standard functions for paging, filtering, summary tables, exporting and the connection to a detailed report for a particular group.

- Operator reference. It allows you to monitor the expenses realized by each provider, connected to your voice network. You can even visualize extract based on router or interface, to see the expenses of a particular GSM card for the certain provider. Selecting a particular operator transfers you to a detail reference, based on groups, etc. and shows the cost of the calls made by those groups, etc. to the selected operator. From the operator reference, you can get a concept what expenses to expect at the end of the period.
- Voice Clerk has some references, that allow tracking based on different parameters – number of users, duration of the calls, expenses, etc. in time (i.e. like year – monthly report). It allows you to monitor your network in advance, to track down trends and to analyze the consumption. In near future for the more complex references there will be graphics for analyzing.

Other options and features of the interface

- The interface of the system is done intelligently and stores history about the users and other data in time. I.E. If a certain user changes his department, this won't lead to new calculations of his expenses in the new group, but would be based on the selected period and will be shown in the exact place in the report.
- Import of user and billing data from a file.

Other functionalities

In this section there is a list of the other useful features in the product that are not part of the upper classification, or are optional:

- Periodic sending of references in CSV or Excel format on e-mail or to a certain address
- Reliability. Since it's developing, the system is build with the thought about stability and reliability. On a customer request, there can be integrated backup servers, who can take the job of the primary one if there is a problem in any of its levels.
- Backup database server. Voice Clerk works with database as on the local, as well as on a separated, backup database server (both synchronize the data between each other) and if there is any problem with the primary one, the work is automatically switched to the backup one. After a defined period of time, the system checks the states and attempts to return to the primary server.
- Backup Voice Clerk server. Despite the fact, that the problems with the server are extremely rare, there is no insurance of crashes. To avoid those cases, the routers can be configured to send accounting information to a backup Voice Clerk server, when the primary one crashes.
- Support of the most popular DBMS such as: MS SQL, PostgreSQL, MySQL, etc.
- In near future, support of web services (through SOAP and XML-RPC) would be added to the system. In this way the product can provide an interface for working from a distance and other features.
- In a process of development is a functionality that allows marking of the official calls as such and separating them from the personal ones, when making a reference. The realization of a feature to support different billing of the business subscribers to the operators is planned.
- Record and history of the made administrative changes in the graphical interface.

- Corporate directory made on XML for IP phones, taking data from the Voice Clerk database.

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