SIM-SERVER
ELGATO

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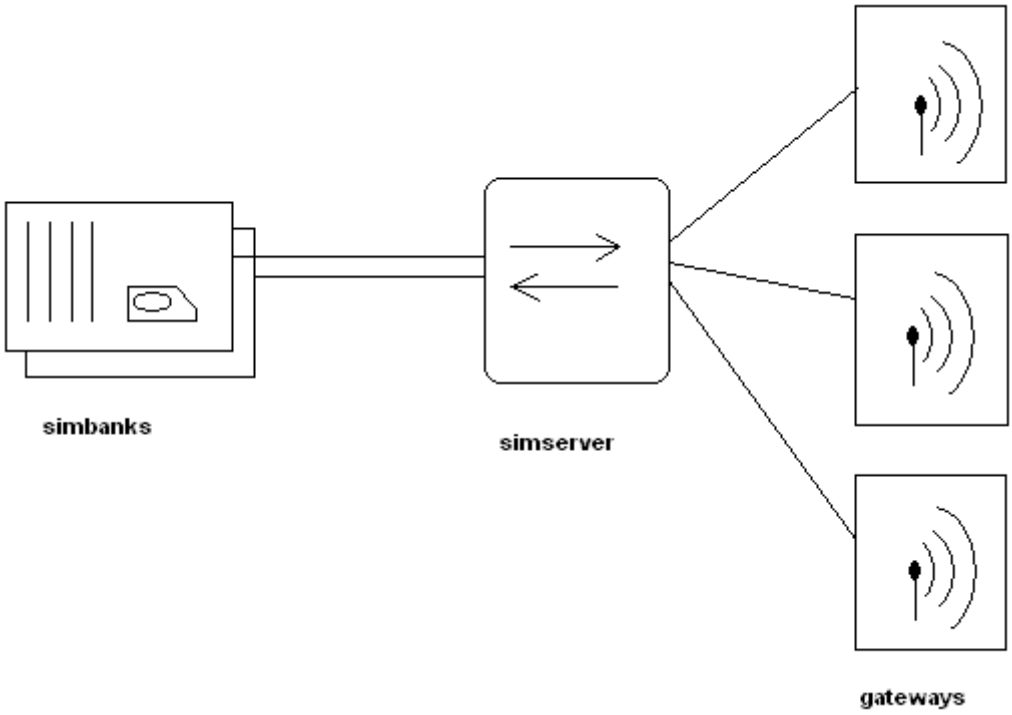
1. **Introduction**

System Sim-Server is a complex of devices, aimed at a centralized storage of Sim-cards or other types of smart-cards and their further usage in such devices as GSM-gateway, tuner of satellite television or other devices, which use smart-cards in their work. Sim-server is a flexible system for control and inventory of Sim-cards, which are used in your applications. There exist wide opportunities of adjusting and configuring the work of the system with the help of a comfortable web-interface.

Sim-server complex includes the following equipment:
Sim-bank, Sim-server, GSM-gateway(s) (compatible with the system Sim-server Elgato).

2. Common information



The system consists from devices of 3 types:

- simbanks, which contains simcards
- Gateways, which have GSM modules in it. These GSM modules perform connection to gsm-network, using info from simcards. Gateways pass traffic from PRI to GSM and vise versa.
- Simserver, which commutates simcards from simbanks with modules from gateways using set of rules. Simserver also has webinterface to maintain every setting, including plenty of settings on gateways. So Simserver is a kind of center of maintenance.

SIMbank – is a 1U computer, which has 20 simholders. Every simholder has 10 places for simcards. Numeration of simcards goes from right to left and from top to bottom. Cards, being commutated have little light turned on.
Gateway– computer with several (1 to 4) gsm boards. Every board has up to 8 GSM modules. So one gateway can provide up to 32 GSM channels.
Simserver – it is a special software, which could be installed either on simbank or on separate computer under debian linux. Simserver commutates simcards with gsm modules, pass data from cards to modules and back. It also allows to maintain rules of commutation, view statistics, maintain cards and settings, maintain gateways and set many options on gate via web-interface. Simserver consist of two parts:

- Binary program named "commutator" which connects banks with gateways.
- Web interface & database which holds all settings, necessary for binary program to work. Web-interface also allows to change all the settings, view statistics and set many options for gateways.

All three devices are connected via tcp-ip protocol. Gates can be placed anywhere and get data from simcards via internet, so working without simcards inserted into them. Simbank and simserver could be located in some maintenance center, while gates are spreaded all over some

big area. The only thing they need is good internet connection. With such design you can easily change simcards without necessity to go to every gateway.

Starting simbank.

Simbank starts by default right after loading of OS on the computer. For manual start you can do following actions:

1. run command “ps ax” from console and make sure, there is no process named “simbank” or “sim_bank”. You should stop simbank program if it exists with command “kill _pid_” where - _pid_ is the identifier of the program in process list, generated by “ps ax” (you can also try “kill -9 _pid_” if “kill _pid_” doesn’t work for more than 2-3 seconds)
2. change folder to /home/simbank (cd /home/simbank)
3. run command “nohup /home/simbank/sim_bank_up.sh > /dev/null &”

Starting gateway

Gateway software starts by default right after loading of OS on the computer. For manual start you can do following actions:

1. run command “ps ax” from console and make sure, there is no process named “u_main”. You should stop u_main program if it exists with command “kill _pid_” where - _pid_ is the identifier of the program in process list, generated by “ps ax” (you can also try “kill -9 _pid_” if “kill _pid_” doesn’t work for more than 2-3 seconds)
2. change folder to /home/simserv(cd /home/simserv)
3. run command “nohup /home/simserv/wstart.sh > /dev/null &”

Starting simserver

1. run command “ps ax” from console and make sure, there is no process named “commutator”. You should stop commutator program if it exists with command “kill _pid_” where - _pid_ is the identifier of the program in process list, generated by “ps ax” (you can also try “kill -9 _pid_” if “kill _pid_” doesn’t work for more than 2-3 seconds)
2. change folder to /home/simserver (cd /home/simserver)
3. run command “nohup /home/simserver/commutator> /dev/null &”

Web-interface is available right after full loading of OS and starting of web-server apache2.

WEB-interface:

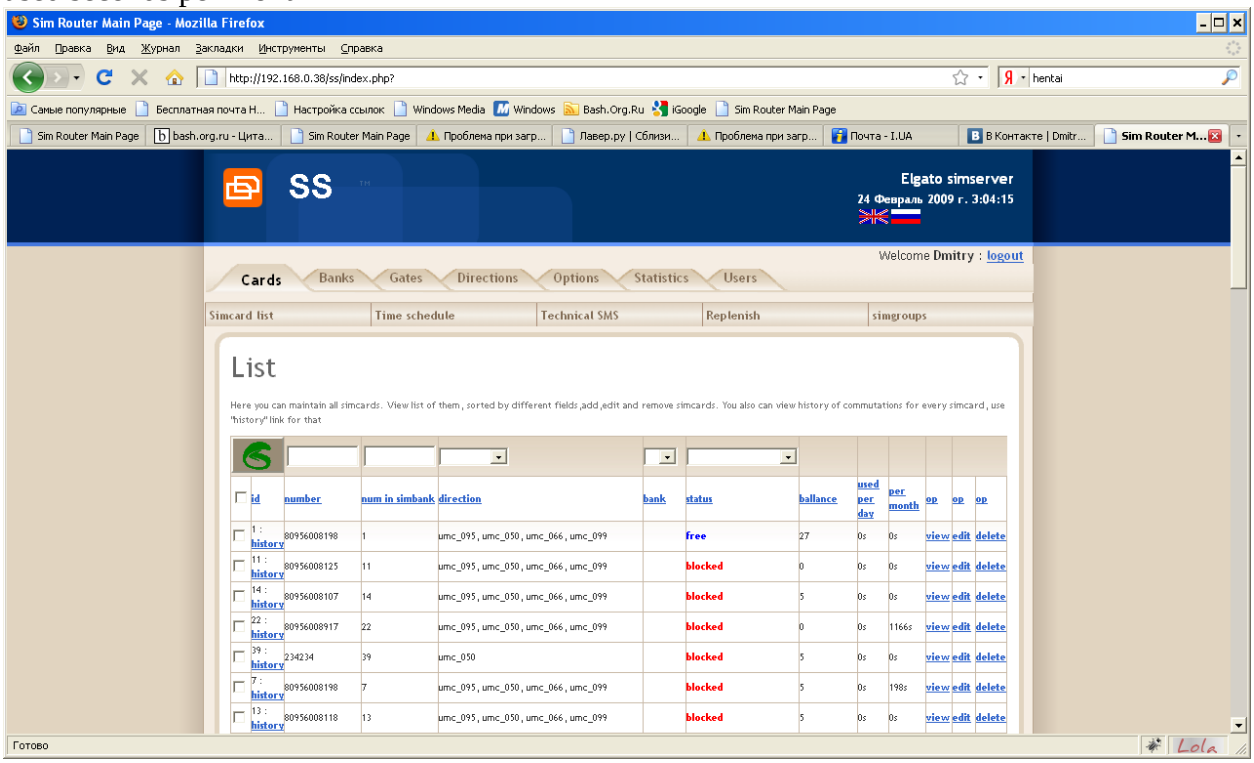
Main sections

Simcards

Here you can maintain simcards, time intervals, replenishments for cards, sms-messages
Simcard-list – it is list of all available simcards, entered the system. Here you can see

- id of simcard,
- number (+380504444444),
- number in simbank(position in simbank),
- direction, which is associated with card. Direction is a set of masks for numbers, this card can dial to (e.g. if mask is 050 than card can call to 8050xxxxxxx)
- bank, which the card belongs to,

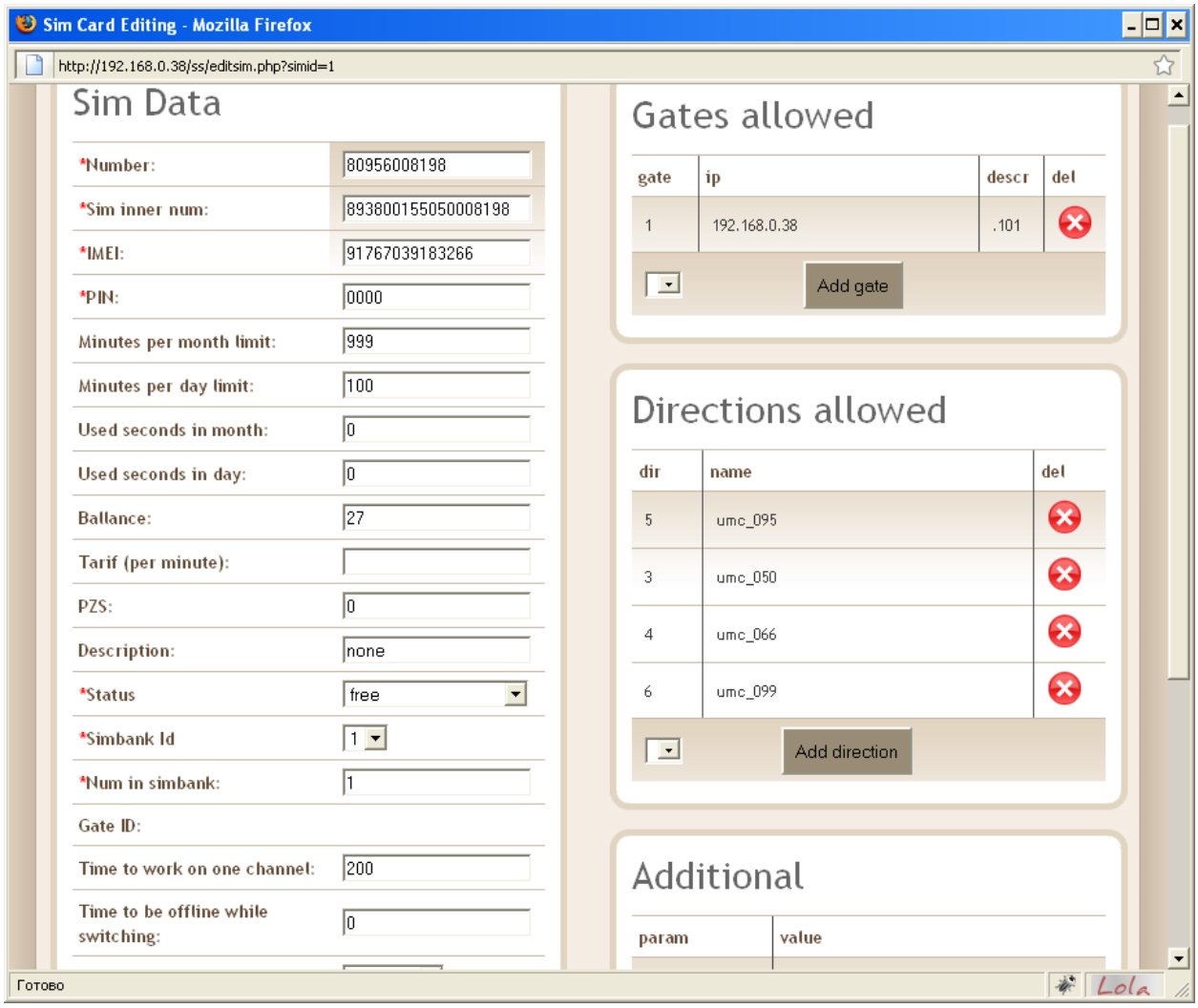
- status of simcard
    - removed – there is no simcard in this place in simbank. It is temporarily removed
    - blocked by operator – simcard is blocked by GSM operator and can't dial anywhere
    - blocked – card is marked blocked to exclude it from commutation
    - free – card is ready for commutation
    - on hold – card was commutated, than uncommutated and now is waiting its turn to be commutated again (is similar to free, except card can wait specified amount of time before next commutation)
    - commutated – card is commutated to some channel and now is probably in work
- balance (how many money left on card)
- used seconds per day
- used seconds per month



Last three columns is for maintenance:

- delete – remove card completely,
- view – view detailed info about the card
- edit – edit parameters of the card

Editing simcard



First you should fill all fields, marked with red asterisk. Then you should save the data using "save" button. After saving main info you'll be able to edit additional info – allowed gates and directions. You should add at least one gate and one direction to card, so that it can be commutated to those channels on the gate, which are allowed to dial to phone number with mask from the direction, associated to simcard.

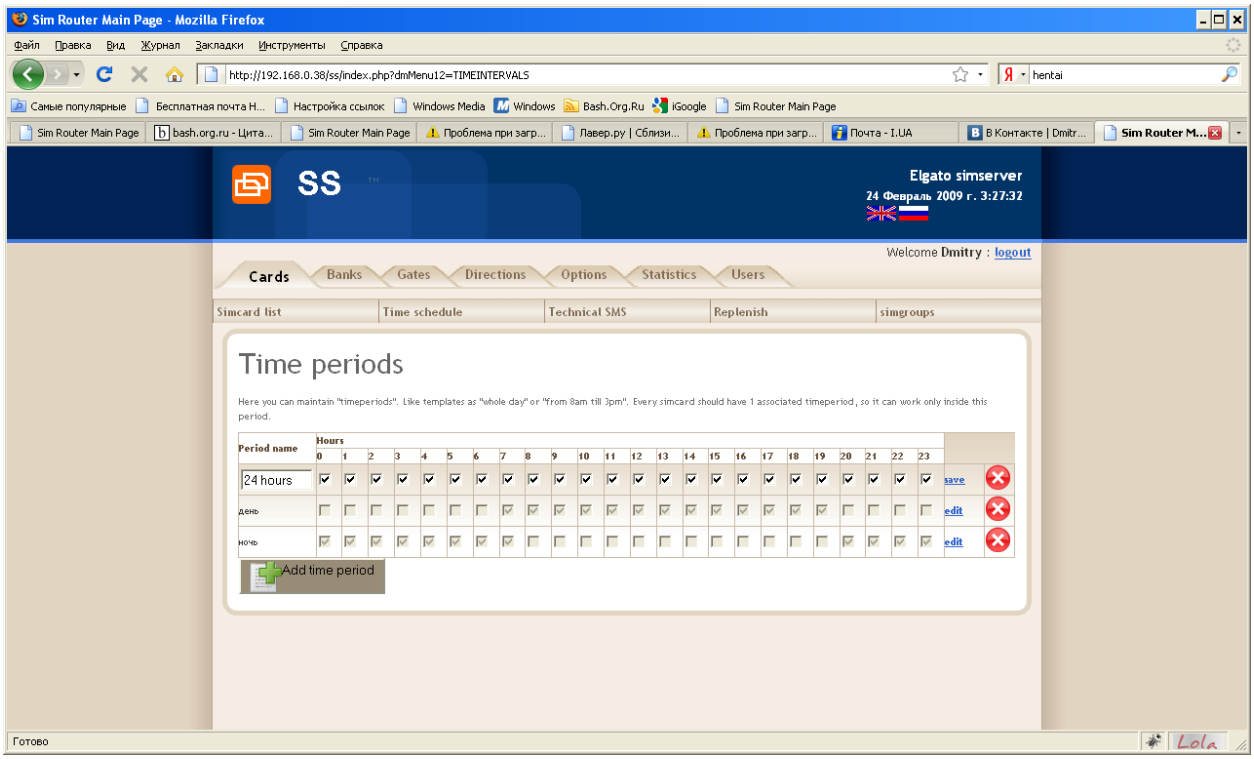
Fields:

- Number – phone number for simcard. E.g. +380504444444
- Sim inner num – inner number for simcard. The number, printed on cover of simcard. It isn't used now.
- IMEI – IMEI for card.
- PIN – PIN. If PIN is disabled for card, you can enter here everything
- Minutes per month limit – how many minutes can simcard use for calls in month
- Minutes per month limit – how many minutes can simcard use for calls in day
- Used seconds per day – how many seconds have been used in current day
- Used seconds per month – how many seconds have been used in current month
- Balance – how many money are on simcard
- Tarif per minute – how any money are charged for minute of call
- PZS (payment for connection) –this field is unused now
- Description – self-explanatory
- Status – state of simcard. Removed, Blocked, free, commutated. See description of statuses higher
- Simbank id – which simbank the card belongs to

- Num in simbank – position of simcard in simbank. Top right position is 1. Top left is 5, Bottom left is 200.
- Time to work on channel – how many seconds can the card be commutated with channel until it uncommutates
- Time to be offline while switching – how many seconds (at least) should card wait in state “on hold” before next commutation
- Time schedule – which time schedule this card is associated to (schedules can be maintained in “time schedule” subsection of the “Cards” tab of main menu)
- Direct channel commutation – if this setting is activated, card can be commutated exactly to channels, added to it in “direct commutation channels” zone
- Weight – the more this value is, the more often the card will be choosed for commutation
- Hide sim number while calling – callee will not see the number of simcard
- Send stealth prefix – send special stealth prefix before sending dialed number in order to hide phone number of simcard

Other subsections

Time schedule

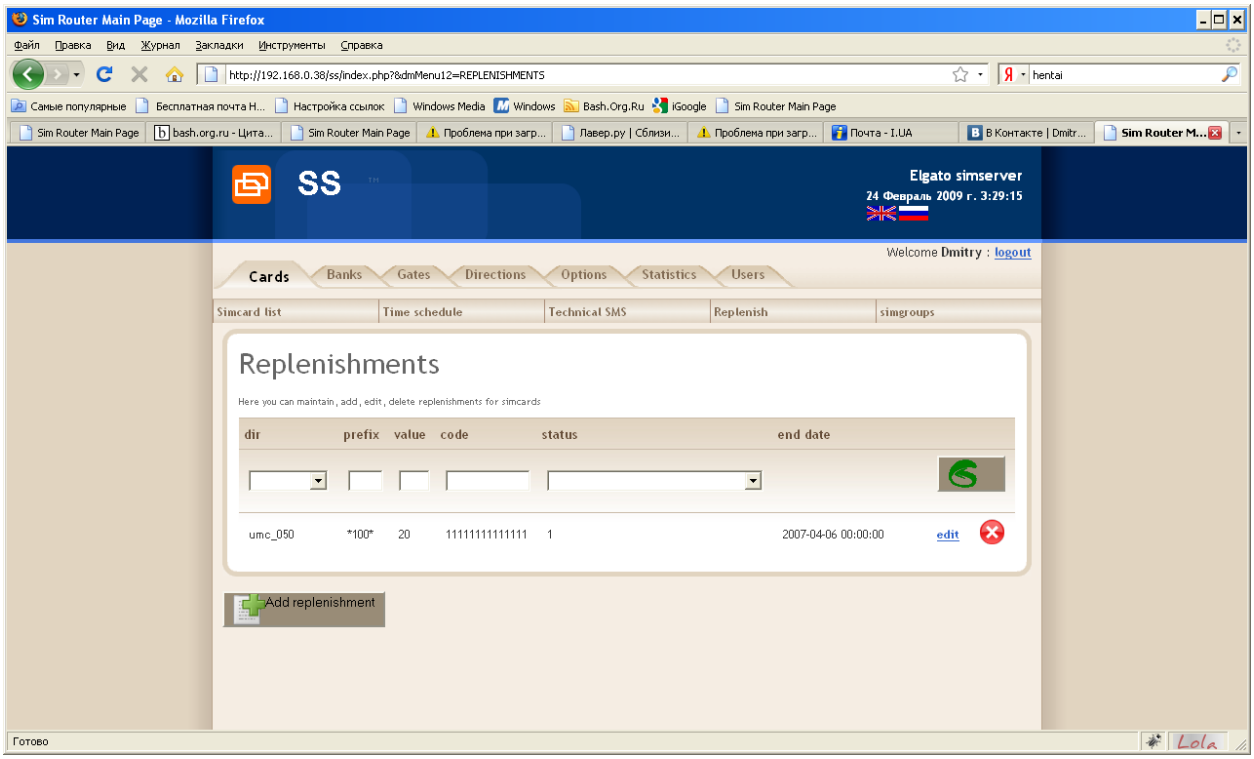


here you can add, edit and delete “time schedules”. You can create your own schedule, mark, on which hours should card work and add this schedule for any card.

Technical SMS

Here you can add, edit and delete text for sms-messages, sent from one simcards to another to imitate human activity

Replenish->Replenishments

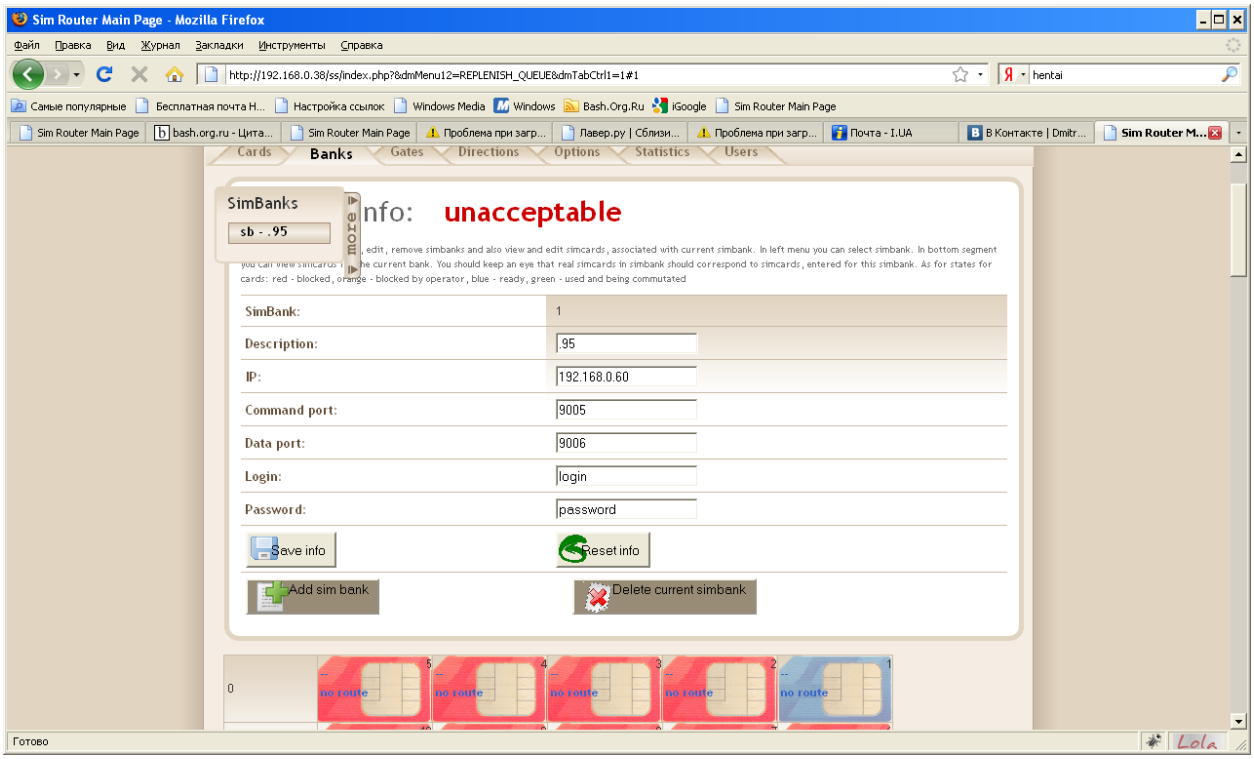


Here you can add, edit, delete and view currently available replenishments, which can be used to recharge cards with ballanca lower than allowed.

Commutation order

All cards are commutated one after another. The more time passed from last commutation of simcard, the higher is probability that the card will be chosen for commutation.

Banks



Here you can add simbanks(“Add sim bank” button), remove currently selected simbank (“Delete current simbank” button) and edit info about simbank.Use “Save info” button to save information.

As for informational fields:

- Description – som additional info about bank, to help you distinguish it from another banks
- IP – ip address of the bank
- Command port – port on simbank, used to reveive commands. Now it is unused
- Data port – port on simbank, used to receive date for simcards. Default is 9006. if your simbank under NAT and you use port mapping, enter here any port mapped to port 9006 on real simbank.
- Login,Password – authentification info to authorize on simbank. “login” and “password” are defaults.

You can use left menu to switch between banks.
You can see simcards map under main bank info. It is dynamically updated, so you can see actual state for cards.

- Grey – card is removed (no real card in simbank)
- Orange – card is blocked by GSM operator
- Red – card is blockd
- Blue – card is free (ready for commutation)
- Yellow – card is on hold (waiting specified amount of time and waiting its turn for commutation)
- Green – card is commutated now.

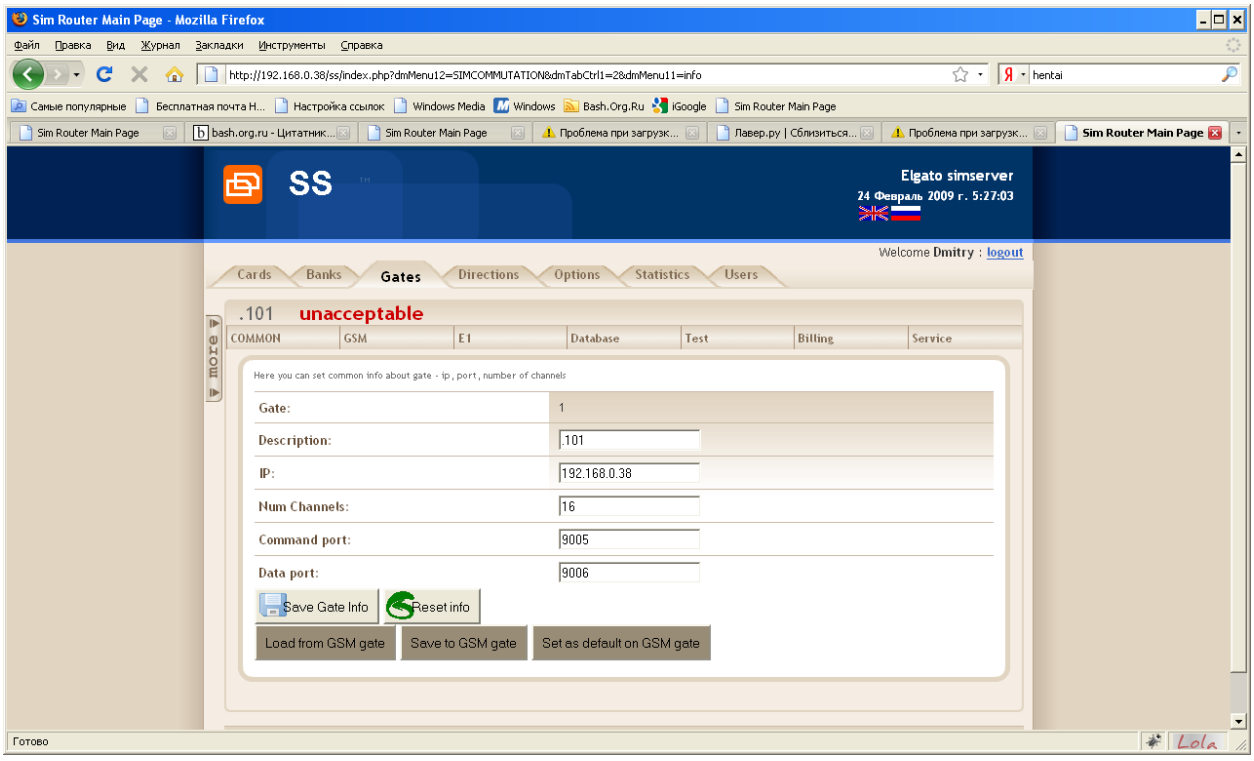
You can click on any card or even empty place to edit or add new simcard for this place.

Gates

Here you can view current state of gateways, add, edit and remove gates and maintain them, change settings and so on.

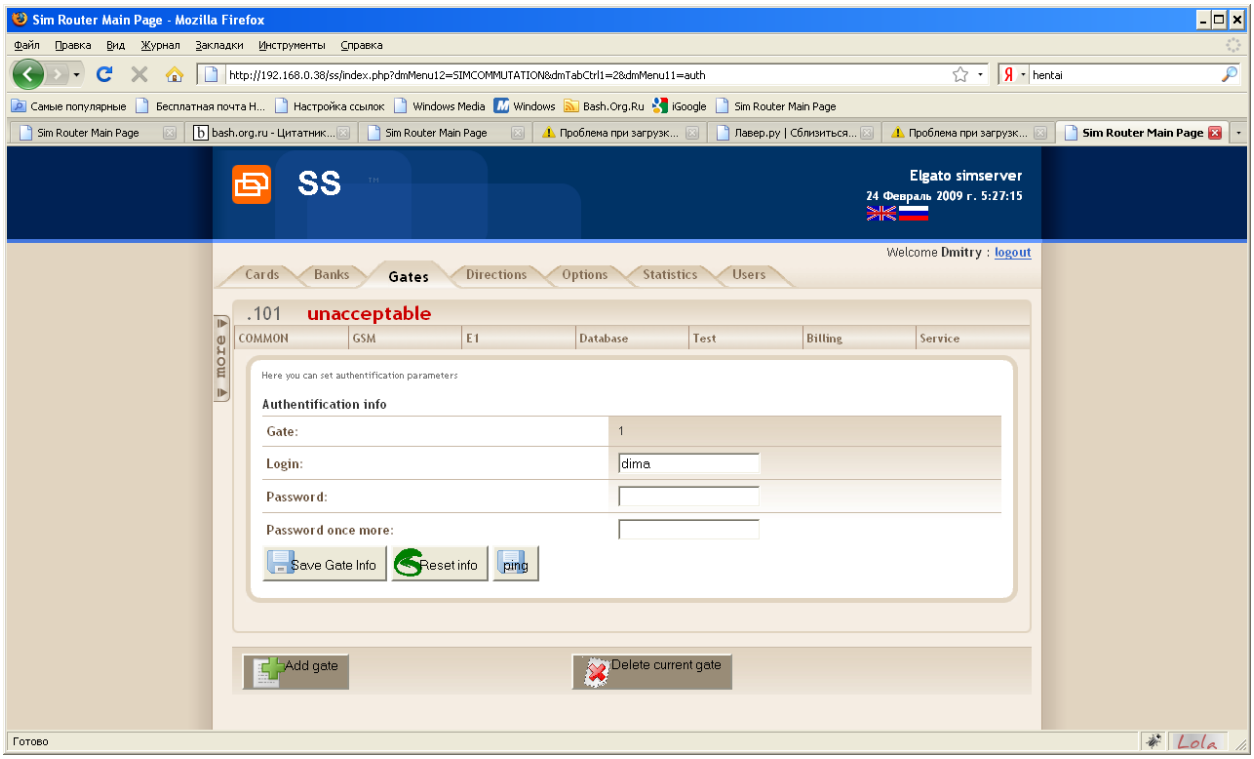
Common

info



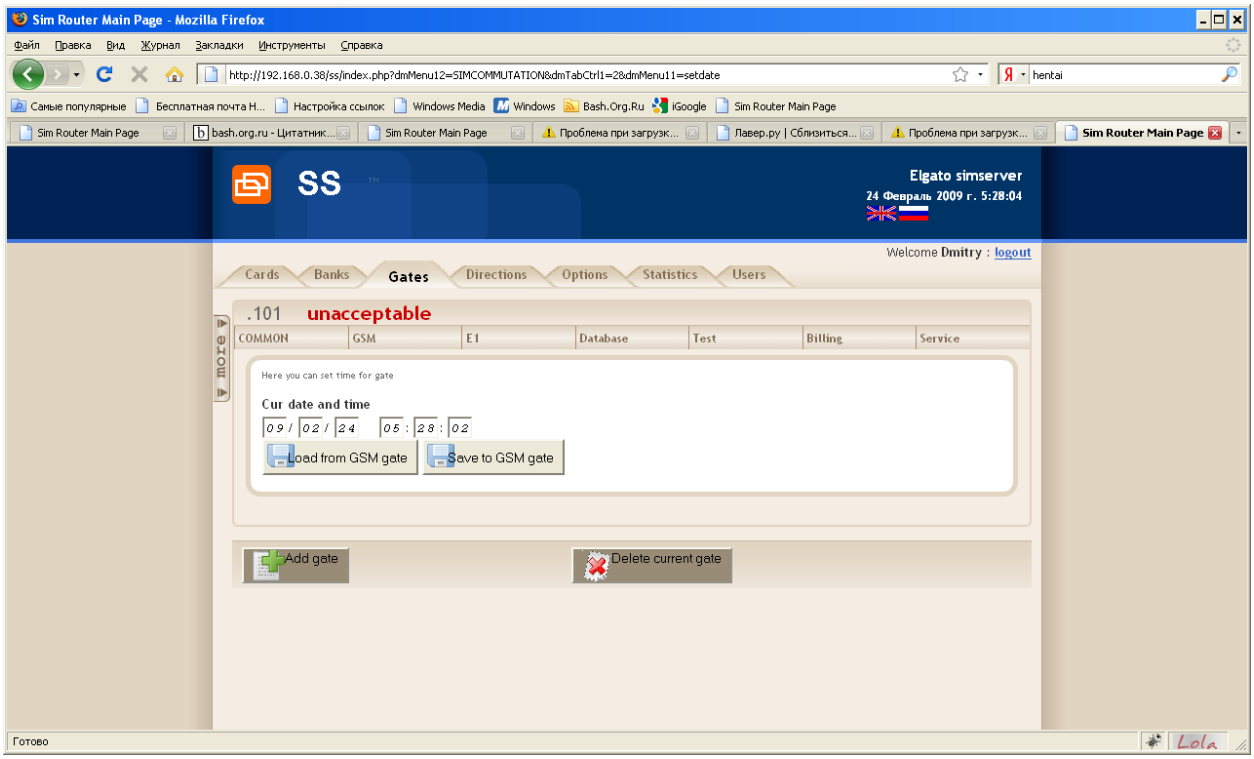
Main info about gateway – description, ip address, number of channels, data port and command port. Use “Save gate info” button to save this info. Other buttons are useless for this screen.

Auth



Enter login and password here to authentificate on gateway. “dima” “123456” are defaults.

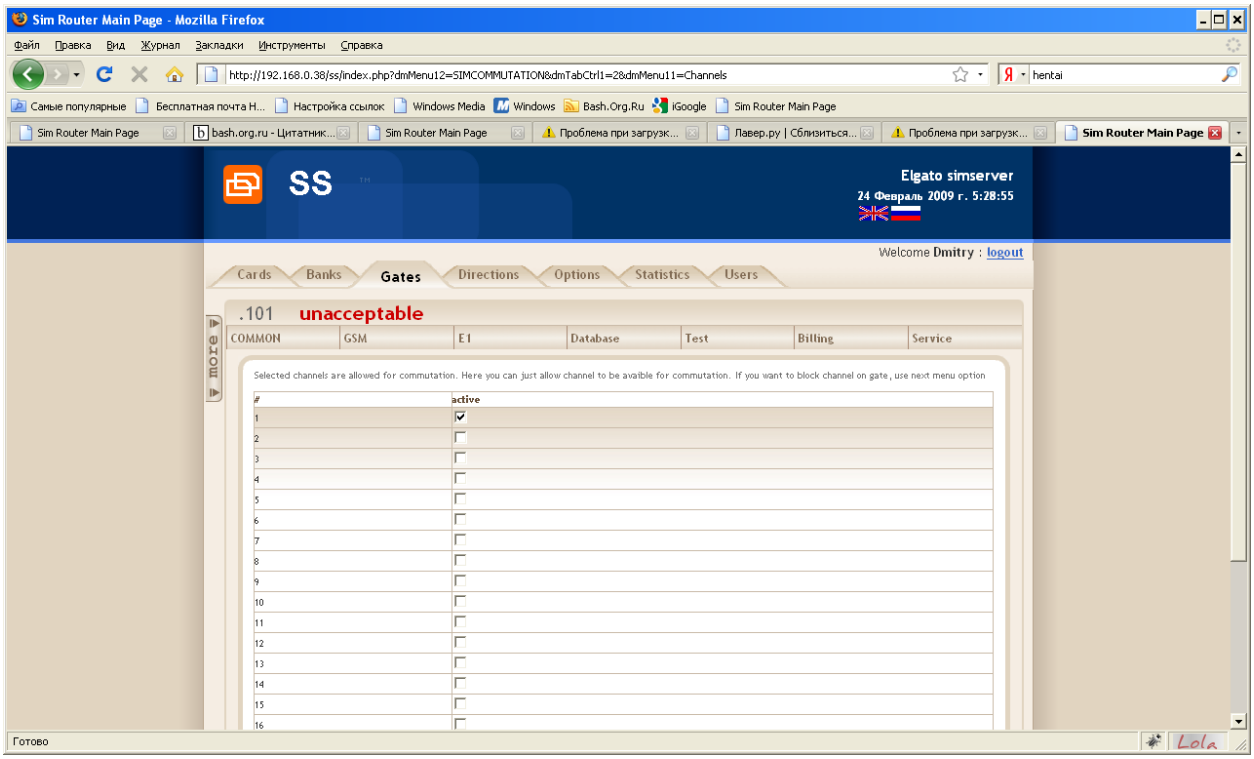
Set date and time



Here you can set date and time for gate.

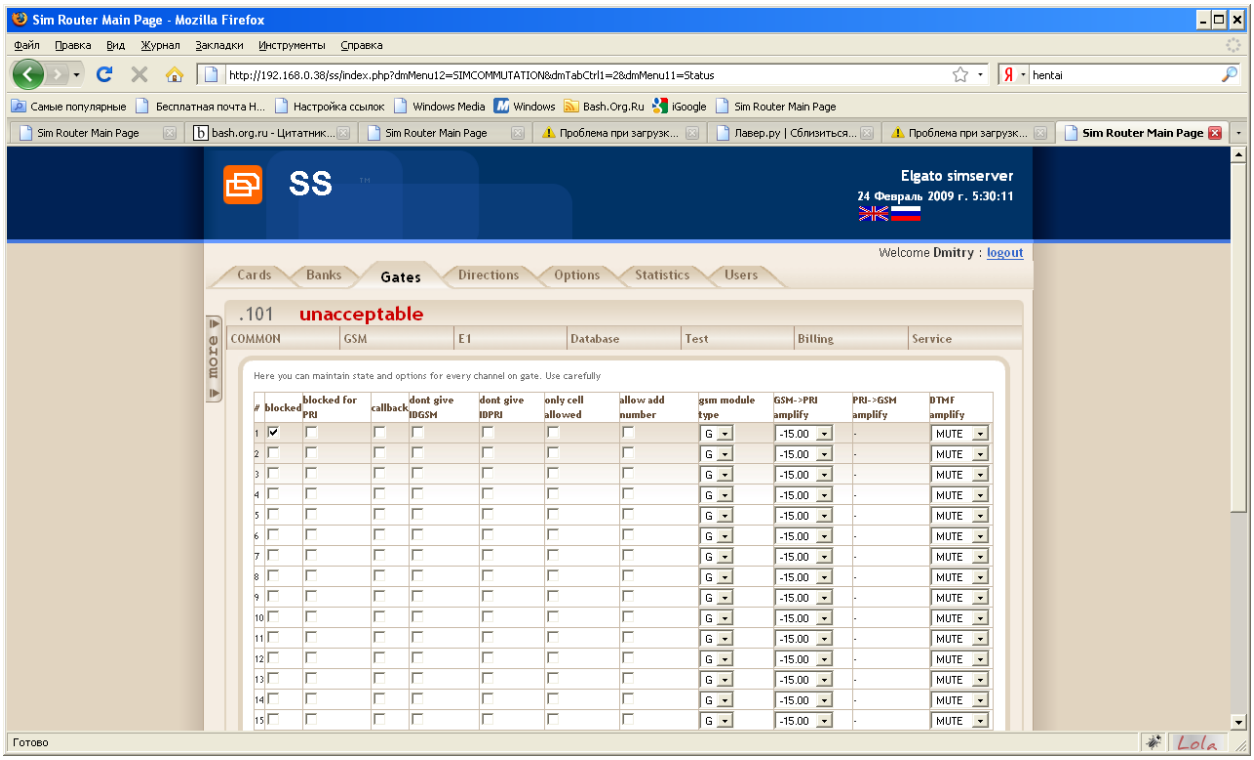
GSM

Channels



Mark channels here, which are opened for commutation. This screen allows you to exclude channels (GSM modules) from commutations if they have any errors on them or whatever.

Status



Main settings for channels on the gate.

- Blocked – channel is free for receiving commutation request for sim.
- Blocked for pri – channel can't receive calls from PRI
- Callback – channel can be used for callback
- Don't give IDGSM – channel doesn't send its it to GSM network
- Only cell allowed – only cell to cell cals are allowed on this channel
- Allow add number – channel can add additional digits to number

- Gsm module type – type of module for this channel. PiML or G
- GSM->PRI amplify – level of amplification of signal which goes from GSM to PRI
- PRI->GSM amplify – level of amplification of signal which goes from PRI to GSM
- DTMF amplify – level of amplification of DTMF signal

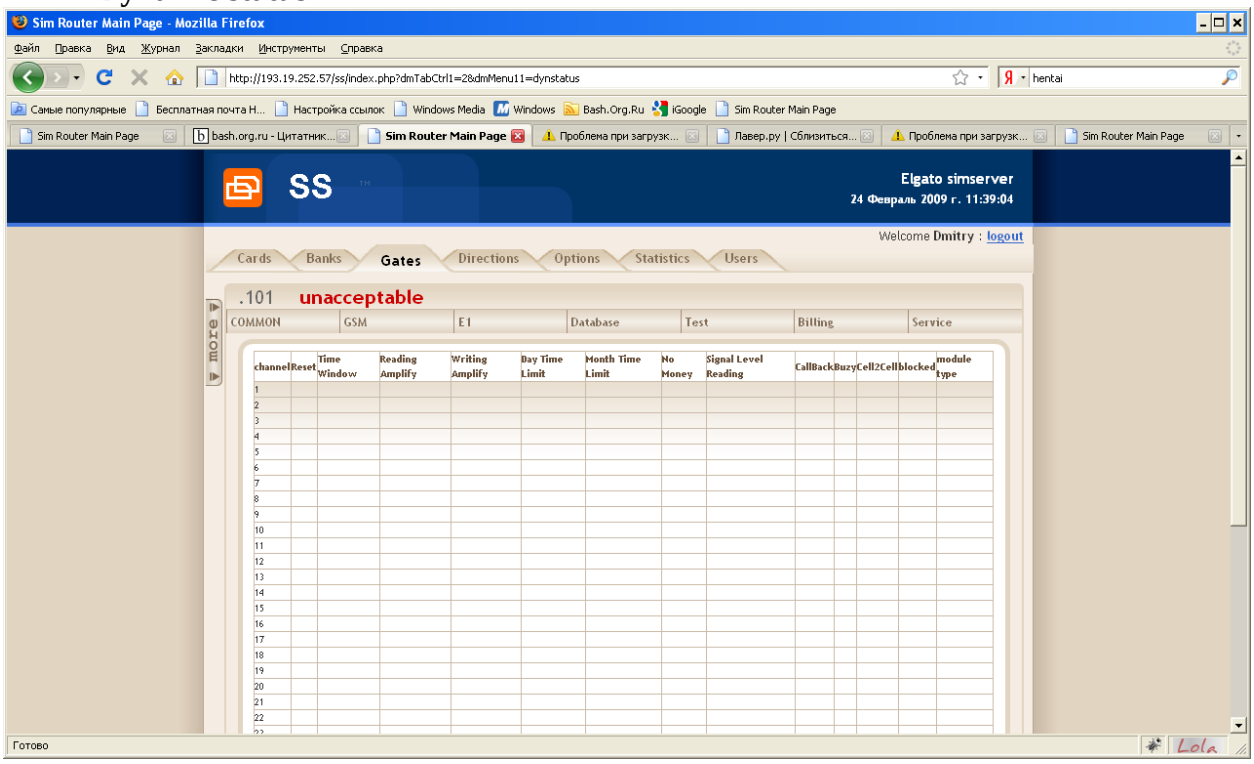
Note: last three columns depends on module type. For certain types certain columns are disabled

In the bottom you can see buttons set.

- Reset info – resets all input controls to original state
- Reload from database – load values, stored in database on simserver
- Save to database – store entered values to database on simserver
- Load from GSM gate – load actual values from gate
- Save to GSM gate – save current values to gate
- Refresh amplify from GSM – order new amplification values. You should do it because it takes some time for gate to prepare amplification data
- Set as default on GSM gate – set the settings, being current on gate, as default. So that gate will use them after reboot.

Good practice is to save data first to database, then to gate and then make them default. You should think twice before saving data to gate, because you can accidentally corrupt it.

Dynamic status

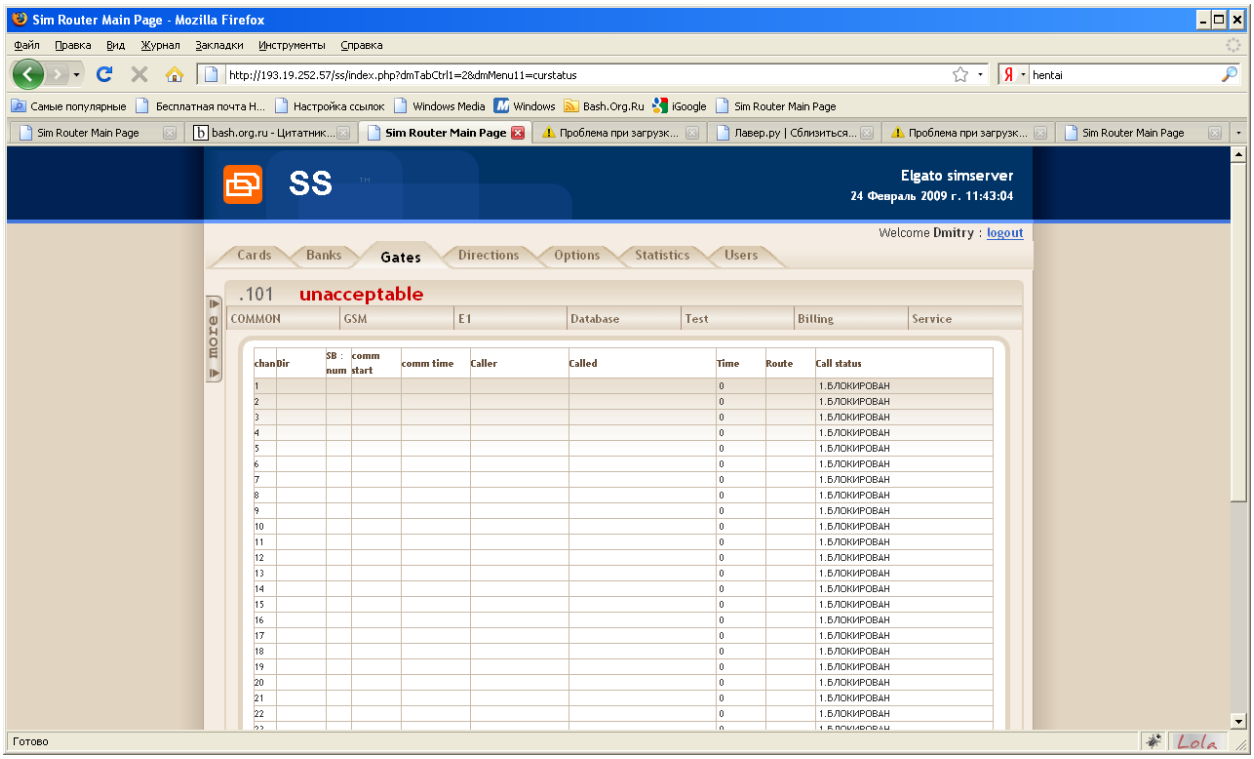


Here you can see dynamic state of flags for channels on the gate.

- Reset –
- Time Window
- Reading amplify – amplification data are prepared and ready to be read by client
- Writing amplify – amplification data was successfully saved on gate
- Day time limit – channel is in limit (probably simcard, commutated to channel has used all its time for today)
- Month time limit – the same for month
- No money – simcard has too little money left on it (less than minimal allowed balance)
- Signal level reading
- Buzy

- Cell2Cell
- Blocked
- Module type

Current call status

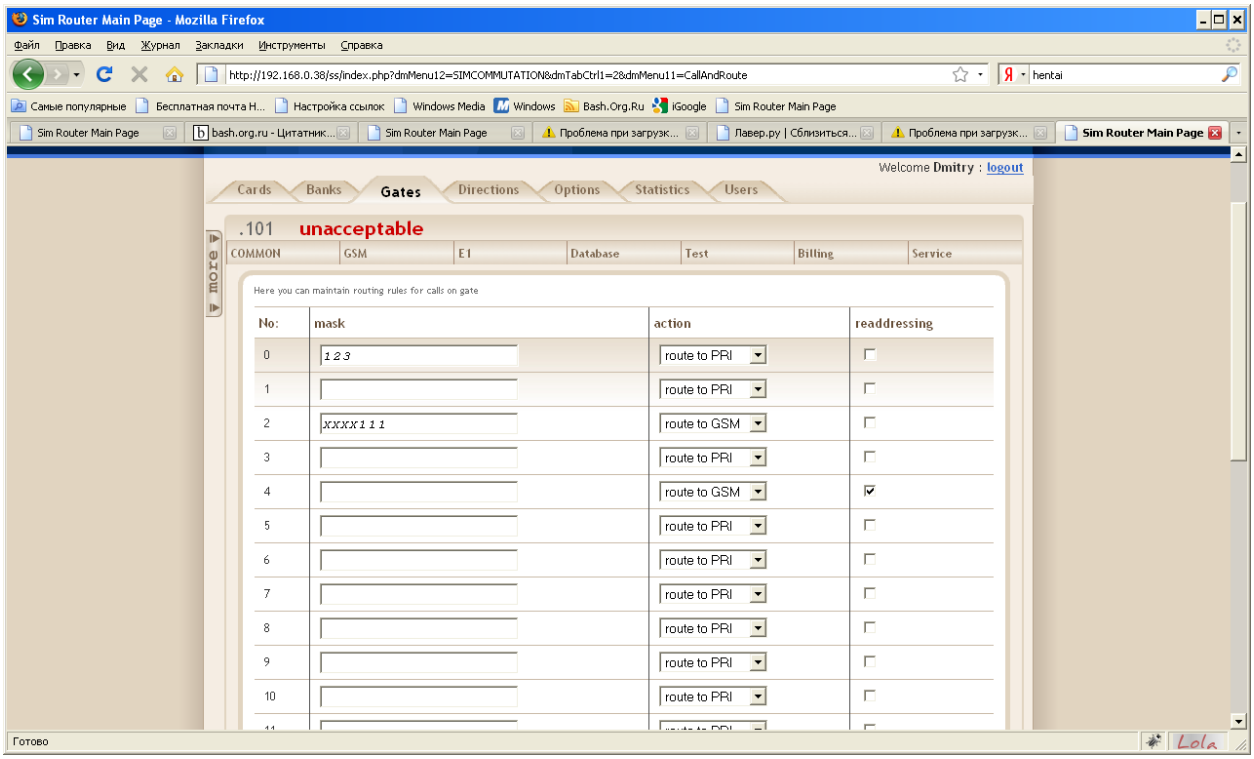


Here you can see current information about calls performed on gate.

- Dir – direction, in which call goes (e.g.PRI->GSM)
- SB:num – simbank and number of simcard in bank, which is commutated with this channel
- Comm. Start – time, when the card was commutated with the GSM module (channel)
- Comm. Time – total time past from beginning of commutation
- Caller – in case a call is made on this channel, this field shows phone number of caller
- Callee – in case a call is made on this channel, this field shows phone number of callee
- Time – call duration,
- Route – state of route. It can be
    - Init – initial state
    - Reset to bank – commutator choused simcard for this channel and sent “reset” signal to it
    - ATR to gate – simcard has responded to “reset” with ATR block, which was passed to gateway
    - Exchange – normal exchange between simcard and module is performed.

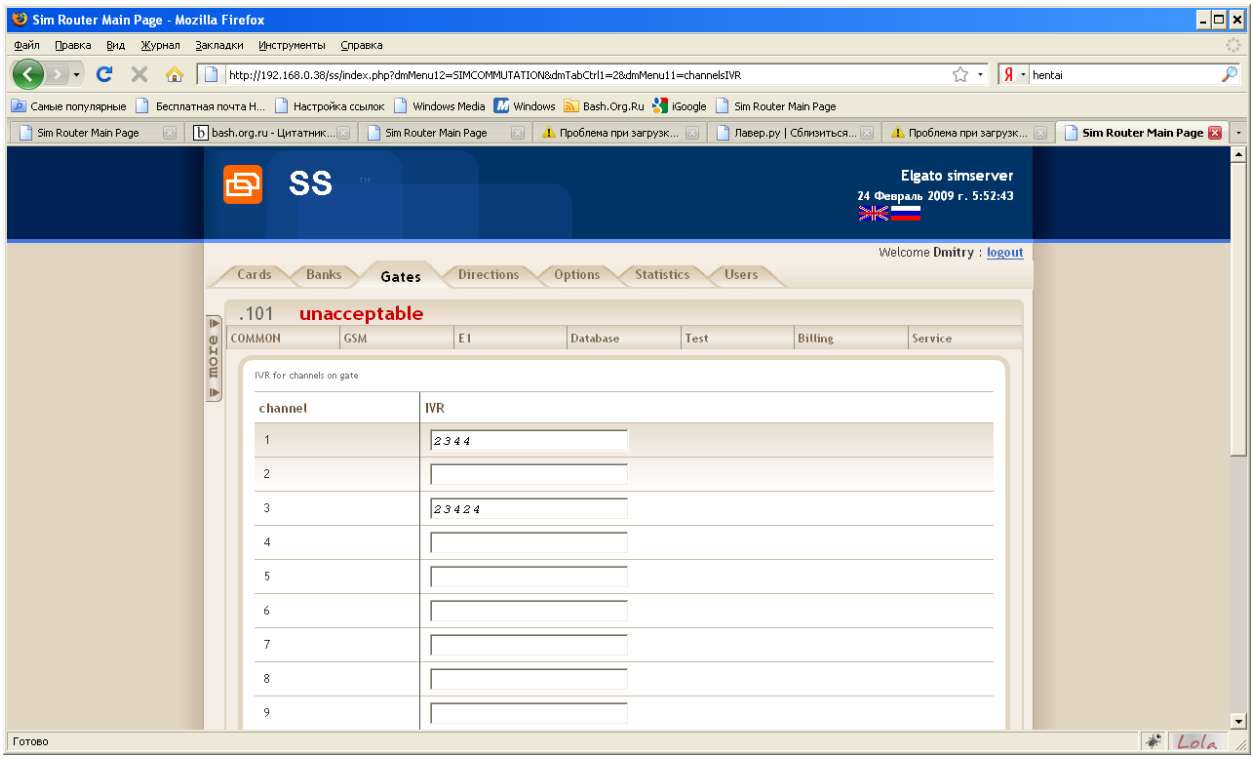
  You can press the link (all text in “route” field are links) to see log of exchange
- Call status – state of channel

Call and routing



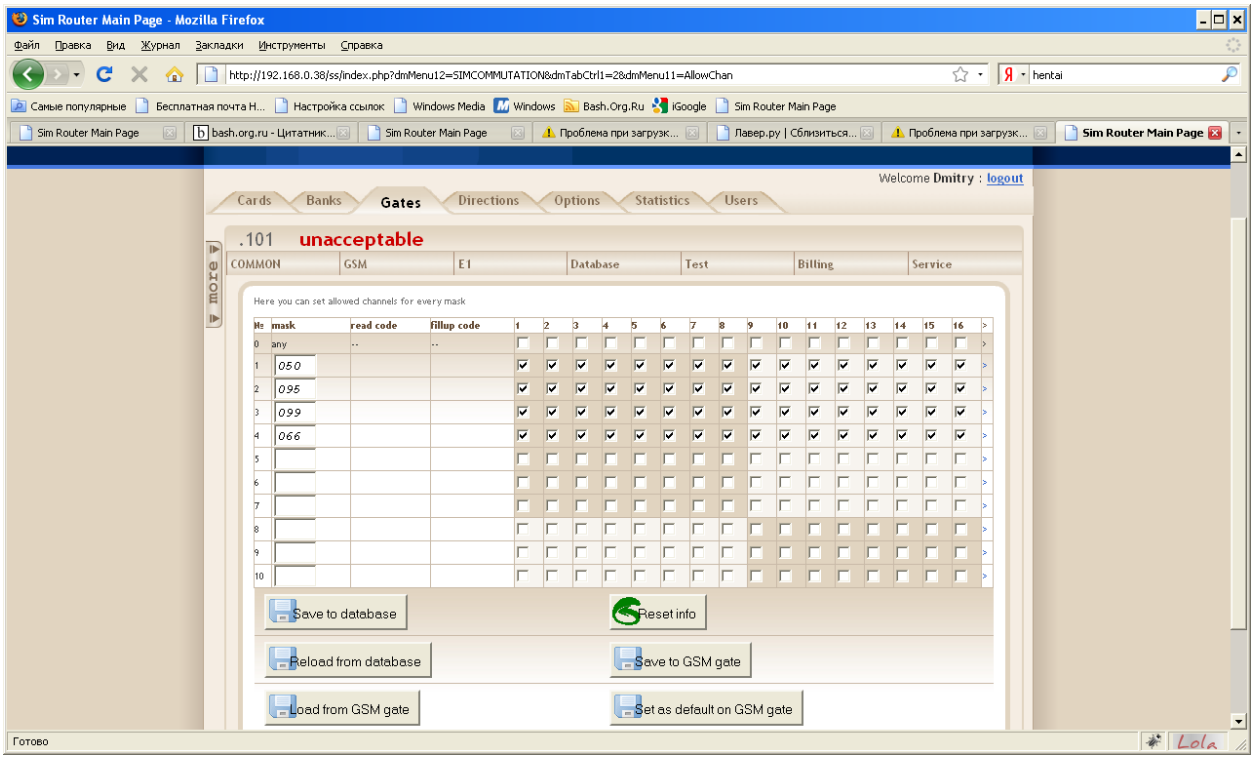
Here you can set associations, which masks routes where. Default is to route calls to GSM. Use buttons at the bottom to save values first to database and next to gateway and set them as default on gateway.

IVR for channels



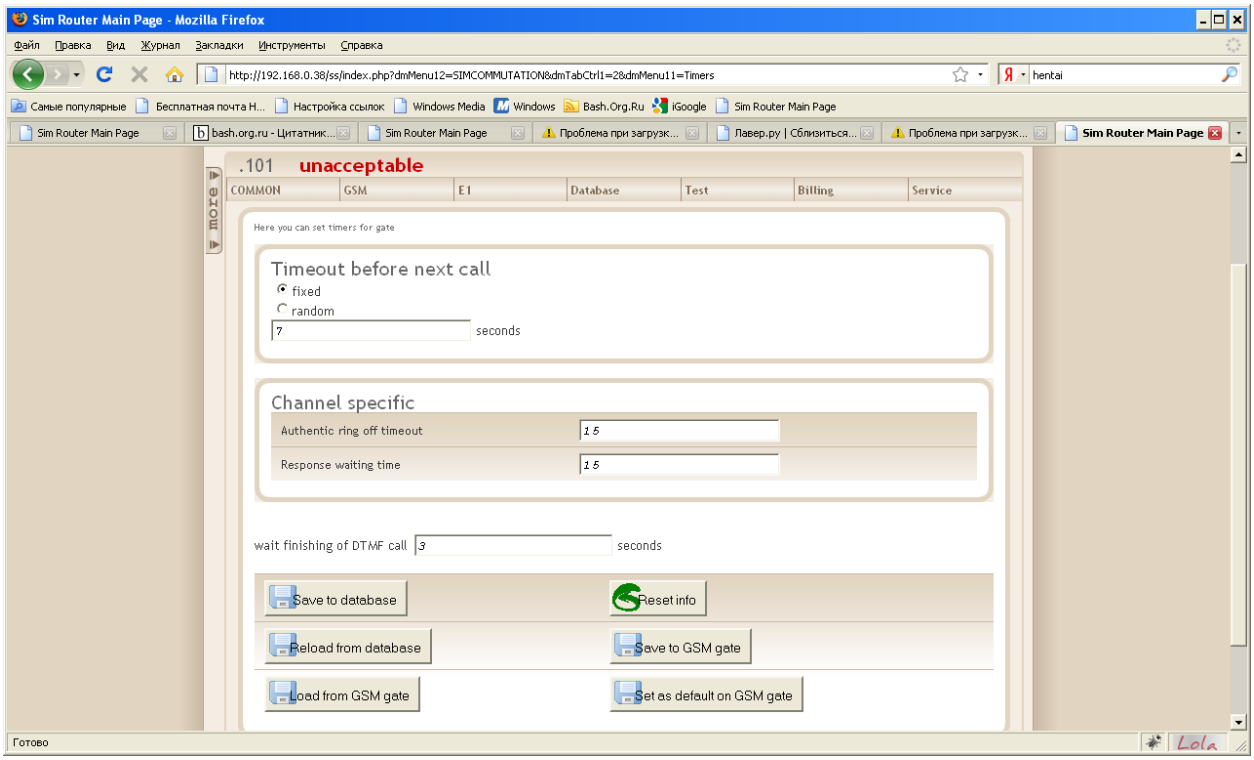
Here you can set IVR for all channels.

Allowed channels



Here you should add masks and mark channels, which can dial to phone numbers with this mask. Use little arrows on the right to access channels 17-32, and little arrows on the left to return to channels 1-16. Save this data to database and gsm gate and make them default.
Good practice is to add all masks and allow all channels to dial to that masks. You can use “any” mask to allow all mask for channel.

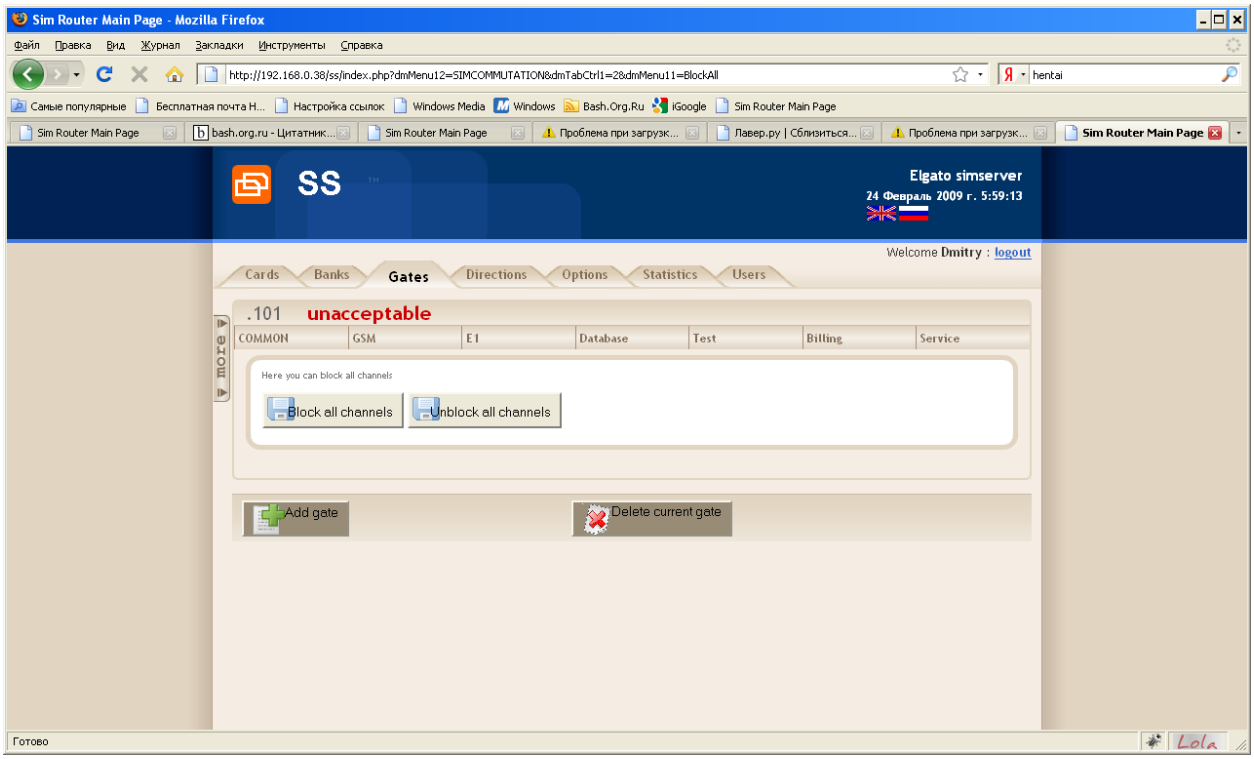
Timers



Here you can set timeout before next call. So when one call finished on channel, channel will not take another call until this amount of time pass. This time could be fixed, or random with defined borders (up to specified value).

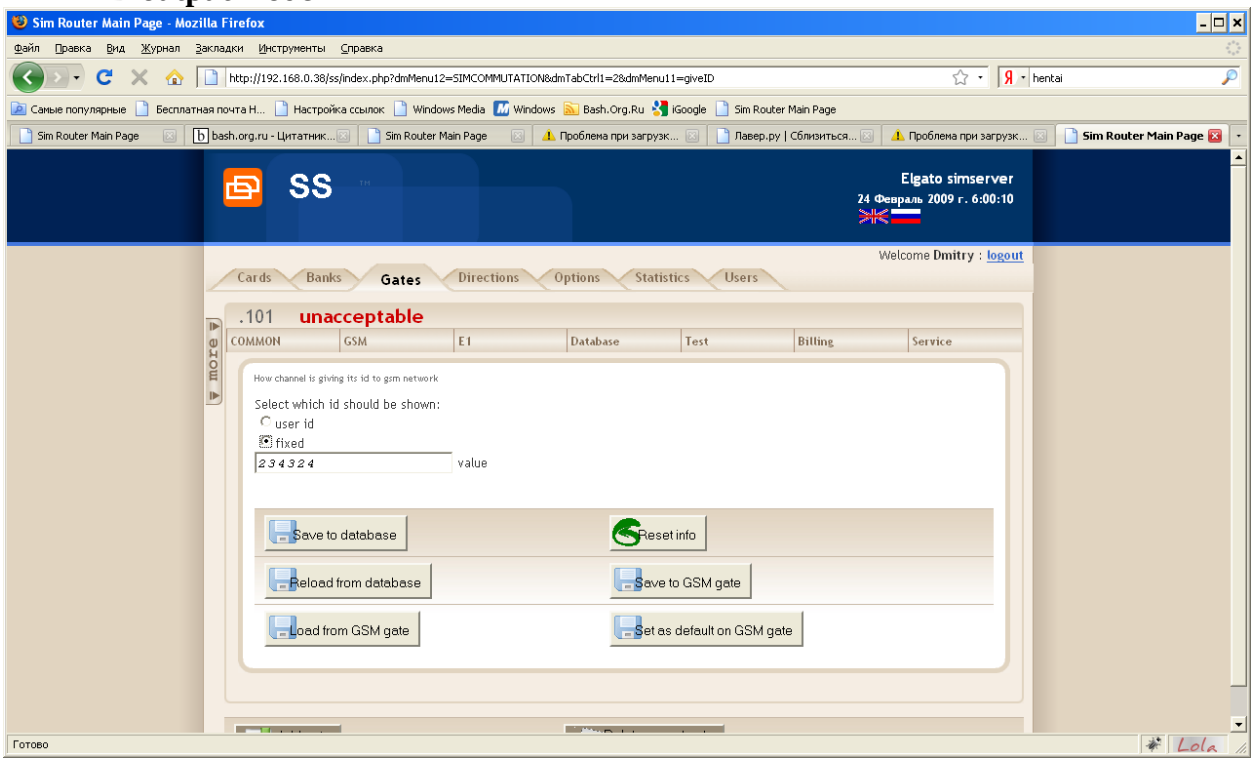
You can also set timeouts for ring off, for waiting response (call will fail if there was no response within specified timeout) and for getting DTMF amplify values from gate.

Block all



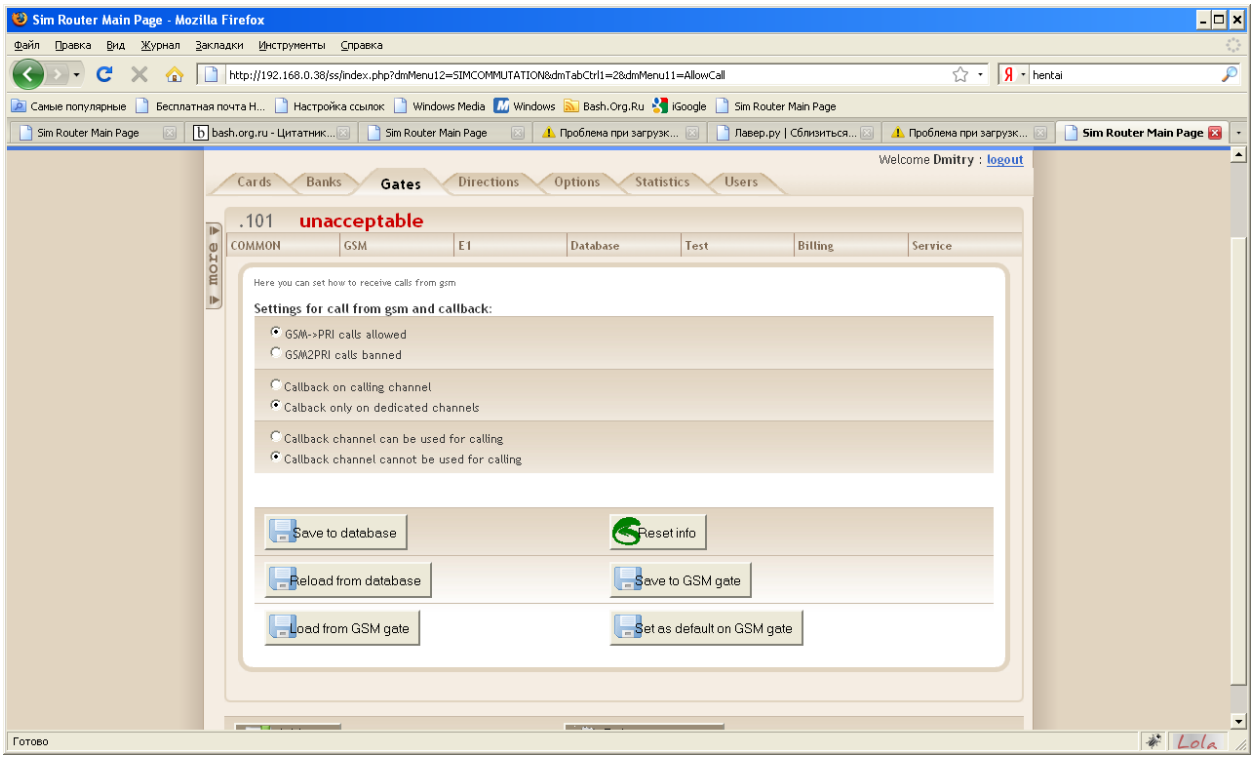
This screen allows to block or unblock all channels on gate. Use carefully.

ID output mode



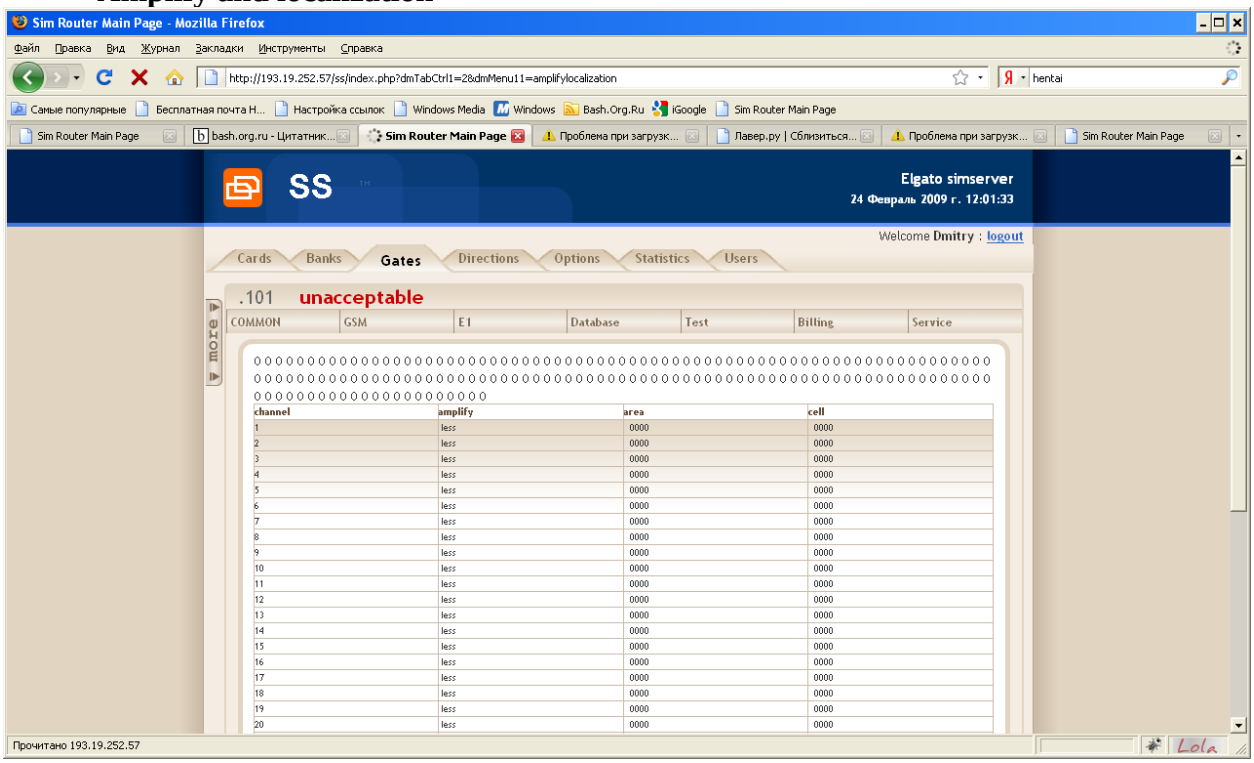
Here you can specify, what id should be shown by channel to gsm network. Default is “user id”

Allow calls from GSM



Here you can specify, what specific calls are allowed.

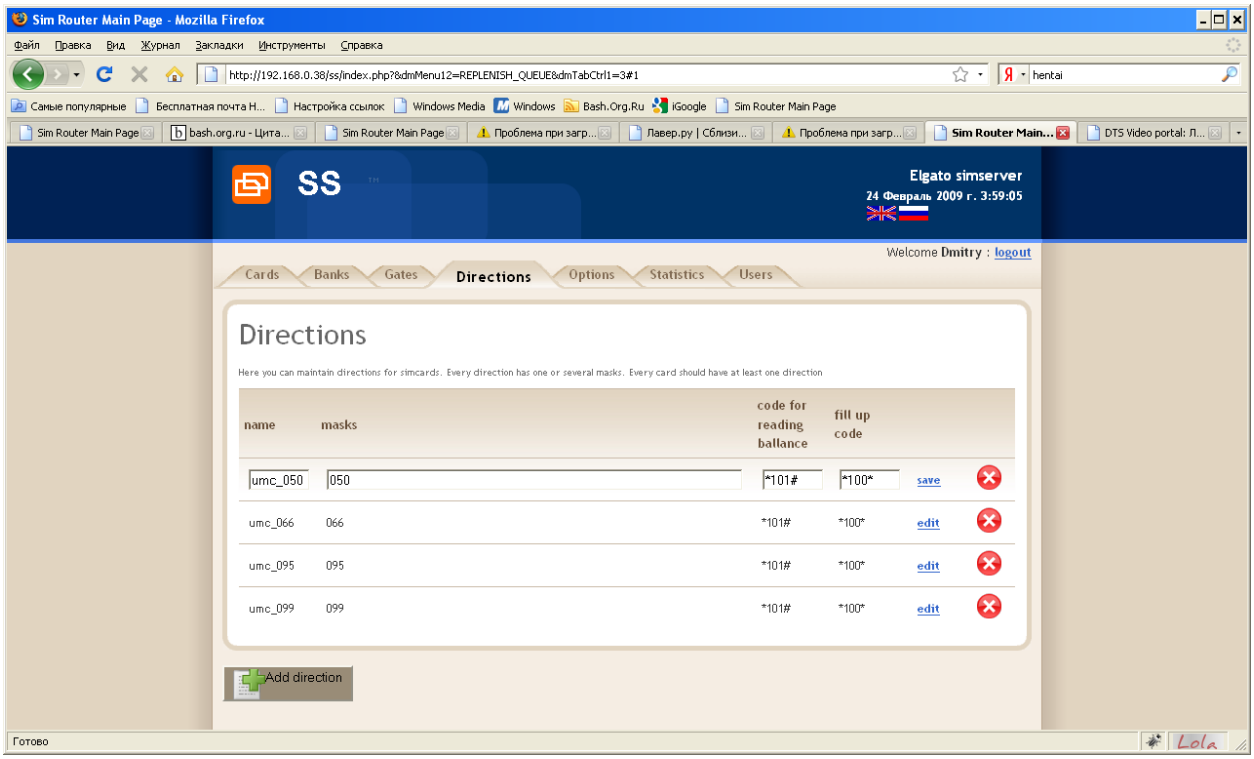
Amplify and localization



Here you can order amplify and other values for channels on the gate.
Area – what area is reported by GSM.
Cell – what cell do GSM modules connect to.

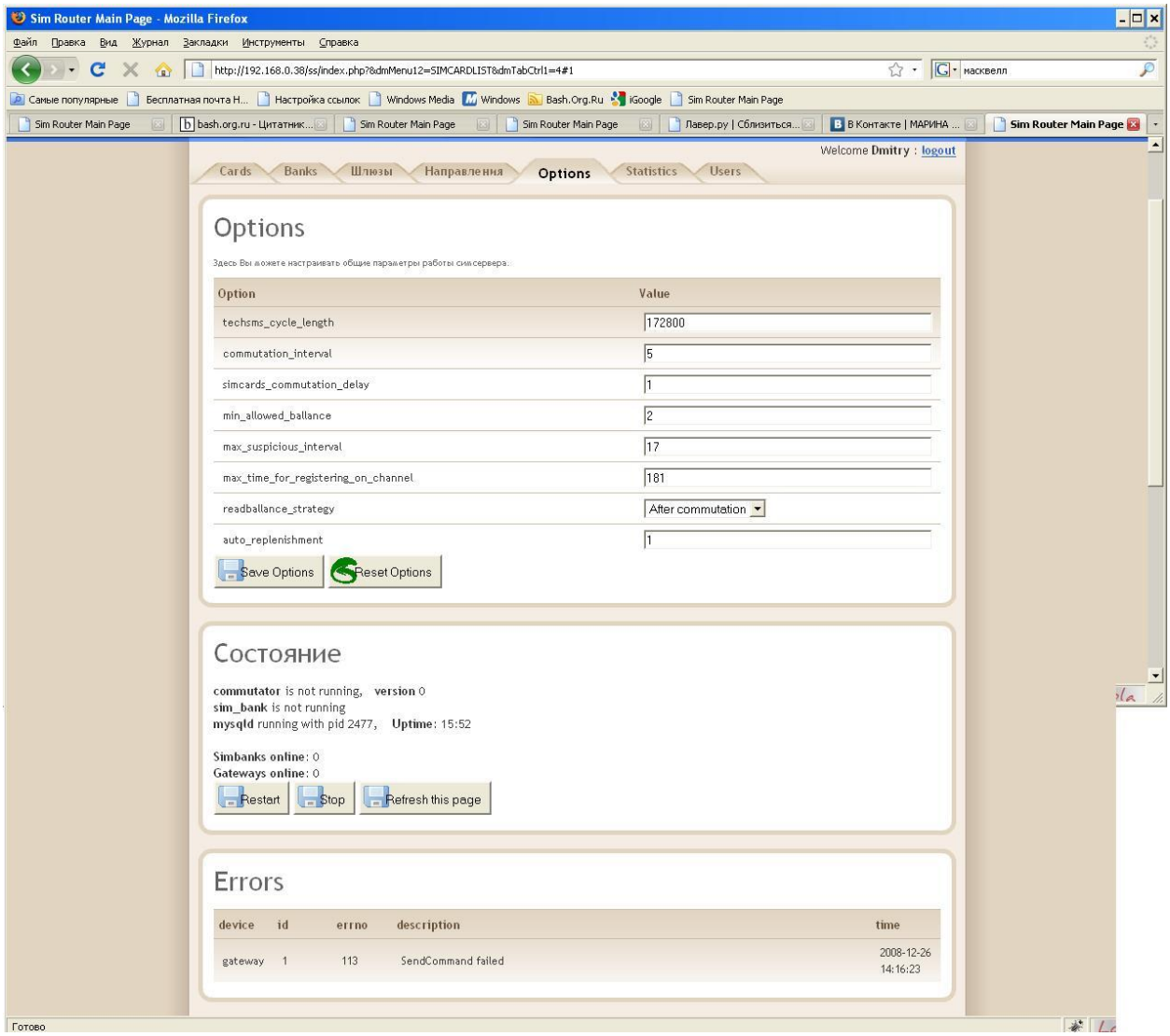
Directions

Direction is a set of masks. Mask is a first 3 (or more) digits from phone number which go after country code (+380XXX4444444 – XXX is mask. E.g. in +380504444444 a part “050” is mask)



Masks, grouped together make direction. In this section you can add, edit and remove directions. Use “Add direction” button to add new direction, “edit” link to edit it, “delete” link to remove. While editing direction you can set name for it, masks separated by commas and codes for reading and filling balance.

Options

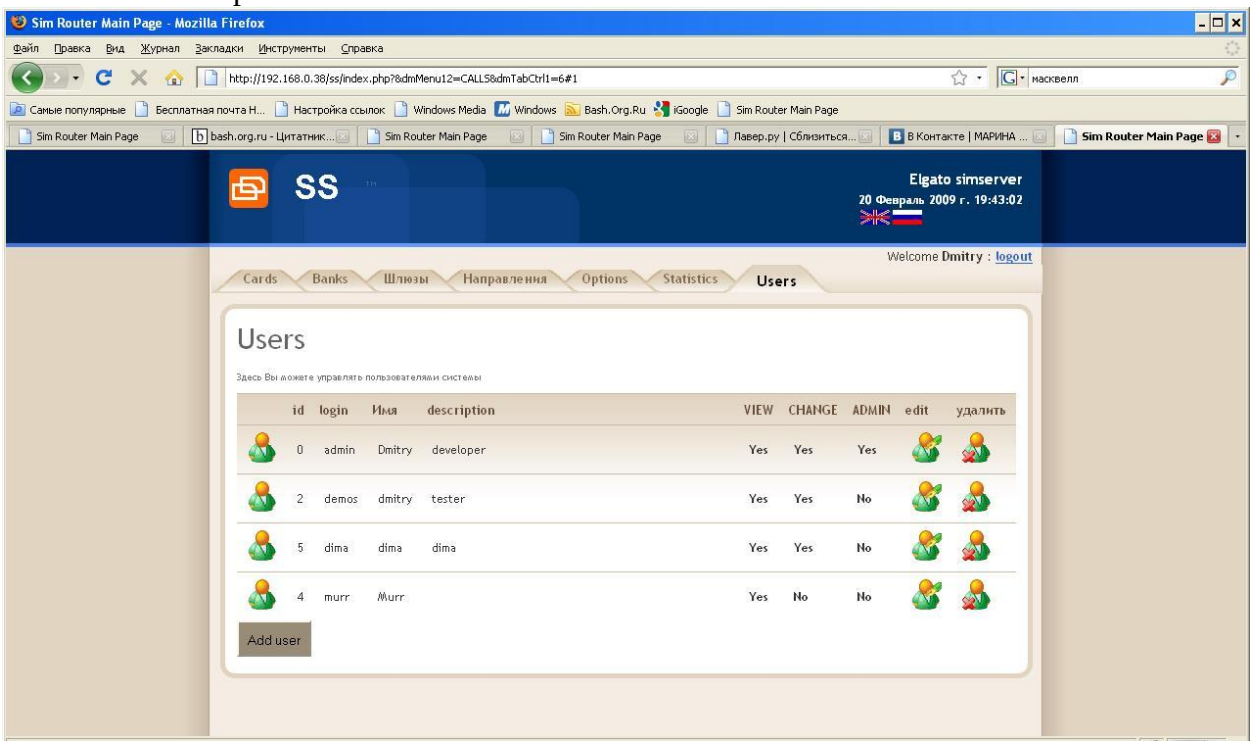


techsms_cycle_length – time between attemts to send sms-messages for imitation of human activity. Next messages are sent after this interval. It is in seconds.
commutation_interval – not used.
simcards_commutation_delay – Time between commutations of simcards. Next simcard will start commutation after this amount of time. Can be 0.
min_allowed_ballance – minimal allowed balance for cards. Cards, which have balane lower than this will not participate in commutation process unless set up for replenishment manually (on simcard edit window)
max_suspicious_interval – maximal amount of time, the channel can be not in “free” state after card had registered on channel and it became “free”. If the channel became “free” and than changed to “blocked” or “test” or whatever, and stays in this state for more than this amount of time, the channel will be blocked and the card will be uncommutated.
max_time_for_registering_on_channel – maximal amount of time, the card can spent trying to register on channel. If it failed to register (channel not in “free” state) before this amount of time has passed, card is uncommutated and channel blocked to be ready to receive another card.
readballance_strategy – strategy of reading balance from card. We can read balance right after the card has registered on chanel or on some random time during card is working
auto_replenishment – this parameter turns on or off automatic replenishment for cards, which has balance lower then minimal allowed balance. If balance on card is lower, commutator tries to get any avaiable replenishment and use it to recharge the card.

In additional zones of this tab you can see if commutator, simbank and mysql are running and their uptime. Also you can see how many gates and banks are online.
In “errors” zone all errors happened are displayed.

Users

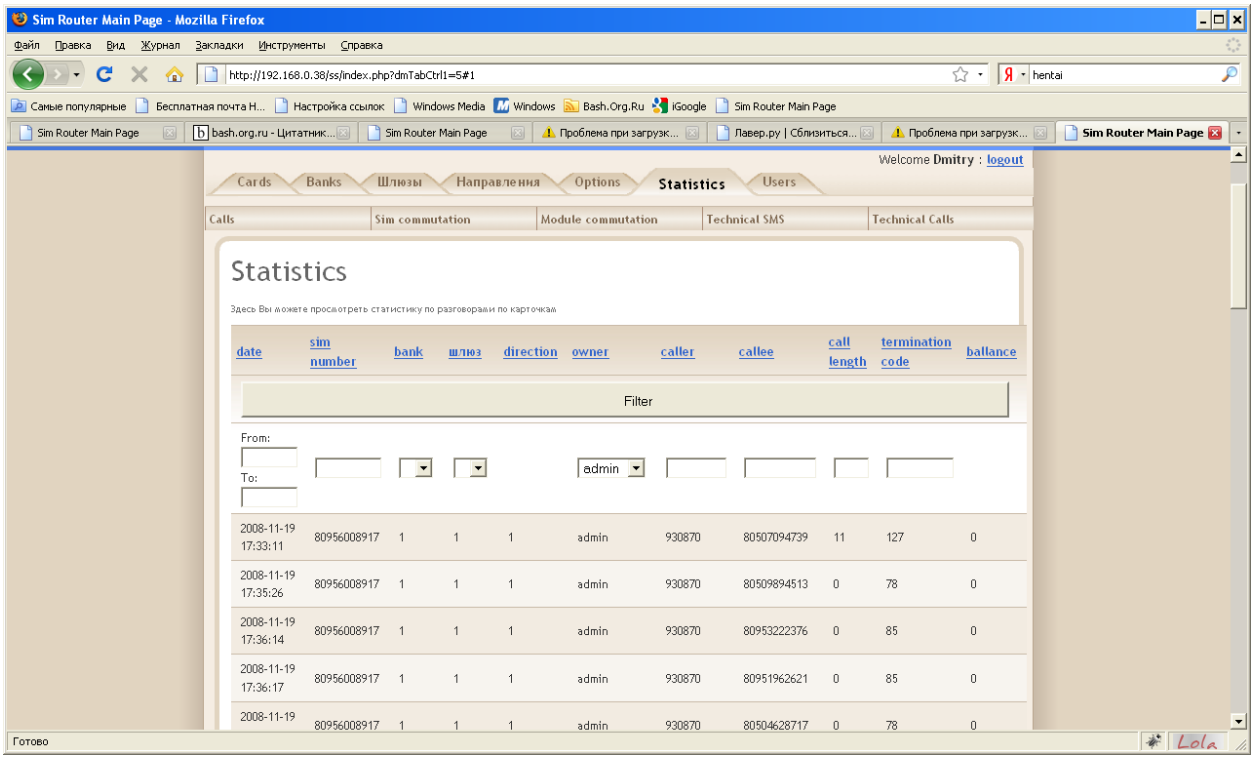
List of users with permissions. It isn’t used now



Statistics

Here you can view statistics of all cards activities.

Calls

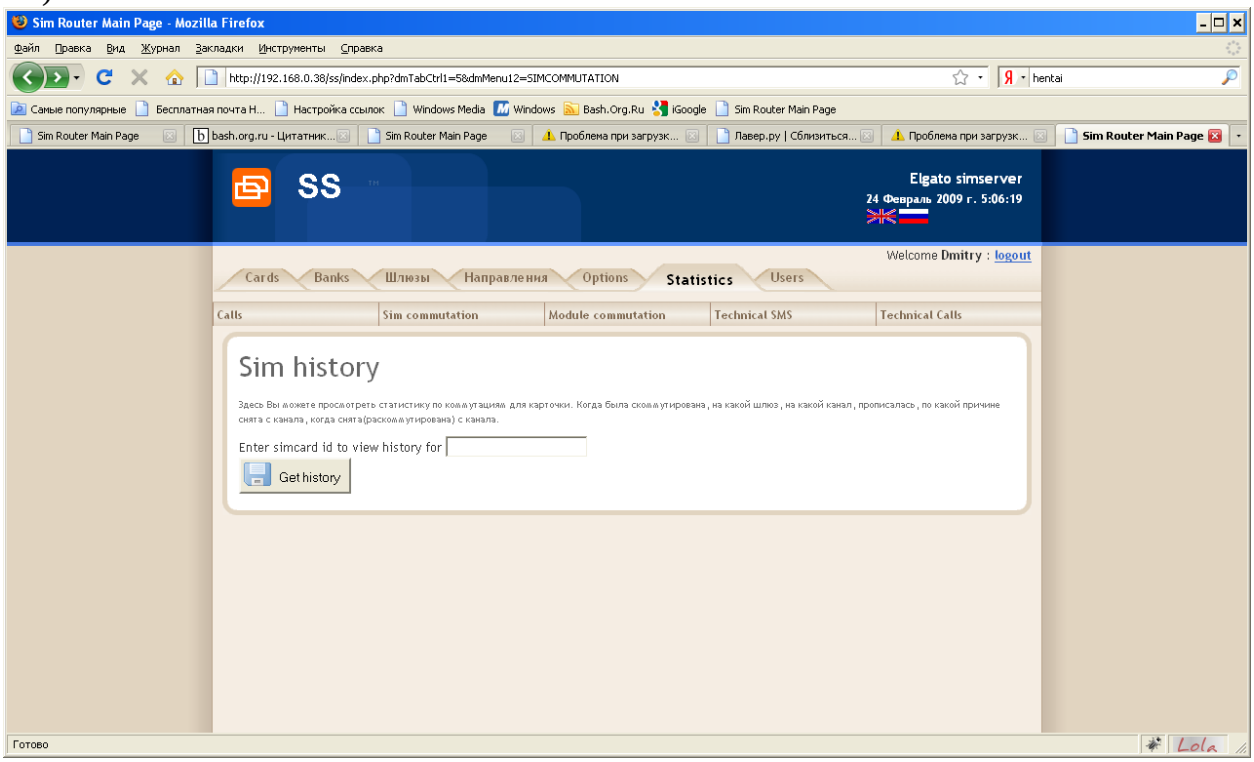


You can view all calls made from this simcard. Fields, showing here are: time, simcard,gate,direction,card owner,caller number, callee number, call length,termination code and

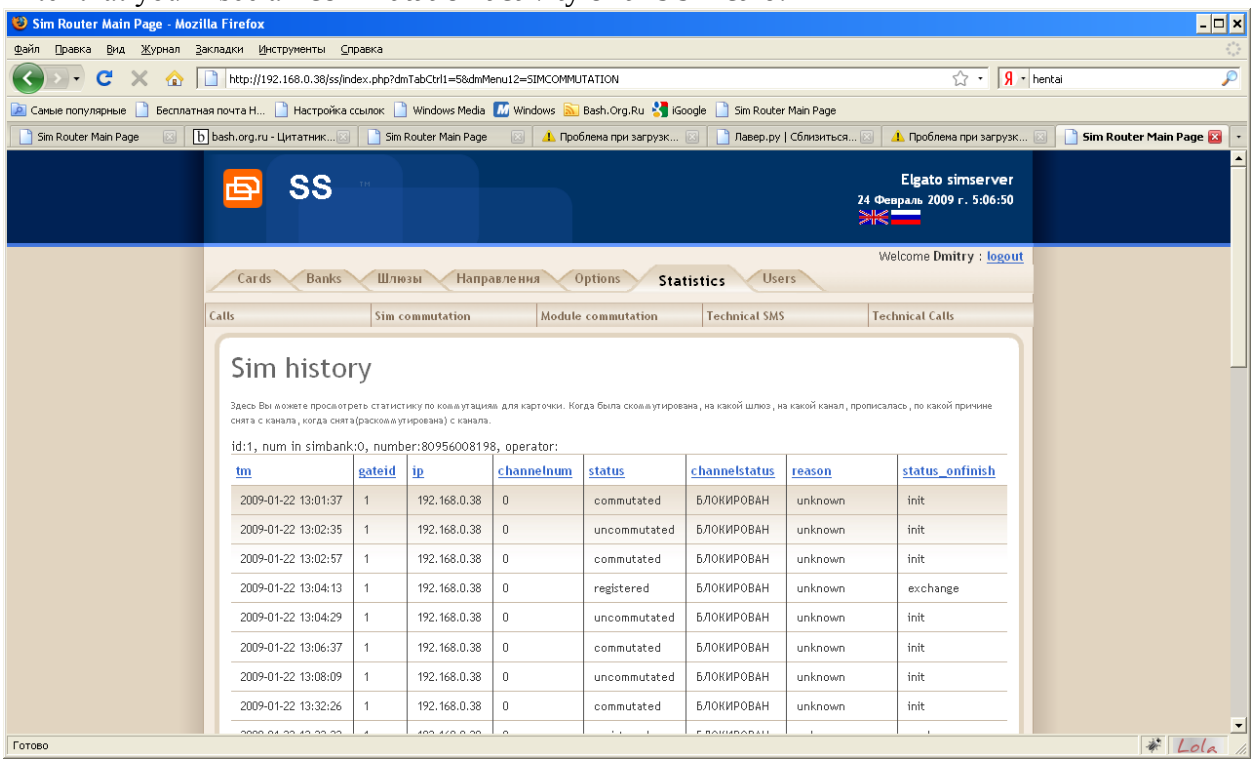
balance. You can enter different conditions into the filter fields and filter calls by card or by gate. You can also sort calls by all columns

Sim commutations

First you should enter sim id (or you can press “history” link on “simcardslist” section of “cards” tab)



After that you’ll see all commutation activity of this simcard.



Fields, you can see, are : time, id of gate on which simcard was commutated, ip of gate, number of channel, state (**commutated** – when simcard was assigned to channel, **registered** – when channel became “free”, **finished** – when simcard began to uncommutate, **uncommutated** – when simcard left the channel and it got blocked), reason (only for finished state. This field shows why the uncommutation process for simcard was started) and status_on_finish(state of route when card began to uncommutate).

There are 4 states of routes : **init** (initial state), **reset to bank**(reset command was sent to bank), **atr to gate** (bank responded to reset and send ATR block, which was forwarded to gate), **exchange**(regular exchange between card and module began).

3. Beginning of the work

Adding banks and gateways.

Add one or several banks on “banks” tab using “add simbank” button.
Add one or several gateways on “gates” tab in “common->info” subsection of gates submenu.

Adding directions

Add one or several directions on “directions” tab. In “masks” field enter several masks, separated by commas. E.g. 050,066,095,099.

Adding simcards

Insert real cards into simbank. Then go in web-interface to “cards” tab and “simcards list” submenu. Use “add simcard” button to add new simcards (or you use “banks” tab and click empty places in simcards map). When editing new simcard, fill all fields, marked by red asterisk and don’t forget to set “time on channel” to value > 300 (300 seconds = 5minutes). Press “save” button. After that you’ll be able to add gateway and directions for simcard. Use additional zones in the right side of window. You should add at least one gate and one direction for simcard to allow it commutate somewhere.

Setting cards

Check, that every card has at least one allowed gate and direction.
Then go to “gates” tab, to “gsm->channels” subsection and mark all channels, allowed to work on this gate. Press “save to database” button.
In the same tab, in “GSM->allowed channels” subsection add masks and channels, which are allowed to make calls to phone numbers with that masks. Press “save to database” button

4. Troubleshooting

Cards don’t commuate

Check that all gates and simbanks are online. (use “options” tab, or view on “banks” and “gates” tabs for word “unacceptable” near simbank or gateway name. if it is written “unacceptable” it means that simserver can communicate with the device)

Check, that there are cards, available for commutation (state=free or “on hold”) balance is higher than minimal, used seconds per month and per day are less than limits.

Check that simcards have gateways and directions associated with them.

Check that channels on gate are allowed and masks are set for channels.