

User Manual v 1.1

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1. Introduction

The berofix card series is a powerful and flexible hardware solution to connect ISDN (BRI,PRI) and GSM lines to any SIP based VoIP system. The berofix is not a Gateway and it is not a standard PCI/PCIexpress card where you have to install any drivers, therefore we call it a "Gateway card". Due to the special design of the hardware berofix will be detected as a standard Realtek-Network card by the operating system. Usualy the driver for this network card will be loaded automatically by the OS. The only thing you have to do is to set up the IP-address before you can access the web interface which is very easy to use. The berofix card series has a modular concept and supports the following hardware DSP based Voice-Processing features:

- G.168/G.165 Echo cancellation with echo path change detection, up to 128ms
- Codec translation: G.723.1 and Annex A, G.729a, G.726, G.711u/a
- DTMF detection and generation
- T.38 fax relay (V.27,V.29 and V.17)
- SIP over TCP with SRTP and TLS (available Q4 2009)
- Hardware Conferencing (available Q3 2009)
- DSS1, EuroISDN conform (features set: COLP,CFU/CFB,CFNRY ...)
- Q.SIG Basic-Features set: CNIP,CNIR,CONP
- PCM Bus interconnection between berofix cards to enable hardware bridging for transparent voice, data and Fax transmission via optional PCM-Bus cable. (available Q4 2009)

The berofix card series consist of a baseboard and the so called LineInterfaces. Each baseboard can carry up to two LineInterfaces. The berofix base boards are available as PCI or PCIexpress cards with the following channel densities:

- berofix400 (4-16 channels)
- berofix1600(16-64 channels)
- berofix6400(64-120 channels)

The following Lineinterfaces are available and can be plugged on the berofix card series.

- BF4S0, 4 Port BRI module
- BF1E1, 1 Port PRI module
- BF2E1, 2 Port PRI module
- BF1GSM,1 Port GSM module (available Q4 2009)
- BF2GSM,2 Port GSM module (available Q4 2009)



Additionally to the baseboard and the LineInterfaces the following accessories are available for the berofix card series:

- bf4S0Bridge (to use all 4 RJ45 slots on a baseboard with one bf4S0)
- bnTAdapters (to connect 2 BRI Lines on 14 RJ45 slots)
- bnPCM Cable (to interconnect berofix baseboards)
- bnE1Crosscable (to connect berofix E1 ports to other systems)

Due to the modular concept you can mix PRI,BRI and GSM ports on one card with full above mentioned features which makes the berofix cards very unique.

1.1. The berofix card overview

The following picture show you the schema of the berofix-baseboards.



Picture 1

Each Lineinterface socket has access to 2 slots. Slot 1 & 2 are applied to Lineinterface 0, while slot 3 & 4 applies to Lineinterface 1. Depending on the Lineinterface you are using, different slots with different Pin Out's are used.



1.2.1 The bf4S0 4 Port BRI module

The bf4S0 Lineinterface is a 4 Port BRI module. The bf4S0 Lineinterface can be configured individually for each port to NT (Network Termination) or TE (Terminal Equipment) mode. In either modes the module supports Point-To-Multi-Point (PMP) or Point-To-Point (PTP). The TE/NT mode as well as the Line termination of 100 ohms are selectable via software (Jumperfree).

If you use a bf4S0 connected on Lineinterface socket 0 and use a bf4S0Bridge on Lineinterface socket 1, the 4 BRI Ports are lead through Slot 1-4 according to picture 2.



Picture 2

If you want to use two bf4S0 modules to get a 8 Port BRI card, you have to plug the first bf4S0module on Lineinterface socket 0 and the second one on Lineinterface socket 1, then the 8 BRI are lead through Slot 1,2,3,4 on a different way as described in picture 3.



Picture 3

As you can see, on each slot two ports are connected. To help you connect your ISDN Lines in this special scenario we have the optional available external dongles ", the BNTAdapters" which can be used. If you use a bf4S0 modules without the above mentioned BF4S0Bridge (picture2) the Pin-Out is similar according to picture 3.

1.2.2 The bfXE1 1-2 Port PRI module

The bfXE1 PRI module are available as 1 Port BF1E1 or as 2 Port BF2E1 LineInterfaces. The bfXE1 module can be configured individually for each port to NT (Network Termination) or TE (Terminal Equipment) mode. The default Pin-Out of this module is always TE mode with PINS 1,2,4,5. If you want to use NT-mode you may need a cross cable which is optional available (the bnE1Crosscable). Line termination (120/75 ohms) is selectable for each port by DIP switches on the Lineinterface. The following example will show you the Slot and Pin-Out's when you plug a BN2E1 module on Lineinterface socket 0 and a BF1E1 module on Lineinterface socket 1.



Picture 4

As you can see, the bf2E1 connected on Lineinterface socket 0, lead out through Slot 1 and 2, while the bf1E1 connected on Lineinterface socket 1 uses Slot3. The next example will show you the Slot usage as well as the Pin-Out's, when you use a bf1E1 mixed with a bf4S0 Lineinterface.



Picture 5

In any combination of PRI LineInterfaces with BRI LineInterfaces, please always plug the PRI LineInterfaces on Lineinterface socket 0.

1.2.3 The bfXGSM 1-2 Port GSM module

The BFXGSM GSM module will be available as 1 Port BF1GSM or as 2 Port BF2GSM. Digital Audio quality with noise suppression and echo canceling is granted by the use of Quadband Siemens GSM Modules (850/900/1800/1900 Mhz). These LineInterfaces will be available during Q4 2009.

1.3. Getting started

The next chapters will describe you the basic steps to bring your new berofix card into your network, and how to configure it, that you can make SIP to ISDN calls and vice versa.

2. Basic Network Setup

As mentioned in chapter 1. berofix uses a Realtek PCI/PCIe Network Chip to communicate with the Host PC. Which means that the berofix looks like a network card, when you put it into a PC. The following examples will show you how you can identify your berofix card in your system.

Output from Ispci for berofix PCI card:

berofix#lspci 0000:03:01.0 Ethernet controller: Realtek Semiconductor Co., Ltd. RTL-8139/8139C/8139C+ (rev 10)

Output from ifconfig

berofix#ifconfig eth1 Link encap:Ethernet HWaddr 00:50:C2:83:D0:04

inet addr:10.0.0.1 Bcast:10.255.255.255 Mask:255.255.255.0

UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1

RX packets:12920014 errors:0 dropped:0 overruns:0 frame:0

TX packets:11879494 errors:0 dropped:0 overruns:24 carrier:0

collisions:0 txqueuelen:1000

RX bytes:2864269597 (2731.5 Mb) TX bytes:2590970576 (2470.9 Mb)

Interrupt:18 Base address:0x2000

berofix uses MAC addresses beginning with 00:50:C2.....

As you can see it looks really like a network card and you don't have to compile or load any additional driver except of the network card driver (8139too for berofix PCI and R8169 for PCIexpress on Linux based systems). This should normally be done automatic from your Operating System. To make it more clear the network environment looks like:

LAN <-> NIC_LAN (eth0) <-> PC <-> NIC_BEROFIX (eth1) <-> BEROFIX

To bring the system up and running the only thing you have to do, is to give eth1 (the berofix card) an ip-address. That is almost all you have to



do before you can work with the berofix card. For several reasons, especially for SIP re-invites, which is a must for T.38, it might make sense to advance your network settings. There are 2 common ways how to handle this. These are:

- Ethernet Bridge (the recommended way)
- IP-Forwarding with a Static Route

These methods will be described in the next chapters more detailed. We recommend to use a the bridge setup, since this makes the easiest setup and allows the most flexibility. It is also possible to use bridges on other operating systems then Linux.

2.1. Detecting berofix with bfdetect tool

Before we will describe the network settings detailed, we will take the chance to introduce the bfdetect tool. With this tool you can detect any berofix device in your network and modfiy several settings like changing the ip-address, change the password or reset the device to factory settings. The bfdetect tool can be downloaded from our Website:

http://www.beronet.com/downloads/berofix/bfdetect.tar.gz

Simply untar and compile it like in the next example:

beropbx:#tar xzf bfdetect.tar.gz beropbx:#cd bfdetect beropbx:#make install (In case don't forget to change permission of the file to be executable)

The bfdetect sends out broadcast UDP Packets to the default network adapter, with this method it is possible to detect and configure berofix cards which have different IP Addresses than the IP Address of the host. Because of this mechanism the Network Adapter of the beroFix card needs to be the default route. In the bridging Setup case this is done automatically, in the ip forwarding case you need to set the default route manually with (if eth1 is the beroFix Network Card):

beropbx:#route add default eth1

If the installation was successful you can discover the berofix device with:

*beropbx:#bfdetect Scanning network for bero*fix devices...*

[1] mac:00:00:24:CA:D8:98 ip:172.20.22.2

- [2] mac:00:A1:B2:C3:D4:DE ip:172.20.26.67
- [3] mac:00:00:24:C7:51:14 ip:172.20.22.3

If you have more then one device select the one you want to configure by typing the number. You'll get a menu with all the options you can set like shown in the following output:

Select a device: 1

Configuration of selected device:

mac: 00:00:24:CA:D8:98 ip: 172.20.22.2 netmask: 255.255.0.0 gateway: 172.20.0.1 dhcp: no

[i] change ip [n] change netmask [g] change gateway [d] switch dhcp on [s] save and quit [q] quit

What would you like to do?

The rest should be straight forward.

2.2.1. Setup Network bridge

You can setup the bridge under Linux with the "brctl" utility. This utility is provided by the "bridge-utils" package on debian based systems (like Ubuntu). As mentioned above the berofix cards have MAC Addresses beginning with "00:50:c2", so you can identify these cards with "ifconfig -a" as described in the next example:

beropbx:#ifconfig -a

- eth0 Link encap:Ethernet HWaddr 00:0C:6E:D3:86:C6 UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1 RX packets:797562 errors:0 dropped:0 overruns:0 frame:0 TX packets:35206 errors:20 dropped:0 overruns:0 carrier:20 collisions:7447 txqueuelen:1000 RX bytes:141351732 (134.8 MiB) TX bytes:19431622 (18.5 MiB) Interrupt:11 Base address:0xc000
- eth1 Link encap:Ethernet HWaddr 00:50:C2:83:D0:01 UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1 RX packets:35124 errors:0 dropped:0 overruns:0 frame:0 TX packets:276362 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000 RX bytes:20636164 (19.6 MiB) TX bytes:28931756 (27.5 MiB) Interrupt:11 Base address:0xa000
- lo Link encap:Local Loopback inet addr:127.0.0.1 Mask:255.0.0.0 UP LOOPBACK RUNNING MTU:16436 Metric:1 RX packets:9 errors:0 dropped:0 overruns:0 frame:0 TX packets:9 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:0

RX bytes:720 (720.0 b) TX bytes:720 (720.0 b)

In this example eth1 is the berofix card and eth0 is our interface to the LAN. We want to apply our LAN interface the ip-address 192.168.0.2 and our berofix device the ip-address 192.168.0.3. After we setup the Bridge we want to access the berofix device from all devices in our LAN which are all in the network 192.168.0.1-254. To setup this bridge, you need to enter a few commands like in the following example::

berofix:# ifconfig eth0 0.0.0.0 up berofix:# ifconfig eth1 0.0.0.0 up berofix:# brctl addbr br0 berofix:# brctl addif br0 eth0 berofix:# brctl addif br0 eth1 berofix:#ifconfig br0 10.0.0.3 up

These commands will first remove the ip-addresses from your network cards, then will create the bridge and add your network card and the berofix card to this bridge. In this case the bridge gets the IP-address 192.168.0.2. The default IP of the berofix is 10.0.0.2 with the subnet 255.0.0.0 and we have to change this with the bfdetect tool to 192.168.0.3 with 255.255.255.

To setup this bridge in a persistent way, you can modify your "/etc/network/interfaces" file on debian based systems (like ubuntu):

auto lo iface lo inet loopback

auto br0 iface br0 inet static address 192.168.0.2 netmask 255.255.255.0 gateway 192.168.0.1 bridge_ports eth0 eth1

Then you can restart your networking with:

berofix:#/etc/init.d/networking restart

Now you should be able to communicate with the berofix using the bridge. Your PC with the ip-address 192.168.0.2 and the berofix with the ipaddress 192.168.0.3 should be reachable from all device of your LAN. That means the berofix can directly accessed from any device of your LAN to make sure that SIP reinvites works like expected. Try to check this by simply using a web browser and browse to the IP of the berofix, is this example just simply enter:

http://192.168.0.3



You will be prompted to enter a username and password, which is by default user:"admin" password:"admin".

2.2.2 Setup Network using ip-forwarding

Before we will explain how to setup ip-forwarding we have to give our berofix card an ip-address. As described above we will use ifconfig to check our network settings.

beropbx:#ifconfig -a

- eth0 Link encap:Ethernet HWaddr 00:0C:6E:D3:86:C6 UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1 RX packets:797562 errors:0 dropped:0 overruns:0 frame:0 TX packets:35206 errors:20 dropped:0 overruns:0 carrier:20 collisions:7447 txqueuelen:1000 RX bytes:141351732 (134.8 MiB) TX bytes:19431622 (18.5 MiB) Interrupt:11 Base address:0xc000
- eth1 Link encap:Ethernet HWaddr 00:50:C2:83:D0:01 UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1 RX packets:35124 errors:0 dropped:0 overruns:0 frame:0 TX packets:276362 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000 RX bytes:20636164 (19.6 MiB) TX bytes:28931756 (27.5 MiB) Interrupt:11 Base address:0xa000
- lo Link encap:Local Loopback inet addr:127.0.0.1 Mask:255.0.0.0 UP LOOPBACK RUNNING MTU:16436 Metric:1 RX packets:9 errors:0 dropped:0 overruns:0 frame:0 TX packets:9 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:0 RX bytes:720 (720.0 b) TX bytes:720 (720.0 b)

In this example eth0 is our NIC from our PC and eth1 is the NIC from the berofix. Via default the IP-address of the NIC from the berofix is 10.0.0.2. So if we gave eth1 an ip-address 10.0.0.1 we will have access to the berofix.

This can be done i.e. via ifconfig like described in the following example:

berofix:#ifconfig eth1 10.0.0.1 up To check if this is working try to ping 10.0.0.2 berofix:#ping 10.0.0.2 PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.

64 bytes from 10.0.0.2: icmp_seq=1 ttl=63 time=12.2 ms

By default any modern Linux distributions will have ip-forwarding disabled. This is normally a good idea, as most peoples will not need ip-forwarding, but we will need to enable ip-forwarding to support SIP reinvites.



Check if IP Forwarding is enabled:

We have to query the sysctl kernel value net.ipv4.ip_forward to see if ipforwarding is enabled or not. Using sysctl:

sysctl net.ipv4.ip_forward
net.ipv4.ip_forward = 0

or just checking out the value in the /proc system:

cat /proc/sys/net/ipv4/ip_forward

As we can see in both the above examples this was *disabled* (as show by the value 0).

Enable IP-Forwarding on the fly

As with any sysctl kernel parameters we can change the value of net.ipv4.ip forward on the fly (without rebooting the system):

sysctl -w net.ipv4.ip_forward=1

or

echo 1 > /proc/sys/net/ipv4/ip_forward

the setting is changed instantly; the result will not be preserved after rebooting the system.

Permanent setting using /etc/sysctl.conf

If we want to make this configuration permanent the best way to do it is using the file /etc/sysctl.conf where we can add the following Line in /etc/sysctl.conf.

net.ipv4.ip_forward = 1

if you already have an entry net.ipv4.ip_forward with the value 0 you can change that 1. To enable the changes made in sysctl.conf you will need to run the command:

sysctl -p /etc/sysctl.conf

On Red Hat based systems this is also enabled when restarting the network service:

service network restart

and on Debian/Ubuntu systems this can be also done restarting the procps service:

/etc/init.d/procps.sh restart

To access the berofix from your LAN you have to setup a route either by adding a static route in your router or just change the standard gateway of the device from where you want to access the berofix to the IP of the host where the berofix is plugged. If everything was successfully setup you can



try to login to the berofix using your favorite Web browser by typing the following URL with default username=admin and password admin:

http://10.0.0.2/

0	beroAri-Login - Opera	_ — ×
<u>F</u> ile <u>E</u> dit <u>Y</u>	<u>V</u> iew <u>B</u> ookmarks Widgets <u>T</u> ools <u>H</u> elp	
ج ک	n 🕹 🖗 🥢 🏢 http://10.0.0.2/ 🔭 🔍 Google	- 60
A.	bero*fix User: Password: Login	
	beroNet :	

Picture 6

3. Configuring berofix via Web-interface

If you have successfully setup the network like described in chapter 1 you can completely configure the berofix card via the web interface. Simply enter the IP-address of the berofix in your favorite browser, for instance:

http://10.0.0.2

The default login username and password for the berofix is:

username: admin password: admin

After you have successfully logged in to the system you will see the following major menu-points

- **Dialplan** (to manage the Dialplan)
- **SIP** (to manage SIP related stuff like registrations and proxy's)
- **ISDN** (to manage ISDN related stuff like ISDN-groups and ISDN-settings)
- **Hardware** (to modify hardware related settings like NT/TE, PTP/PMP)
- **Preferences** (to manage Network Setting, Firmware updates and Logging)
- **Management** (to check the state of the system or enabled Debugging)

8		ber	o*fix - Opera			_ - ×
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	* €					
De	ero* țix					
			STATE			
	Dialplan	Sip Isdn Isd	n Hardware Preferenc	es + • Management +	Logout	
			ISDN Status			1
•	Port	Туре	Prot.	L2Link	L1Link	
	1	TE	PTP	۲	9	
			ACTIVE CHANNELS			
	Direction	Port	Channel	DAD	OAD	
	Total Calls:0					
					be	roNet 🏭
						v.1.3

Picture 7

All functions and menu-points to configure the berofix through the web interface will be described in the following chapters.

3.1. Activating changes

After you have change some values through the web-interface a small button in the top of the web-interface will appear. To activate this changes you have to press the "activate" button. The button will appear in three colors which have the following meanings:

				Delo-1	ix - Mozilla Fire	rox				العا
Bearbeite	en <u>A</u> nsicht <u>C</u> h	ronik <u>L</u> eseze	eichen E <u>x</u> t	ras <u>H</u> ilfe						
-	🍃 😣 💼 [# http://10.0	0.0.2/app/be	erogui/index.php?r	m=dialplan			☆ 👻	🖸 🕶 in klammern	
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					DIALPL	AN				
			 Dialplan 	Sip+ Isdn	Hardware P	eferences +	Management +	Logout		
					activate	•				
										-
	Direction	From ID	To ID	Destination	New Destination	Source	New Source	Position		
	isdn-sip	g:nt	p:bt	(.*)	\1	(.*)	\1		modify copy delete	
	isdn-sip	g:nt	p:bt	(.*)	\1	(.*)	\1		modiły copy delete	
	sip-isdn	(.*)	g:te	(.*)	\1	(.*)	\1		modiřy copy delete	
					Add					
					1					
									beroNet 🏭	
Ň										
									v.1.3	
handbuc	🔲 [gursel@gu	rsel 🧕 🥹	bero*fix - N	1ozilla 😻 [Zi	mbra: Spam ()	[Screens	shots - D	[Bildschirmfo	to 🔚 Vertrieb - D	atei

Picture 8

- Yellow means only a reload of the system. You can press the "activate" button every time it appears. No influence to the current calls on the system.
- Orange means that the ISGW (ISDN-SIP-Gateway a peace of software) has to be restartet. That means that all current calls are going to be dropped when you press the "activate" button.
- Red means that the ISGW and all LineInterfaces has to be restarted. That means that all current calls are going to be dropped when you press the "activate" button. This restart can take up to 30sec..

3.2. Dialplan

The Dialplan is one of the most important things during the configuration of the berofix. Here you can define rules from where and to where a call should go as well as the configuration of special features like enabling T.38 or deactivating EC for a particular call.

The berofix dialplan engine is based on Regular Expressions and will read the dialplan entries from the top to the button and will exit, when it finds the first match. So be aware, if you have two possible matches, only the



first one will be taken into account. That fore you have the position arrows on the right of the following picture, to change the priority. As shown in picture 9 you see the Dialplan entries grid, where you can add, modify, copy and delete a Dialplan entry as well as changing its position as mentioned above.

9					bero*fi	x - Opera					_ • ×
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew <u>B</u> ookn	narks Widgets	<u>T</u> ools <u>H</u> elp							
	-	کي 🔶 🚽	🤌 🧷 🏢 http	://10.0.0.2/app/k	perogui/index.php	?m=dialplan			? - 🤇	Google	- 60
		_									
	ŀ	bero	*fix								
						DIALPLAN					
			• Dial	plan Sip +	lsdn Isdn H	lardware Prefe	rences +	Managemer	nt+ Logou	ıt	
•						Now		Now			
		Direction	From ID	To ID	Destination	Destination	Source	Source	Position		
		sip-isdn	(.*)	g:IsdnGroup1	(.*)	\1	(.*)	\1	▲ ▼	modify cop	oy delete
		isdn-sip	g:IsdnGroup1	p:sip1	(.*)	\1	(.*)	\1	▲ ▼	modify cop	oy delete
						Add					
						1					
										hau	
										ber	onet :
											v.1.3

Picture 9

The columns in the grid have the following meaning:

- **Column Direction:** Shows you the direction from where the "Call" is originated and to where it is routed. For instance in the first row you see that the "Call" is originated from SIP and will be routed to ISDN. In the the second row it is vice versa.
- **Column FromID:** Shows you from which ID the "Call" is originated. This could be the name of a SIP proxy, a SIP Registrar or just an IP-Address, if the "Call" is originated from SIP. If the "Call originated from ISDN the From ID could be a single ISDNPort or an ISDNPort-Group.
- **Column ToID**: Shows you to which ID the "Call" is routed. This could be a single ISDNPort or a ISDNPort-Group, if the "Call" will be routed to ISDN. If the "Call" is routed to SIP the To ID is could be the name of a SIP proxy, a SIP Registrar or just an IP-Address.
- **Column Destination:** shows you the original destination (CalledID or DAD) .
- **Column New Destination:** show you the new modified destination (CalledID or DAD).
- **Column Source:** show you the original CallerID (OAD)
- Column New Source: show you the new modified CallerID (OAD)



3.2.1. Adding new Dialplan entry

You can add a new Dialplan entry by pressing the "add" button in the Dialplan overview. The following screen will appear:

🧿 Dialplan -	Mozilla Firefox	X
# http://10.0.0.2/app/berogui/misc/dialplan_p	oopup.php?logingroup=admin	<u> </u>
*		
Dero*TIX		
—		
	DIALPLAN	
Direction:	SIP-ISDN 🗾	
From ID:	p:asterisk 🗾	
To ID:	g:lednGioup3	
Destination:		
Source:		
New Source:		
	more	
	Save Close	
		baraNat :!!!
		beroivet
Fertig		X

Picture 10

As mentioned above the Dialplan entries are based on Regular Expressions. In the next Chapter we will show you how to use Regular Expression with some examples. In the Direction field you have to choose the direction from where the call is originated and to where the call is routed. Possible values are SIP->ISDN or ISDN->SIP. After you choose the direction, the form will change its style. The meaning of From-ID and To-ID are depending on the direction you choose. In Direction SIP->ISDN the From-ID is a configured SIP-Proxy, a SIP Registrar or just an IP-Address, from where the call is originated. In this case the To-ID is a configured ISDNPort Group or just a single ISDN Port. If you choose the Direction ISDN->SIP the From-ID is the a configured ISDNPort Group or just a single ISDN Port, while the To-ID is just a SIP-Proxy, a SIP Registrar or just an IP-Address. The other values are already described in the previous Chapter.



Behind the "more " button you will find a bunch of values you could use for this specific Dialplan entry like disable/enable Echocanceler and much more like described in picture 11.

۲	DIALPLAN - Mozilla Firefox	_ 0	×
http://10.0.0.2/app/berog	ui/misc/dialplan_popup.php?logingroup=a	dmin# ූ	•
	more		
	Configuration		
	Echocancel <0=off,1=0n> (def '1')		
	Early Audio <0=off,1=0n> (def '1')		
	Overlap dial timeout (def '3')		
	Overlap TO dad empty (def '10')		
	dnumplan (def '0')		
	rnumplan (def '0')		
	onumplan (def '0')		
	cpnnumplan (def '0')		
	unknownprefix (def ")		
	internationalprefix (def '00')		
	nationalprefix (def '0')		
	privateprefix (def ")		
	screening (def '0')		
	presentation (def '0')		
	T.38 support <0=off,1=on> (def '1')		
	EC tail length <0=8ms,1=16ms,,15=128ms> (def '15')		
	DTMF (def 'rfc2833')		
	Т.38		
	Codecs (def 'pcma')		
Fertia		N	
reitig			•i

Picture 11

This settings has the highest priority and will overwrite all settings that have been set in the SIP- or in the ISDN-Group sections.

3.2.2. Dialplan entry examples

The best way to explain how to handle berofix dialpans is to make some examples.

Example1:

Incoming call from SIP with the following settings

SourcelP: 172.20.0.1 CallerID: 2593890 CalledID: 025938912.

Dialplan entry values:

Direction:	"SIP->ISDN"
FromID:	"(.*)" will match any IP-Address from where the call is coming
ToID:	"(g:te)" will go to ISDNPort-Group g:te
Destination:	" 0(.*)" will match all numbers starting with 0
New Destination:	" \1 " \1 is the parameter 1 (\1 the value in the first parenthesizes of Destination
Source New Source:	"(.*)" will match any CallerID "\ 1 " \1 is the value in the first parenthesizes of Source

With this settings the the "Call" will be routed to ISDNPort Group "g:te". The CalledID will be changed to 25938912, that means the first 0 will be stripped and the CallerID is still 2593890.

Example2:

Incoming call from SIP with the following settings

SourcelP: 172.20.0.1 CallerID: 12 CalledID: 0176242XXXXX.

Dialplan entry values:

Direction:	"SIP->ISDN"
FromID:	"172.20.0.1" will match only this source IP-Address
ToID:	"1" will go to ISDNPort 1
Destination:	"0176(.*)" will match all numbers starting with 0176
New Destination:	"0049176\1" will cut 0176 from CalledID and add 0049176 to the CalledID followed by add the parameter 1 (\1 the value of the
	first parenthesizes in Destination
Source New Source:	"()" will match Caller IDs with 2 Characters "25938912" will overwrite the CallerID with this value

With this settings the the "Call" will be routed to ISDNPort 1". The CalledID will be modified to 0049176XXXXX. The CallerID will be changed to 25938912.



Example3:

Incoming call from ISDN with the following settings

ISDNPort:	g:teports
CallerID:	25938912
CalledID:	0176242XXXX

Dialplan entry values:

Direction:	"ISDN->SIP"
FromID:	"g:teports" will match only this ISDNPort-Group
ToID:	"p:mysipserver" will go to SIP Proxy mysipservedr
Destination:	"259389([0-9][0-9])" will match all numbers starting with
	259389 followed by 2 digits in the range from [0-9]
New Destination:	"\1" will cut 259389 from CalledID and add the 2 digits (\1 the
	value in the first parenthesizes)
Source	"(.*)" will match any CallerID
New Source:	"\ 1 " \1 is the value in the first parenthesizes of Source

With this settings the the "Call" will be routed to SIP Proxy p:mysipserver. The CalledID will be changed to 12. The CallerID is untouched

Example4:

Incoming call from ISDN with the following settings

ISDNPort: 1 CallerID: 12 CalledID: 02593890

Dialplan entry values:

Direction:	"ISDN->SIP"						
FromID:	"1" will match only this ISDNPort-Group						
ToID:	"p:mysipserver" will go to SIP Proxy mysipservedr						
Destination:	"O([2-9])(.*))" will match all numbers starting with						
	0. The second digit has to be in range[2-9] followed by the any						
	characters						
New Destination: "(1)2" will cut 0 from CalledID and add the parameter							
	value in the first parenthesizes) followed by parameter 2 (\2 the						
	value in the second parenthesizes)						
Source	"(.*)" will match any CallerID						
New Source:	"\1 " \1 is the value in the first parenthesizes of Source						

With this settings the the "Call" will be routed to SIP Proxy p:mysipserver. The CalledID will be changed to 2593890. The CallerID is untouched.

With the above examples you should be able to handle almost every situation in the real world. If this is not enough and you need some special things, feel free to implement more complex Regular Expressions. For each Dialplan entry you can also set the special features like enable Echocanceler or turn on T.38. More informations about this can be found in section **3.3.2 SIP-Options and 3.4.1 ISDN Options.**

3.3. SIP+

By selecting the menu-point SIP, you could set all options regarding SIP like adding Registrars or Proxy's as well as change the RTP-Port-Range. There are 2 menu-point, SIP and SIP General which will be explained in detail in the next chapters.

3.3.1. SIP Settings Overview

3			bero*fix - Mozilla I	Firefox		_ _ _ X				
<u>D</u> atei	<u>B</u> earbeiten <u>A</u> nsicht	<u>C</u> hronik <u>L</u> esezeichen	E <u>x</u> tras <u>H</u> ilfe			4 ⁴ 4 8 ₁ 9				
4	🔿 - 💪 🖸 🕯	http://10.0.0.2/app	/berogui/index.php?m=	=sip	☆ - C -	Google 🔍				
⊵Z Zin	Zimbra: Posteingang # OTRS :: Login FeGroupWare - Login									
ſ										
	bero*†ix	C								
			SIP CONFI	GURATION						
		Dialplan • Sip.	Isdn Hardware	Preferences + Manag	ement+ Logout					
			acti	vate						
	Name	Server Address	User	Туре	Default					
	Sip1	172.20.22.3	test	proxy	1	modiřy delete				
	Sip2	172.20.0.102	test	registrar	0	modiřy delete				
			A	dd						
			1							
						Help				
						beroNet 🏭				
						v.1.3				
Fertig						X				



Under the menu point SIP you will get the SIP overview. As you can see in picture 12, you have a overview about all SIP Proxy's and Registrars you have setuped. You can add, modify and delete these settings in this overview.

The next screen will pop up if you press either add or modify (picture 13).

http://10.0.0.2/app/berogui/misc/sip_popup.php 2 bero*fix SIP
bero*fix sip
bero*fix sip
sip
sip
SIP
SIP
Name:
Server Address:
Secret:
Туре: Рюху 🗾
Default:
more
Save Close
horoNet ***
Deronet ::::

Picture 13

You can choose a name for this SIP entry and enter it under the label "Name". The "Server Address" is the IP-Address or the DNS name of the Registrar or Proxy. Optional you can also set the Port where your Proxy or Registrar is listening. For instance "sip.beronet.com:5061" when you want to use Port 5061."User" and "Secret" are necessary if your Registrar or Proxy requires authentication. "Type" describes, if this settings are for a Registrar a Proxy or maybe both which means a Registrar and a Proxy. The default checkbox is to mark this entry as default. This means if we get a "Call" from ISDN or GSM and no Dialplan entry matches, then the call will be routed to the default SIP entry. Behind the more button you will find a lot of special options like enable T.38 or DTMF transmission, which you can set for this SIP entry. Special options you set here can be overwritten by the dialplan. The dialplan has always the highest priority. For example you set T.38 on under SIP settings and turn T.38 off in the dialplan, T.38 will be disabled if the dialplan matches.

3.3.2. SIP-Options

As mentioned above behind the more button are a bunch of special feature that can be set. The feature are:

Early_Audio:	0=off,1=on (default is 1=on) also called (Early) Media-Stream in onhook. With this option set to yes you can have Audio without a connect. This is often used by carriers if for you dial for instance a wrong number and the carrier uses this feature to stream you a Voice prompt like "number you have dialed is not correct," without charging you anything.				
T.38 support:	0=off,1=on (default is 1 on) To activate or deactivate T.38 support if fax is detected or we receive a T.38 invite.				
DTMF:	info,inband or rfc2833 default is rfc2833)This is the way how to transport DTMF Information through SIP).				
Codecs:	pcma, pcmu, gsm, g729a or g723(def 'pcma')				

3.3.3. SIP General Settings

Under SIP General settings you can set the Bind Port, that is the port where berofix is listening for SIP messages and the RTP port range, as you can see in picture 14.



Picture 14

In further releases of the berofix firmware options like SIP over TCP or SRTP and TLS settings will be also added here.

3.4. ISDN

If you have any ISDN Hardware in the system like a bf4S0 or a bfXE1 you can put the physical ISDN ports into groups and modify ISDN specific features for these groups. An ISDNPort-Group is a bunch of ISDN Ports. If you Dial out on an ISDNPort-Group the system will find automatically the next free channel in this Group, regardless if it is a BRI-Port or PRI-Port and wether it is set to PTP or PMP. The next picture shows you an overview about the configured ISDN Ports.

9	bero*fix	- Mozilla Firefox			_ 				
<u>D</u> atei <u>B</u> earbeiten <u>A</u> nsicht <u>C</u> hronik	<u>L</u> esezeichen E <u>x</u> tras <u>H</u> i	lfe			1.1				
🖕 🗼 👻 💰 🛞 🗰 🏢 http	://10.0.0.2/app/berogui/ir	ndex.php?m=isdn	Ę] 🗕 🕻 🗕 Google	0				
Zimbra: Posteingang 🗰 OTRS :: Log	in 🕒 eGroupWare - Logir	r							
bero*fix									
	ISDN	CONFIGURA	TION						
D	Dialplan Sip + Isdn Hardware Preferences + Management + Logout								
		activate							
	Group	Ports							
	IsdnGroup1	1	modiřy delete						
	IsdnGroup2	2,3,4	modiřy delete						
		Add							
				b	Help eroNet 🎬				
					v.1.3				
Fertig					X				

Picture 15

Again you can add, modify and delete ISDNPort Groups in this overview. The next screen will pop up if you press either add or modify (picture 16).





Picture 16

You can create a new or modify an ISDNPort-Group give him a name and add or remove the possible ports in this group. Only available Ports are can be added into a Group. A port which is already assigned to a Group will be displayed grey. Behind the more option you can set a lot of values regarding ISDN, these options will be explained in the next chapter.

3.4.1. ISDN-Options

Echocancel:	0=off,1=on (default value is 1=on) this will activate or deactivate the Echocanceler
EC tail length: Overlap dial time	0=8ms,1=16ms,,15=128ms (default value is 15=128ms) meout: (default is 3=3sec.)For an incoming setup coming from
interdigit this	ISDN-Lines a interdigit collect timer will be started. And the Timer is called Overlap Dial Timeout which you can set with option. After the specified timeout the setup will be signaled to the routing site.
Dialplans:	Dialplan means the type of Number in ISDN Terms(this only make sense for outgoing calls.) This options defines the number format for an outgoing call. Be aware that the remote end have to support this feature There are different types of dialplans: • 0=unknown • 1=international • 2=national • 4=subscriber
dnumplan:	(default is 0)=unknown) destination number(DAD). For lines with "Clip-No-Screening" this has to be set to 4="subscriber".
rnumplan:	(default is 0)=unknown) redirected number dialplan
onumplan:	(default is 0)=unknown) originated number(OAD) Dialplan
cpnnumplan:	(default is 0=unknown) connected party number Dialplan
Prefixes:	Prefixes will be automatically prefixed to the OAD depending of the Dialplan we receive. For instance if we get a Setup with Dialplan set to "unkown", we will append the unknown prefix to the OAD. The same will happen to international and national calls. If Dialplan is set to "subscriber" the privateprefix will be appended.
unknownprefix	(default is empty)
internationalpr	efix: (default is 00)If a call is coming from outside and it is an international call, the prefix (in this case 00) will be put in front of the OAD
nationalprefix:	(default is 0)If a call is coming from outside and it is an national call, the prefix (in this case 0) will be put in front of the OAD.
privateprefix:	(def is empty)
screening:	(default is 0) these are the exact ISDN screening and presentation indicators Screening=0 and presentation=0 means callerID presented but not screened(the remote end does see the callerID). Screening=1 and presentation=1 means callerID presented but screened(the remote end does not see the callerID)
presentation:	(default is 0)



3.5.GSM

The bfXGSM Module will be available Q4 2009.

3.6.Hardware

By selecting the menu point "Hardware", you will see all LineInterfaces which are plugged to your berofix card. The next picture will show you this:

۲	bero*f	ix - Mozilla Firefox			— • ×
<u>D</u> atei <u>B</u> earbeiten <u>A</u> nsicht <u>C</u> hron	k <u>L</u> esezeichen E <u>x</u> tras <u>H</u>	ilfe			2 ¹ 2 2 ₁ 2
🖕 🗉 👻 🙆 🖝 🏢	http://10.0.0.2/app/berogui/ir	ndex.php?m=isdn_hw		☆ 🔻 🖸 🗸 Google	
	1				
bero*fix					
	15	SDN HARDWAR	RE		
	Dialalan Sin, Ieda	a Hardwara Dreferances	s. Management.	Logout	
		- Haldware Pielelences	st management t	Logour	
		activate			
	Card Type	Line Interface			
	bf 1E 1	0	modiřy		
	bf4S0	1	modiřy		
				— H	elp
				bero	Net 🏭
					v.1.3
Fertig					🗶 🔡

Picture 17

As you can see one bf1E1 and one bf4S0 LineInterface is plugged on this card.

Every time you reset the berofix to factory defaults, the system will automatically detect all Lineinterface plugged on the berofix board and show them in this above mentioned overview. If you want to expand your card with a new LineInterface, for instance you have already a berofix with one bf1E1 and want to add a new bf4S0 Lineinterface, you have to reset the berofix to "factory defaults" to start the detection process.

3.6.1 Modify Hardware Settings

Each Lineinterface has its own specific settings. For instance on the bf4S0 Lineinterface you can set line-termination on/off in software. This option does not exist in the bfXE1 or bfXGSM. That means by selecting the button modify you will get different outputs depending on the Lineinterface you have selected. If you select a bf4S0 Lineinterface by clicking the modify button in the propper row you will get the following screenshot:

3	3 ISDN HARDWARE - Mozilla Firefox								
#	## http://10.0.0.2/app/berogui/misc/isdnhw_popup.php?lif=1&c=bf4S0								
	*								
	Dero*T	X							
			ISDN HARDWAR	E					
	Card Type: bf4S0 Line Interface: 1								
	Port: 3	Type: le		Termination:	Clock Source:				
	Port: 4	Type: te 💌	Protocol: PTP -	Termination: 🗹	Clock Source: O				
	Port: 5	Type: te 💌	Protocol: PTP -	Termination: 🗹	Clock Source: O				
	Save Close								
	beroNet 🏭								
Fertiq	g				🔀 🔡				

Picture 18

As you can see in the above picture you will see all 4 ports of the bf4S0 Lineinterface counted from 2-5. In this case port 1 is the E1 Port from the first LineInterface (bf1E1). In this Form you can set the LineType (TE/NT mode) or the protocol (PTP / PMP) as well as the 1000hm LineTermination. Cardtype describes the Lineinterface which is detected while Line Interface show you the Slot where it is plugged. All features like NT/TE as well as the Linetermination can be set in software, that means you don't have to set any Jumper on the board. Selectting TE or NT Mode will also change the hardware PinOut of the Ports by changing the rx with the tx pins. This means you can use an one to one cable to connect the ports with a foreign system. The last option is the Clocksource. You can define a port where the system should get its clocksource from. For instance if you select clocksource on port 2 the system will try to get its clock from this port.

If you choose the bf1E1 Lineinterface and press the modify button you will get the following screenshot:

3	ISI	DN HARDWARE - Moz	zilla Firefox	_ _ \					
# htt	p://10.0.0.2/app/berogui/	misc/isdnhw_popup.php	?lif=0&c=bf1E1	☆					
	sk 🔎								
b	pero* † IX								
-									
	ISDN HARDWARE								
	Card Type: bf1E1 Line Interface: 0								
	Port: 1	Type: te 💌	Protocol: PTP -	Clock Source: 〇					
		Save	Close						
				beroNet 🏭					
Fertic				M					
reitig				A .# J					

Picture 19

As described previously the output is different depending on the Lineinterface you choose. In this case you see the one E1 port from our bf1E1 Lineinterface plugged on Lineinterface slot 0. As you can see you can also set the Type and the Protocol. The Protocol for E1 is always PTP, because PMP Mode is not supported on E1 Lines. Further on you can set the LineType TE or NT Mode. This option will only set the Type in software which means on this LineInterface type the hardware PinOut is not switched compared with the bf4S0 Lineinterface. For instance if you select TE Mode you can use a one to one cable to connect this port to a foreign NT port. If you select NT-Mode and want to connect it to a TE port, you have to use a propper cross E1 cable where the rx and the tx pins are crossed. A propper cable the BNE1Crosscable is optional available.

3.7. Preferences

By select the menu point preferences, you can set and manage some general features of the berofix like Logging, Firmware Update and much more. All these Features will be described in the following chapters.

3.7.1. Logging

Berofix has the capability to send logging information through udp Packets to a remote server, like syslog. By selecting the menupoint logging you will reach the following screenshot:



Picture 20

Several settings regarding Logging can be set here like:

Logging Server:	is the IP-address where the log should sent to,
Logging Server Port:	is the UDP Port where the log should sent to
Logging Active:	to activate or deactivate the logging
Log Level:	Log Level 1 is very low while Log Level 9 is very high.

Under Linux based systems you can use netcat to see the log. Just type "nc -ulp 54323" on the desired destination to see the output of the logging.

3.7.2. Changing Password

By selecting the menupoint "Change Password" you can, as already decribed by the name, change the password for the Web Login. By default the username and password is admin and admin.

3.7.3. Update Tool

By selecting the menu point "Update Tool" you can update the firmware of berofix. Under the following URL

http://www.beronet.com/downloads/berofix/

you can always find the newest available firmwares. On berofix there are two memory slots reserved for firmware images. The reason for this is that if you update the firmware and you see something is not working as expected you can just reactivate the previous one. To make it more clear have a look to the next screenshot.



Picture 21

The rest should be straight forward.

3.7.4. Network settings

By selecting the menu point "Network" you can handle all network options like IP-Address, Netmask as well as the default Gateway, as you can see on the next picture.



Picture 22

3.7.5. Backup and Restore

You can backup the configuration of berofix to an external file by just downloading it. These backup files could be used to restore the settings of berofix. Be aware that this could be depending on the berofix firmware version. So if you try to restore a backup file from an older version of the firmware, the restore process could fail.

3.8. Management+

Under the menu point manage you can reach the state view, activate debugging as well as reboot and reset berofix to its factory defaults. In the next chapters these points will be described more detailed.



3.8.1 State

By selecting the menu point "State" you will get an overview about all configured ports and the current channels that are going through the berofix card. The next picture show you how the state form looks like.



Picture 22

As you can see in the section ISDN Status, that ports 1-3 are configured and the state for Layer 1 and Layer 2 is up. Under "Active Channels" you see that there is currently 1 Active call originated by SIP and terminated via ISDN.

3.8.2 Debug

The menu point "Debug" will give you the opportunity to report us problems with the berofix card on a defined way. This will help us to reproduce, analyse and fix your Problem quite fast. On all ISDN Ports you can start a so called "Debug" by pressing the Button "Start ISDN and TCP Trace". By starting the debug process the system will start tracing all ISDN and SIP protocol elements. After you have finished your tests you can press "Stop ISDN and TCP Trace" and download the trace file. All relevant informations about the callflow are stored in this debug file. Send this debug file to support@beronet.com with a small description about your test and we will be able to reproduce your problem.



Another goodie on this page is the so called Dialplan debugging. By pressing this "button" you can debug if your Dialplan is working as expected. The next picture will show you a screenshot of the Dialplan debugging.

👌 🛛 Dialplan Debug - Mozilla Firefox 📃 🗖	×
http://10.0.0.2/app/berogui/misc/dialplan_debug.php?sec=	☆
DEBUG DIALPLAN	
Rebad Clear Stop	
verbose ON. S INVITEJINDICATION:from=10.0.0.1,to=alice2593890 D INCOMING src:0302593890 dest:alice2593890 OUTGOING src:0302593890 dest:2593890 I SETUPJREQUEST:port=3,channel=0,dad=2593890,oad=0302593890 isdn SETUPJINDICATION:port=2,channel=1,dad=2593890,oad=0302593890 S INVITEJREQUEST: to="2593890",from="0302593890"	
beroNet 🇱	
Fertig	

Picture 23

3.8.3 Info

This Info page give you some general Informations about the System as you can see in the following picture.

3.8.4.Reset

By select the menu point "Reset", you will reset berofix to "factory default" values. Be aware that all configured values are going to be lost. Use this option only if you really know what you do.

3.8.5 Reboot

By select the menu point "Reboot", you will reboot the berofix system. This can be helpful in some situations.

3.9. Loggout

By select the menu point Logout, you will log out of the system.

4. The Telnet Interface

The berofix System has also a telnet interface to track some basic stuff in real time. The telnet interface is listining on port 54322. Every Option in the telnet interface is menudriven and should be straight forward. By typing the following line you will get the following output.

beropbx#telnet 10.0.0.2 54322

			gursel@	gursel	l-desktop: ~		
<u>D</u> atei	<u>B</u> earbeiten	<u>A</u> nsicht	<u>T</u> erminal	<u>R</u> eiter	<u>H</u> ilfe		
h							
ISGW S	tatus Monii	tor					
h	:help						
1	:1sdn sta	ate of rogic	trations				
i	status (of opera	tions				
c	:clear so	reen					
v	:set verb	oosity					
prX	:ISDN por	rt resta	rt(X is p	port nu	umber)		
x n	: shuldown	i isgw hetlog ti	arget				
t	:toggle r	netlog o	n/off				
k	:do a seg	gfaulť					
d	:list dia	alplan		6	11		
cc	:print ca	all cont.	iguration	n TOR (igurati	call at giv ion	en index	
rd	:reload d	dialplan		rgurati	LUII		
q	:disconne	ect clie	nt				
U							

Picture 24

5. Examples with Asterisk

This example assumes that you can reach the berofix card in your network. The example uses a berofix card with one bf4S0 Lininterface. The first thing you have to do when you try to bring your berofix card up and running with the Asterisk, you have to establish the SIP connection between them. To do so simply add the following lines to the "/etc/asterisk/sip.conf" to create a new SIP friend/peer:

```
[berofix]
type=friend
secret=berofix
host=10.0.0.2
allow=all
canreinvite=no
context=from-sip
```

In the "/etc/asterisk/extensions.conf" you need to add a context "from-sip" like:

```
[from-sip]
exten => _X.,1,Playback(tt-monkeys)
```

So every call from berofix will be routed to Playback(tt-monkeys). When you want to send calls to berofix you can simply use the following dial statement:

exten => _0X.,1,Dial(SIP/99\${EXTEN:1}@berofix)
exten => _0X.,n,hangup

To make this work you need to reload the configs on the asterisk cli:

asterisk -rx "reload"

Now you need to setup these parameters also at the berofix site, and you should be able to make basic calls. In the first step you should put your ISDN ports into groups. By the selecting the menupoint ISDN you can simply add a ISDN Port Group called "BRI" where you put all your 4 BRI ports in it.After that you need to have a SIP entry to communicate with the Asterisk. To do so click on the menupoint SIP+ \rightarrow SIP and add a new SIP entry with the name "asterisk", the Serveraddress "10.0.0.2", User "berofix", Secret "berofix", the Type "Proxy" and default "enabled". After that go to the Dialplan and add the twe following rules:

Rule 1:

Direction:	SIP-> ISDN
From ID:	p:asterisk
To ID:	g:BRI
Destination:	99(.*)
New Destination:	\1
Source:	(.*)
New Source:	\1



The settings above means that every SIP Call starting with 99 is directly routed to the "BRI" group, the prefix "99" will be removed and the callerid is transported transparently.

Rule 2:

Direction:	ISDN-> SIP
From ID:	g:BRI
To ID:	p:asterisk
Destination:	(.*)
New Destination:	\1
Source:	(.*)
New Source:	\1

This setup means that every ISDN Call coming from the ISDN Ports of the "BRI" group are routed to Asterisk.

As last step you need to activate the configuration. Do this by clicking on the

"activate" icon.

6. Support

Please find new firmware, documentation and tools at: http://www.beronet.com/downloads/berofix

If you encounter issues or bugs, please report them in the berofix betatest project at: http://bugs.beronet.com

IF you have any questions or need support to setup the card don't hesitate to contact us: support@beronet.com