



# **SDK API Manual**

**Version 2.5.8**

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# 1 Introduction

This manual describes the SDK API extensions to the standard library of version `#SDK_VERSION###`. They provide a range of general-purpose extensions for the Arena scripting language.

The current version ships with the following features:

- Send and retrieve SMS
- Send E-mail
- Read or write from or to a serial device
- Control digital input/output ports
- Run TCP/UDP servers
- Run IP/TCP/UDP clients
- Access files of mounted media (e.g. an USB stick)
- Retrieve status information from the system
- Get or set configuration parameters
- Write to syslog
- Transfer files over HTTP/FTP
- Perform config/software updates
- Control LEDs
- Get system events, restart services or reboot system
- Scan for networks in range
- Create your own web pages
- Voice control functions
- SNMP functions
- CAN socket functions
- Various network-related functions
- OPC-UA functions
- Other system-related functions

## 2 API functions

### 2.1 Serial

#### 2.1.1 nb\_serial\_getattr

```
struct nb_serial_getattr (string dev)
```

The nb\_serial\_getattr function retrieves the current attributes of a serial device.

dev            serial device (e.g. serial0 for first device)

Returns a struct containing values for baudrate, databit, stopbit, parity, flowctl or void on error.

#### 2.1.2 nb\_serial\_setattr

```
int nb_serial_setattr (string dev, int b, int d, int s, int p, int f)
```

The nb\_serial\_setattr function can be used to set the attributes of a serial device.

dev            serial device (e.g. serial0 for first device)  
b              baudrate (e.g. 9600, 19200, 38400, 57600, 115200)  
d              number of data bits (5, 6, 7, 8)  
s              number of stop bits (1, 2)  
p              parity (0=no parity, 1=odd parity, 2=even parity)  
f              flow control (0=none, 1=xon/xoff, 2=hardware)

Returns -1 on error, otherwise zero.

#### 2.1.3 nb\_serial\_write

```
int nb_serial_write (string dev, string msg)
```

The nb\_serial\_write function can be used for writing a message directly to a serial device.

dev            serial device (e.g. serial0 for first device)  
msg            message to be written

Returns number of bytes write or -1 on error.

### 2.1.4 nb\_serial\_read

```
string nb_serial_read (string dev)
```

The nb\_serial\_read function can be used to read a message from a serial device.

dev            serial device (e.g. serial0 for first device)

Returns the string received from the serial port or an empty string in case of errors.

## 2.2 Media

### 2.2.1 nb\_media\_mount

```
int nb_media_mount (string dev)
```

The nb\_media\_mount function mounts the specified media device.

dev            device name

Returns 0 on success and -1 on error. The media will be mounted to /mnt/media/usb0 for instance. You may use any IO functions afterwards to operate on it.

Available media devices:

usb0	first USB device
storage0	first extended storage device

### 2.2.2 nb\_media\_umount

```
int nb_media_umount (string dev)
```

The nb\_media\_umount function unmounts the specified media device.

dev            device name (e.g usb0, storage0)

Returns -1 on error.

### 2.2.3 nb\_media\_getmount

```
string nb_media_getmount (void)
```



The `nb_media_getmount` function returns a list of any currently mounted media including the corresponding mountpoint (i.e. in the form "`<media> on <path>`"). If nothing is mounted (or in case of an error) an empty string will be returned.

## 2.3 Modbus

### 2.3.1 `nb_modbus_register`

```
int nb_modbus_register (int fd, int type)
```

This function will register a file descriptor (as returned by `open` or `accept`) to the modbus subsystem.

<code>fd</code>	file descriptor
<code>type</code>	can be either <code>MODBUS_TYPE_TCP</code> or <code>MODBUS_TYPE_RTU</code>

On success, the function returns 0. Otherwise -1.

### 2.3.2 `nb_modbus_unregister`

```
int nb_modbus_unregister (int fd)
```

This function unregisters a previously registered file descriptor.

<code>fd</code>	file descriptor
-----------------	-----------------

On success, the function returns 0. Otherwise -1.

### 2.3.3 `nb_modbus_set_slave`

```
int nb_modbus_set_slave (int fd, int slave)
```

The `nb_modbus_set_slave` function applies the local slave identifier number which is required when communicating in RTU mode.

<code>fd</code>	file descriptor
<code>slave</code>	slave identifier

The function will return zero if successful. Otherwise it returns -1, the error can be figured out using `nb_modbus_last_error`.

### 2.3.4 `nb_modbus_flush`

```
int nb_modbus_flush (int fd)
```

The nb\_modbus\_flush function will discard any data received without reading from the file descriptor.

fd	file descriptor
----	-----------------

The function will return zero or the number of flushed bytes in case of success. Otherwise it returns -1, the error can be figured out using nb\_modbus\_last\_error.

### 2.3.5 nb\_modbus\_last\_error

```
string nb_modbus_last_error (void)
```

The nb\_modbus\_last\_error function show the last occurred error.

### 2.3.6 nb\_modbus\_set\_debug

```
int nb_modbus_set_debug (int fd, bool flag)
```

The nb\_modbus\_set\_debug function enables or disables the debug mode.

fd	file descriptor
flag	true for enabled or false for disabled

The function will return zero on success, otherwise -1.

### 2.3.7 nb\_modbus\_send\_raw

```
array nb_modbus_send_raw (int fd, array request)
```

The nb\_modbus\_send\_raw function sends the request to the associated descriptor and receives the confirmation.

fd	file descriptor
request	modbus raw request

The functions returns the modbus confirmation if successful. Otherwise it will return void.

### 2.3.8 nb\_modbus\_reply\_raw\_response

```
int nb_modbus_reply_raw_response (int fd, array response)
```

The nb\_modbus\_reply\_raw\_response function will reply to a modbus request.

fd	file descriptor
response	the raw modbus response

The `nb_modbus_replay_raw_response` function will return the number of bytes sent on success. Otherwise it will return -1.

### 2.3.9 nb\_modbus\_extract\_payload

```
array nb_modbus_extract_payload (int fd, array request)
```

The `nb_modbus_extract_payload` function extracts the payload from a given request.

fd	file descriptor
request	modbus request

It returns the extracted payload from the request if successful, otherwise void.

### 2.3.10 nb\_modbus\_read\_bits

```
array nb_modbus_read_bits (int fd, int addr, int len)
```

The `nb_modbus_read_bits` function reads the status of the bits from the remote device.

fd	file descriptor
addr	address of bits to read
len	length of data to read

The function returns the number of read status bits/registers if successful, otherwise it returns -1.

### 2.3.11 nb\_modbus\_read\_regs

```
array nb_modbus_read_regs (int fd, int addr, int len)
```

The `nb_modbus_read_regs` function reads the status of the registers from the remote device.

fd	file descriptor
addr	address of registers to read
len	length of data to read

The function returns the number of read status registers if successful, otherwise -1.

### 2.3.12 nb\_modbus\_write\_bits

```
int nb_modbus_write_bits (int fd, int addr, int length, array data)
```

The nb\_modbus\_write\_bits function writes the status of bits to the remote device.

fd	file descriptor
addr	address of bits to write
length	length of array
data	array to write

The function returns the number of bits written if successful, otherwise -1.

### 2.3.13 nb\_modbus\_write\_input\_bits

```
int nb_modbus_write_input_bits (int fd, int addr, int length, array data)
```

The nb\_modbus\_write\_bits function writes the status of input bits to the remote device.

fd	file descriptor
addr	address of input bits to write
length	length of array
data	array to write

The function shall return the number of written bits if successful, otherwise -1.

### 2.3.14 nb\_modbus\_write\_regs

```
int nb_modbus_write_regs (int fd, int addr, int length, array data)
```

The nb\_modbus\_write\_regs function writes the status of the registers to the remote device.

fd	file descriptor
addr	address of registers to write
length	length of array
data	array to write

The function returns the number of written bits if successful, otherwise -1.

### 2.3.15 nb\_modbus\_write\_input\_regs

```
int nb_modbus_write_input_regs(int fd, int addr, int length, array data)
```

The nb\_modbus\_write\_input\_regs function writes the status of the input registers to the remote device.

fd	file descriptor
addr	address of input registers to write
length	length of array
data	array to write

The function returns the number of written bits if successful, otherwise -1.

### 2.3.16 nb\_modbus\_receive

```
int nb_modbus_receive (int fd)
```

The nb\_modbus\_receive function will receive an indication request from the specified descriptor. This function is used by a modbus slave/server to receive and analyze indication requests sent by the masters/clients.

fd	file descriptor
----	-----------------

The function returns the received indication request.

### 2.3.17 nb\_modbus\_reply

```
int modbus_reply (int fd, array req, struct resp)
```

The nb\_modbus\_reply function sends a response for a received request (as returned by nb\_modbus\_receive) to the specified descriptor.

fd	file descriptor
req	request
resp	response struct made up as follows:

```
resp = mkstruct(
    "bits", mkarray
    (
        0, 0, 0, 1, 1, 1, 1,
        0, 0, 0, 1, 1, 1, 1
    ),
    "ibits", mkarray
    (
        1, 0, 1, 0, 1, 0, 1,
        1, 0, 1, 0, 1, 0, 1
    ),
    "regs", mkarray
    (
        0x0000 0x0001, 0x0002, 0x0003, 0x0004, 0x0005, 0x0006, 0x0007,
```

```

        0x0008, 0x0009, 0x000A, 0x000B, 0x000C, 0x000D, 0x000E, 0x000F
    ),
    "iregs", mkarray
    (
        0xFF00, 0xFF01, 0xFF02, 0xFF03, 0xFF04, 0xFF05, 0xFF06, 0xFF07,
        0xFF08, 0xFF09, 0xFF0A, 0xFF0B, 0xFF0C, 0xFF0D, 0xFF0E, 0xFF0F
    )
);

```

**Representation:**

```

"bits" => Discrete Output Coils
"ibits" => Discrete Input Contacts
"regs" => Analog Output Holding Registers
"iregs" => Analog Input Registers

```

## 2.4 SMS

Please note that the SMS daemon must be properly configured prior to using the functions below.

### 2.4.1 nb\_sms\_send

```
string nb_sms_send (string number, string msg)
```

The nb\_sms\_send function can be used to send an SMS to the specified number.

number	recipient's phone number
msg	the message to be sent

Returns the resulting message identifier on success or an empty string on error.

### 2.4.2 nb\_sms\_sendmsg

```
string nb_sms_sendmsg (struct msg)
```

The nb\_sms\_send function can be used to send an SMS with parameters specified in the struct msg which includes the following fields:

number	recipient's phone number
report	request delivery report (if set to yes)
gateway	the SMS gateway used for sending the message
sim	the SIM over which the message shall be sent
modem	the modem used for sending (deprecated)
msg	the message to be sent

Returns the resulting message identifier on success or an empty string on error.

### 2.4.3 nb\_sms\_list

```
array nb_sms_list (void)
```

The nb\_sms\_list function can be used to retrieve the list of messages in the inbox. Returns an array of message identifiers.

### 2.4.4 nb\_sms\_retrieve

```
string nb_sms_retrieve (string id)
```

The nb\_sms\_retrieve function returns the message text of the specified message identifier.

id	the message identifier
----	------------------------

### 2.4.5 nb\_sms\_header

```
string nb_sms_header (string id, string tag)
```

The nb\_sms\_header function returns the headers of a given message identifier.

id	the message identifier
tag	a specific header tag (such as "From")

Returns the value of the specified header tag or all headers (if tag omitted) or an empty string on error.

### 2.4.6 nb\_sms\_body

```
string nb_sms_body (string id)
```

The nb\_sms\_body function returns the body of a given message identifier.

id	the message identifier
----	------------------------

Returns the message's body text or an empty string on error.

### 2.4.7 nb\_sms\_delete

```
int nb_sms_delete (string id)
```

The `nb_sms_delete` function can be used to delete a message from the inbox.

<code>id</code>	the message identifier
-----------------	------------------------

Returns zero on success or -1 on error.

## 2.5 E-Mail

### 2.5.1 `nb_email_send`

```
int nb_email_send (string rcpt, string subj, string msg)
```

The `nb_email_send` function can be used to send an E-Mail to a particular address.

<code>rcpt</code>	recipient's email address (e.g. abc@abc.com)
<code>subj</code>	email subject
<code>msg</code>	email content

Returns zero on success or any error code. Please note that the E-Mail client must be properly configured prior to using this function.

### 2.5.2 `nb_mail_list`

```
int nb_mail_list (string usr, string pwd, string url)
```

The `nb_mail_list` function can be used to get the number of existing mails at a remote IMAP/POP3 server.

<code>usr</code>	the username used for authentication (can be empty)
<code>pwd</code>	the password used for authentication (can be empty)
<code>url</code>	IMAP/POP3 server URL (e.g. imap://mail.example.com)

Returns number of available mails or -1 on error. Please note that IMAP functions are limited to the INBOX folder.

### 2.5.3 `nb_mail_delete`

```
int nb_mail_delete (string usr, string pwd, string url, int index)
```

The `nb_mail_delete` function can be used to delete an E-Mail from a remote IMAP/POP3 server.



usr	the username used for authentication (can be empty)
pwd	the password used for authentication (can be empty)
url	IMAP/POP3 server URL (e.g. imap://mail.example.com)
index	the mail index to be deleted

Returns 0 on success.

### 2.5.4 nb\_mail\_fetch

```
int nb_mail_fetch (string usr, string pwd, string url, int index)
```

The nb\_mail\_fetch function can be used to fetch an E-Mail from a remote IMAP/POP3 server.

usr	the username used for authentication (can be empty)
pwd	the password used for authentication (can be empty)
url	IMAP/POP3 server URL (e.g. imap://mail.example.com)
index	the mail index to be fetched

Returns void on error, otherwise a struct with the following fields:

from	sender's address
to	recipient's address
subject	subject of the mail
date	when the mail has been sent
body	content of the mail

### 2.5.5 nb\_mail\_send

```
int nb_mail_send (string usr, string pwd, string url, struct mail)
```

The nb\_mail\_send function can be used to send an E-Mail via a remote SMTP server.

usr	the username used for authentication (can be empty)
pwd	the password used for authentication (can be empty)
url	SMTP server URL (e.g. smtp://mail.example.com)
mail	a struct containing the fields from, to, subject and body

Return -1 on error, otherwise zero.

## 2.6 Digital I/O

### 2.6.1 nb\_dio\_get

```
int nb_dio_get (string port)
```

The `nb_dio_get` function retrieves the status of a digital I/O port.

<code>port</code>	DIO port to be queried (in1, in2, out1, out2)
-------------------	---

Returns the DIO status (0 = off, 1 = on) or -1 on error.

### 2.6.2 nb\_dio\_set

```
int nb_dio_set (string port, int state)
```

The `nb_dio_set` function can be used to turn on/off the status of a digital output port.

<code>port</code>	digital output port to be configured (out1, out2)
<code>state</code>	new output status (0 = off, 1 = on)

Returns -1 on error.

### 2.6.3 nb\_dio\_count

```
int nb_dio_count (string port)
```

The `nb_dio_count` function can be used to get the number of toggles of the specified input port.

<code>port</code>	digital input port (in1, in2)
-------------------	-------------------------------

Returns the number of toggles since the last measurement.

### 2.6.4 nb\_dio\_summary

```
string nb_dio_summary (void)
```

The `nb_dio_summary` function retrieves the status of all digital I/O ports.

Returns a string holding the status of all ports or an empty string on error.

## 2.7 Configuration

### 2.7.1 nb\_config\_get

```
string nb_config_get (string key)
```

The `nb_config_get` function returns the currently configured value of a particular config parameter.

`key`            config key (e.g. "config.info")

Returns the config value or an empty string on error.

### 2.7.2 `nb_config_set`

```
int nb_config_set (string config)
```

The `nb_config_set` function can be used to set system configuration parameters.

`config`            config to be set in the form key=value (e.g. sdk.status=0)

Returns -1 on error. The config values will be immediately applied to the system.

### 2.7.3 `nb_config_summary`

```
string nb_config_summary (void)
```

The `nb_config_summary` function returns the current system configuration which corresponds to the delta of the factory configuration and the currently active configuration.

## 2.8 Status Information

### 2.8.1 `nb_status`

```
struct nb_status (string section)
```

The `nb_status` function will return various status values (as available through cli).

`section`            the status section which shall be queried

The following sections can be specified:

info	System and config information
config	Current configuration
system	System information
configuration	Configuration information
license	License information
wwan	WWAN module status
wlan	WLAN module status
gnss	GNSS (GPS) module status
eth	Ethernet interface status
lan	LAN interface status
wan	WAN interface status
openvpn	OpenVPN connection status
ipsec	IPsec connection status
pptp	PPTP connection status
gre	GRE connection status
dialin	Dial-In connection status
mobileip	MobileIP status
dio	Digital IO status
audio	Audio module status
can	CAN module status
uart	UART module status
ibis	IBIS module status
redundancy	Redundancy status
sms	SMS status
firewall	Firewall status
qos	QoS status
neigh	Neighborhood status
location	Current Location

Returns a struct holding the relevant status values (see 'status.are' example).

### 2.8.2 nb\_status\_summary

```
string nb_status_summary (void)
```

The nb\_status\_summary function will return a short summary about the current system status or an empty string on error.

## 2.9 Network Scanning

### 2.9.1 nb\_scan\_networks

```
struct nb_scan_networks (string ifc)
```

The `nb_scan_networks` function can be used to scan for available networks.

`ifc` the interface to scan (e.g. WLAN1 or Mobile1)

Returns a struct holding the relevant networks (see examples).

Please note that scanning a mobile interface will tear down any running WWAN connections. Same applies to WLAN interfaces operating in access-point mode. Therefore the scan interval is limited to 30 seconds.

## 2.10 File Transfers

The file transfer functions can be used to transfer files from or to a remote server denoted by an FTP or HTTP/HTTPS URL. Please note that all functions operate on files in the SDK sandbox (which is `/mnt/sdk` on the host system).

### 2.10.1 nb\_transfer\_get

```
int nb_transfer_get (string usr, string pwd, string url, string path)
```

The `nb_transfer_get` function can be used to get a file from a remote server. If both, username and password are specified, the function will perform authentication based on the relevant methods of HTTP or FTP.

`usr` the username used for authentication (can be empty)  
`pwd` the password used for authentication (can be empty)  
`url` the URL where to get the file from  
`path` the local path where the file should be stored

Returns -1 on error.

### 2.10.2 nb\_transfer\_put

```
int nb_transfer_put (string usr, string pwd, string url, string path)
```

The `nb_transfer_put` function can be used to transfer a file to a remote server. The `usr/pwd` arguments can be applied in order to perform authentication.

usr	the username used for authentication (can be empty)
pwd	the password used for authentication (can be empty)
url	the URL where to put the file to
path	the path to the local file which could be sent

Returns -1 on error.

### 2.10.3 nb\_transfer\_post

```
int nb_transfer_post (string usr, string pwd, string url, string path,  
string pp)
```

The nb\_transfer\_post function can be used to transfer a file to a remote HTTP server. By using the POST method, additional parameters may be passed. The usr/pwd arguments can be applied in order to perform authentication.

usr	the username used for authentication (can be empty)
pwd	the password used for authentication (can be empty)
url	the URL where to put the file to
path	the path to the local file which could be sent
pp	additional POST parameters

Returns -1 on error.

POST parameters have to be provided as follows:

```
<key1>=<val1>&<key2>=<val2>&<keyN>=<valN>
```

### 2.10.4 nb\_transfer\_list

```
array nb_transfer_list (string usr, string pwd, string url)
```

The nb\_transfer\_list function can be used to retrieve the list of files from a remote server. The usr/pwd arguments can be applied in order to perform authentication.

usr	the username used for authentication (can be empty)
pwd	the password used for authentication (can be empty)
url	the URL specifying the directory to be listed

Returns an array of struct describing the directory files. They are made up of:

name	name of the file
size	file size in bytes
mode	file mode and permission (see chmod)
user	owner username
group	owner groupname
time	modification time
tm	time struct of modification time

### 2.10.5 nb\_transfer\_delete

```
int nb_transfer_delete (string usr, string pwd, string url)
```

The nb\_transfer\_delete function can be used to delete a file from a remote FTP server. The usr/pwd arguments can be applied in order to perform authentication.

usr	the username used for authentication (can be empty)
pwd	the password used for authentication (can be empty)
url	the URL specifying the path of the file to be deleted

Returns -1 on error.

## 2.11 LED

### 2.11.1 nb\_led\_acquire

```
int nb_led_acquire (int led)
```

The nb\_led\_acquire function will acquire the specified LED for a particular script. Any associated system indication on that LED will be stopped until the LED is released again.

led	the LED number to be acquired (starting from left/top) or LED_ALL for all LEDs
-----	---

Returns -1 on error, otherwise zero. Please note that the status LED cannot be acquired.

### 2.11.2 nb\_led\_release

```
int nb_led_release (int led)
```

The nb\_led\_release function will release an acquired LED again.

`led` the LED number to be released or `LED_ALL` for all LEDs

Returns -1 on error, otherwise zero.

### 2.11.3 nb\_led\_set

```
int nb_led_set (int led, int mode)
```

The `nb_led_set` function will set the specified LED to a specific mode.

`led` the LED number to be released or `LED_ALL` for all LEDs  
`mode` the LED mode to be applied

Returns -1 on error, otherwise zero.

LED modes can be specified by OR'ing the following colors and types:

```
LED_OFF           turn off LED
LED_COLOR_GREEN   color is green
LED_COLOR_RED     color is red
LED_COLOR_YELLOW  color is yellow
LED_SOLID         type is solid
LED_BLINK_FAST    type is fast blinking
LED_BLINK_SLOW    type is slow blinking
```

## 2.12 Config/Software Update

The following functions can be used to trigger a configuration or software update of the system. An Uniform Resource Locator (URL) can have the following format:

```
http://<username>:<password>@<host>:<port>/<path>
https://<username>:<password>@<host>:<port>/<path>
ftp://<username>:<password>@<host>:<port>/<path>
sftp://<username>:<password>@<host>:<port>/<path>
tftp://<host>/<path>
file:///<path>
```

Please bear in mind that calling `nb_update_software` will result in a system reboot. The `nb_update_config` call will restart the SDK which will terminate your scripts. Thus, it is recommended to exit the script after calling this function and check the result later on via `nb_update_status`.

If a file URL is used, the path must correspond to an absolute path to the root directory. Using `/tmp` for update tasks is currently not possible.



### 2.12.1 nb\_update\_status

```
string nb_update_status (void)
```

The nb\_update\_status function returns the status of the last or currently running update operation

### 2.12.2 nb\_update\_config

```
int nb_update_config (string url)
```

The nb\_update\_config function will perform a configuration update from the specified URL.

url                    the URL of the config file

Returns zero on success.

Please note that any running SDK script will be terminated during the update process. Thus, the script must exit after nb\_update\_config() has been called.

### 2.12.3 nb\_update\_software

```
int nb_update_software (string url)
```

The nb\_update\_software function will perform a software update from the specified URL.

url                    the URL of the software image

Returns zero on success.

### 2.12.4 nb\_update\_sshkeys

```
int nb_update_sshkeys (string url)
```

The nb\_update\_sshkeys function will perform an update of the SSH authorized keys.

url                    the URL of the keys file

Returns zero on success.

## 2.13 Web Pages

The following functions can be used to implement your own pages within the Web Manager. Such a page will appear under the SDK menu as soon as it has been registered.

### 2.13.1 nb\_page\_register

```
int nb_page_register (int id, string title)
int nb_page_register (int id, string title, string submenu)
```

The nb\_page\_register function registers a new page with the specified identifier and title. If submenu is specified it will be hooked into the specified menu.

id	identifier
title	page title
submenu	submenu for page

Returns -1 on error, otherwise a page structure which can be used for other page functions.

### 2.13.2 nb\_page\_unregister

```
int nb_page_unregister (struct page)
```

The nb\_page\_unregister function can be used to unregister a page again.

page	page structure
------	----------------

Returns -1 on error, otherwise zero.

### 2.13.3 nb\_page\_request

```
struct nb_page_request (struct page)
```

The nb\_page\_request function listens for incoming requests.

page	page structure
------	----------------

Returns void on error, otherwise a request structure which holds possible GET and POST parameters.

### 2.13.4 nb\_page\_respond

```
int nb_page_respond (struct page, string fmt, ...)
```

The nb\_page\_respond function can be used to echo back a string to the request and can be called multiple times until nb\_page\_finish is called. It supports a format string and additional arguments that are formatted accordingly. Please refer to the printf function for more information about formatting options.

page	page structure
fmt	format string

Returns -1 on error and zero on success.

### 2.13.5 nb\_page\_finish

```
int nb_page_finish (struct page)
```

The nb\_page\_finish function can be used to finish a request. Any data will be passed to the client then.

page	page structure
------	----------------

Returns -1 on error and zero on success.

## 2.14 Voice

The voice control functions mentioned below can be used to control the behaviour of the voice gateway which is responsible for dispatching calls between Voice-Over-Mobile, SIP and Audio endpoints.

Calls are represented as structures which may look like:

```
struct(5): {
  .id = int: 12345
  .state = string[7]: "dialing"
  .calling = string[24]: "sip://user@192.168.1.254:5060"
  .called = string[22]: "vom://+123456789@Vom1"
};
```

The following states are possible:

routing	call is in routing state
dialing	call is in dialing state
alerting	call is in alerting state
active	call is active
hungup	call had hung up

In common, the functions can operate with either a call identifier or the call struct itself (e.g. if further parameters need to be provided).

Endpoints are represented as structures which may look like:

```
struct(3): {
  .id = int: 54321
  .desc = string[5]: "vom://Vom1"
```

```
.state = string[4]: "busy"
.volume = int: 7
};
```

Endpoints can be specified by ID or a descriptor which can be made up as follows:

Sip1	First SIP subscriber
Vom1	First Voice-Over-Mobile
Aud1	First Audio device

The following URLs are valid descriptors as well:

54321	endpoint ID
vom://++123	Voice-Over-Mobile number
vom://++123@Vom1	Voice-Over-Mobile number on Vom1
sip://user@192.168.1.254:5060	SIP address
sip://user	SIP user (must be subscribed)
aud://Aud1	Audio device
nil://Nil1	Null device

The following states are possible:

busy	endpoint is already holding a call
available	endpoint is ready to take a call

### 2.14.1 nb\_voice\_event

```
struct nb_voice_event (int timeout)
```

The nb\_voice\_event function listens for any new voice events.

timeout	timeout in seconds
---------	--------------------

Returns void on error, otherwise a structure holding the event type and the according call:

```
struct(2): {
.type = string[8]: "dispatched"
.call = struct(5): {
.id = int: 12345
.state = string[7]: "alerting"
.calling = string[24]: "sip://user@192.168.1.254:5060"
.called = string[22]: "vom://+123456789@Vom1"
}
};
```

The following event types are possible:

<code>incoming</code>	call is coming in from calling endpoint (ready to route)
<code>outgoing</code>	call is going out to calling endpoint (ready to route)
<code>dialing</code>	call is dialing the called endpoint
<code>dispatched</code>	call has been dispatched (alerting the called endpoint)
<code>connected</code>	call is connected to the called endpoint
<code>hungup</code>	call has hung up

### 2.14.2 `nb_voice_endpoint_list`

```
array nb_voice_endpoint_list (void)
```

The `nb_voice_endpoint_list` function lists all currently known endpoints. Returns void on error, otherwise an array holding the endpoint structures.

### 2.14.3 `nb_voice_endpoint_get`

```
struct nb_voice_endpoint_get (endpoint)
```

The `nb_voice_endpoint_get` function can be used to lookup or update a specific endpoint.

```
endpoint    endpoint struct, ID or descriptor
```

Returns void on error, otherwise the corresponding endpoint structure.

### 2.14.4 `nb_voice_call_list`

```
array nb_voice_call_list (void)
```

The `nb_voice_call_list` function lists all currently known calls. Returns void on error, otherwise an array holding the call structures.

### 2.14.5 `nb_voice_call_get`

```
struct nb_voice_call_get (call)
```

The `nb_voice_call_get` function can be used to lookup or update a specific call.

```
call    call struct or id
```

Returns void on error, otherwise the corresponding call structure.

### 2.14.6 nb\_voice\_call\_dial

```
int nb_voice_call_dial (call)
```

The nb\_voice\_call\_dial function can be used to dial a new call.

```
call    call struct
```

Returns -1 on error, otherwise the corresponding result.

### 2.14.7 nb\_voice\_call\_accept

```
int nb_voice_call_accept (call)
```

The nb\_voice\_call\_accept function can be used to accept calls in dispatch state.

```
call    call struct or id
```

Returns -1 on error, otherwise the result.

Remark: This function can be used to take a call for audio endpoints.

### 2.14.8 nb\_voice\_call\_route

```
int nb_voice_call_route (call, endpoint)
```

The nb\_voice\_call\_route function can be used to route incoming or outgoing calls to a dedicated endpoint.

```
call          call struct or id
endpoint      endpoint struct, ID or descriptor
```

Returns -1 on error, otherwise the result.

### 2.14.9 nb\_voice\_call\_hangup

```
int nb_voice_call_hangup (call)
```

The nb\_voice\_call\_hangup function can be used to hangup or drop a call.

```
call    call struct or id
```

Returns -1 on error, otherwise the result.

### 2.14.10 nb\_voice\_call\_volume

```
int nb_voice_call_volume (endpoint, int level)
```

The nb\_voice\_call\_volume function can be used to adjust the volume level of a call.

```
endpoint    endpoint struct, ID or descriptor
level      volume level (0 to 7)
```

Returns -1 on error, otherwise the result.

## 2.15 SNMP

The SNMP functions below offer facilities to

- expose certain OIDs to the SNMP agent
- extend the list of MIB entities
- run SET or GET commands
- issue SNMP traps

Only integer and octet string entities are currently supported.

### 2.15.1 nb\_snmp\_register

```
int nb_snmp_register (string name, int ext, string type, string mode)
```

The nb\_snmp\_register function will register a MIB entity.

```
name      name of entity
ext       the OID extension number of the entity
type      type of entity (i for integer, s for octet string)
mode      mode of entity
```

Returns -1 on error. Please note that only scalars are currently supported.

### 2.15.2 nb\_snmp\_link

```
int nb_snmp_link (void)
```

The nb\_snmp\_link function will link any registered MIB entities to the agent. The entities will be accessible from an SNMP client over .1.3.6.1.4.1.<vendor>.10.90 after this function has been called. The default values are 0 for integers and an empty string for octet strings.

Returns -1 on error.

### 2.15.3 nb\_snmp\_update

```
int nb_snmp_update (string name, string value)
```

The nb\_snmp\_update function will update the specified MIB entity to the given value.

name	name of entity
value	value to be set

Returns -1 on error.

### 2.15.4 nb\_snmp\_listen

```
int nb_snmp_listen (int timeout)
```

By using the nb\_snmp\_listen function it is possible to get notified as soon as an entity has been set by a client.

timeout	timeout to wait in seconds
---------	----------------------------

Returns a struct containing the name and value of the set entity. Otherwise, void will be returned

### 2.15.5 nb\_snmp\_unlink

```
int nb_snmp_unlink (void)
```

The nb\_snmp\_unlink function disconnects any MIB entities from the agent. Returns -1 on error.

### 2.15.6 nb\_snmp\_host

```
int nb_snmp_host (string host, int port, int version, string community)
int nb_snmp_host (string host, int port, int version, string user,
                 string password, string auth, string priv, string engine)
```

The nb\_snmp\_host function will set the SNMP host for running SET or GET requests. For an SNMPv1/v2 host the parameters are:



host	hostname or address
port	trap port
version	SNMP version (1 or 2)
community	community string

For an SNMPv3 host the parameters are:

host	hostname or address
port	port
version	SNMP version (3)
user	username
pass	password
auth	authentication protocol (MD5 or SHA)
priv	privacy protocol (DES or AES)
engine	engine ID

Returns -1 on error.

### 2.15.7 nb\_snmp\_get

```
void nb_snmp_get (string oid)
```

The nb\_snmp\_get function will perform a GET request for the specified OID. An SNMP host has to be set with nb\_snmp\_host prior to using that function.

oid	the queried OID
-----	-----------------

This function returns void in case an error occurred, an integer value if OID represent an integer or a string value if OID represents an octet string.

### 2.15.8 nb\_snmp\_set

```
int nb_snmp_set (string oid, string type, string value)
```

The nb\_snmp\_set function will perform a SET request for the specified OID. An SNMP host has to be set with nb\_snmp\_host prior to using that function.

oid	the OID to be set
type	the OID type ("i" for integer or "s" for octet string)
value	the value to be set

Returns -1 on error.

### 2.15.9 nb\_snmp\_traphost

```
int nb_snmp_trap (string host, int port, int version, string
community)
int nb_snmp_trap (string host, int port, int version, string user,
string password, string auth, string priv)
```

The nb\_snmp\_trap function will set the host for sending SNMP traps. The same parameters as for nb\_snmp\_host apply. Returns -1 on error.

### 2.15.10 nb\_snmp\_trap

```
string nb_snmp_trap (string oid, string type, string value)
```

The nb\_send\_trap function will send an SNMP trap with the specified OID to a remote traphost.

oid	SNMP object identifier of the trap
type	type of value to be sent ('e' for empty, 'i' for integer and 's' for octet string)
value	value to be sent

Please note that a traphost has to be set with nb\_snmp\_trap prior to using this function.

Returns -1 on error.

### 2.15.11 nb\_snmp\_inform

```
string nb_snmp_inform (string oid, string type, string value)
```

The nb\_send\_inform function will send an SNMPv3 inform with the specified OID to a remote traphost.

oid	SNMP object identifier of the trap
type	type of value to be sent ('e' for empty, 'i' for integer and 's' for octet string)
value	value to be sent

Please note that a traphost has to be set with nb\_snmp\_trap prior to using this function.

Returns -1 on error.

## 2.16 CAN

The following functions can be used to communicate with the CAN interface.

### 2.16.1 nb\_can\_setattr

```
int nb_can_setattr (string ifc, int bitrate, int listenonly, int restart)
```

The nb\_can\_setattr function can be used to set the attributes of a CAN interface.

ifc	name of interface (e.g. can0)
bitrate	bitrate (e.g. 500000)
listenonly	sets ctrlmode listenonly
restart	restart timeout in case of a bus-off (0 = disabled)

Returns -1 on error, otherwise zero.

### 2.16.2 nb\_can\_open

```
int nb_can_open (string ifc)
```

ifc	name of interface (e.g. can0)
-----	-------------------------------

The nb\_can\_open function enables the specified interface and returns a raw socket descriptor. Please note that the attributes (e.g. bitrate) have to be set in advance before opening any interface.

Returns -1 on error.

### 2.16.3 nb\_can\_close

```
int nb_can_close (int socket)
```

socket	socket descriptor
--------	-------------------

The nb\_can\_close function closes the specified socket descriptor and disables the associated interface. Returns -1 on error.

### 2.16.4 nb\_can\_setfilter

```
int nb_can_setfilter (int socket, int id, int mask)
```

The nb\_can\_setfilter function can be used to specify which CAN frames shall be filtered out and which shall be passed to the upper layers.

socket	socket descriptor
id	CAN filter ID
mask	CAN filter mask

Returns -1 on error.

A filter matches if  $\text{received-id} \& \text{mask} == \text{id} \& \text{mask}$ . The filter can also be inverted (CAN\_INV\_FILTER bit set in id) or it can filter for error frames (CAN\_ERR\_FLAG bit set in mask).

### 2.16.5 nb\_can\_sendonly

```
int nb_can_sendonly (int socket)
```

The nb\_can\_sendonly function can be used to disable the reception of CAN frames on the selected socket.

socket	socket descriptor
--------	-------------------

Returns -1 on error.

### 2.16.6 nb\_can\_recvmsg

```
struct nb_can_recvmsg (int socket, int timeout)
```

socket	socket descriptor
timeout	timeout to wait for a message (0 means infinite)

The nb\_can\_recvmsg function can be used to receive a raw message from the CAN bus. Returns void on error, otherwise it returns a msg struct containing the fields:

id	32 bit CAN ID + EFF/RTR/ERR flags
data	received data (max. 8 bytes)

The ID can be examined using the following bit operators:

CAN_EFF_FLAG	EFF/SFF is set in the MSB
CAN_RTR_FLAG	remote transmission request
CAN_ERR_FLAG	error frame
CAN_SFF_MASK	standard frame format (SFF)
CAN_EFF_MASK	extended frame format (EFF)
CAN_ERR_MASK	omit EFF, RTR, ERR flags

### 2.16.7 nb\_can\_sendmsg

```
int nb_can_sendmsg (int socket, struct msg)
```

socket	socket descriptor
msg	message struct (id + data)

The nb\_can\_sendmsg function can be used to send a raw message to the CAN bus.

Returns -1 on error, otherwise zero.

## 2.17 Network

### 2.17.1 nb\_gethostbyname

```
array nb_gethostbyname (string host)
```

The nb\_gethostbyname function performs a DNS lookup for the given hostname and returns an array of resolved IP addresses.

host            the to be resolved host

Returns an empty array if host could not be resolved. Please note that a valid DNS server must be available when using this function.

### 2.17.2 nb\_ifc\_address

```
string nb_ifc_address (string interface)
```

The nb\_ifc\_address function can be used to obtain the first address of an interface.

interface        internal interface name (e.g. lan0)

Returns the interface address or an empty string on error.

### 2.17.3 nb\_ping

```
int nb_ping (string host)
int nb_ping (string host, int timeout)
```

The nb\_ping function will send ICMP ping packets to the specified host and returns whether the host correctly responded or not.

host            the host to ping  
timeout         timeout waiting for a reply (in milliseconds)

Returns 1 in case the host is alive, 0 if down and -1 on error.

### 2.17.4 nb\_arp\_ping

```
int nb_arp_ping (string host)
```

The `nb_arp_ping` function will send an ARP request for the specified host and returns whether the host address has been successfully resolved.

`host`            the host address to ping

Returns 1 in case the specified host could be resolved, 0 if not and -1 on error.

### 2.17.5 nb\_arp\_gratuitous

```
int nb_arp_gratuitous (string ifc)
int nb_arp_gratuitous (string ifc, string host)
```

The `nb_arp_gratuitous` function will send an gratuitous ARP advert for the address of the specified interface (or the host address provided). This can be used to update the ARP tables of your neighbors.

`ifc`            the interface on which the packet should be sent  
`host`           the host address to advert

Returns 1 in case the packet has been sent or -1 on error.

### 2.17.6 nb\_etherwake

```
int nb_etherwake (string hwaddr, string ifc)
```

The `nb_etherwake` function will send a WakeOnLan magic packet to wake up sleeping hosts.

`hwaddr`        the Ethernet MAC address of the host  
`ifc`            the interface on which the packet is sent

Returns 0 in case the packet has been successfully sent or -1 on error.

## 2.18 OPC-UA

The OPC-UA functions below offer facilities to

- connect to an OPC-UA server
- browse the node store
- search for nodes
- read/write values from/to nodes

Please note that only integer, string, double and boolean values are currently supported.

A node struct is usually represented as struct with the following fields:

`namespace-index` the namespace index `node-id` the node identifier `browse-name` the name shown when browsing `display-name` the display name

### 2.18.1 nb\_opcua\_connect

```
int nb_opcua_connect (string url)
```

The nb\_opcua\_connect function will connect to an OPC-UA server.

url	the server URL ("opc.tcp:// . . . : . . . ")
-----	--

Returns a client session descriptor or -1 on error.

### 2.18.2 nb\_opcua\_browse

```
int nb_opcua_browse (int client, int nindex, value nid, int depth)
```

The nb\_opcua\_browse function will browse recursively the children of the specified node.

client	the descriptor of the client session
nindex	the namespace index of the node
nid	the node identifier from where browsing starts
depth	specifies how deep the node tree will be descended

Returns an array of node structs or void on error.

### 2.18.3 nb\_opcua\_search

```
int nb_opcua_search (int client, value pattern)
```

The nb\_opcua\_search function will search in the entire namespace at the server for nodes matching the given pattern.

client	the descriptor of the client session
pattern	the pattern to search for

Returns an array of node structs with found nodes or void on error.

### 2.18.4 nb\_opcua\_read

```
value nb_opcua_read (int client, int nindex, int nid)
```

The nb\_opcua\_read function will read the value of the given node.

client	the descriptor of the client session
nindex	the namespace index of the node
nid	the node identifier

Returns the value of the given node or void on error.

### 2.18.5 nb\_opcua\_write

```
int nb_opcua_write (int client, int nindex, int nid, value val)
```

The nb\_opcua\_write function will change the value of the given node.

client	the descriptor of the client session
nindex	the namespace index of the node
nid	the node identifier
val	the new value for the node

Returns zero or -1 on error.

### 2.18.6 nb\_opcua\_disconnect

```
int nb_opcua_disconnect (int client)
```

The nb\_opcua\_disconnect function will disconnect the client from the server

client	the descriptor of the client session
--------	--------------------------------------

Returns -1 on error.

## 2.19 Other

### 2.19.1 nb\_syslog

```
int nb_syslog (string fmt, ...)
```

The nb\_syslog function creates a message in the system log. Please refer to sprintf for more information about the format string and additional arguments.

msg	message to be written to syslog
-----	---------------------------------

Returns -1 on error.

### 2.19.2 nb\_event\_get

```
string nb_event_get (int timeout)
```

The nb\_event\_get function will poll for system events.



timeout      max. number of seconds to wait for an event

Returns the received event as string or an empty string in case the specified timeout has been reached.

### 2.19.3 nb\_event\_msg

```
struct nb_event_msg (int timeout)
```

The nb\_event\_msg function will poll for system events.

timeout      max. number of seconds to wait for an event

Returns void in case the specified timeout has been reached or a struct with the event string and optional parameters:

```
struct(2): {  
  .event = string: "call-incoming"  
  .param = string[10]: "+123456789"  
};
```

### 2.19.4 nb\_reboot

```
void nb_reboot (int delay)
```

The nb\_reboot function will trigger a system reboot.

delay      the delay in seconds

### 2.19.5 nb\_restart

```
int nb_restart (string service)
```

The nb\_restart function will restart the specified service.

service      the service to be restarted

Returns -1 on error, otherwise zero.

### 2.19.6 nb\_reset\_factory

```
int nb_reset_factory ()
```

The nb\_reset\_factory function will reset the box to factory defaults. Returns -1 on error, otherwise zero. Please note that the system will reboot after this function has

been called.

### 2.19.7 nb\_reset\_statistics

```
int nb_reset_statistics (string wanlink)
```

The nb\_reset\_statistics function will reset all statistics (e.g. link data counters).

wanlink      the WAN link to reset (e.g. wanlink0)

All interfaces will be reset if an empty wanlink (or "all" keyword) is used. Returns -1 on error, otherwise zero.