sngrep

Что такое sngrep?

sngrep - это терминальный инструмент, который группирует сообщения SIP (Session Initiation Protocol) по Call-Id и отображает их в виде потоков стрелок, аналогичных тем, что используются в RFC SIP.

Цель этого инструмента - облегчить процесс изучения или отладки SIP.

Функции:

- Захват SIP-пакетов с устройств или чтение из PCAP-файла.
- Поддержка UDP, TCP и TLS (частично).
- Позволяет фильтровать с помощью BPF (Berkeley Packet Filter)
- Сохранение захваченных пакетов в PCAP файл

Установка

Сборка из исходников

Скачайте последний релиз (или клонируйте GIT-репозиторий)

На большинстве систем команды для сборки будут стандартными для atotools:

```
./bootstrap.sh
./configure
make
make install (as root)
```

Процесс configure проверит наличие необходимых зависимостей:

- libncurses5 - для пользовательского интерфейса, окон, панелей.
- libpcap - для захвата пакетов с устройств и чтения их из PCAP файлов.
- libssl - (опционально) для транспорта TLS
- libncursesw5 - (необязательно) для пользовательского интерфейса, окон, панелей (поддержка широких символов).

Вы можете передать следующие флаги в ./configure для включения некоторых функций

флаг конфигурации	Функция
`--with-openssl`	Добавляет поддержку OpenSSL для разбора перехваченных сообщений TLS (требуется libssl).
`--with-gnutls`	Добавляет поддержку GnuTLS для разбора перехваченных сообщений TLS (требуется gnutls).
`--with-pcre`	Добавляет поддержку Perl-совместимых регулярных выражений в полях regexp
`--enable-unicode`	Добавляет поддержку Ncurses UTF-8/Unicode (требуется libncursesw5)
`--enable-ipv6`	Включает поддержку захвата пакетов IPv6.
`--enable-eep`	Включает поддержку отправки/получения пакетов EEP.

Вы можете найти [подробные инструкции для некоторых дистрибутивов].

Бинарные файлы

Пользователи OSX могут установить sngrep с помощью homebrew.

```
brew install sngrep
```

Установка двоичных пакетов

Debian / Ubuntu

If you're using a recent version of Debian/Ubuntu, you can find sngrep in the official Debian/Ubuntu repositories. (thanks to @linuxmaniac)

Otheriwse, you can use Irontec repositories for some of Debian and Ubuntu releases.

Binaries are built only for amd64 and i386 architectures right now with all supported features enabled.

Debian

Add Irontec repositories entry in your */etc/apt/sources.list*

Use your distrubution source line (**only one of these**)

```
deb http://packages.irontec.com/debian squeeze main
deb http://packages.irontec.com/debian wheezy main
deb http://packages.irontec.com/debian jessie main
deb http://packages.irontec.com/debian stretch main
```

```
deb http://packages.irontec.com/debian buster main
deb http://packages.irontec.com/debian bullseye main
```

Ubuntu

Add Irontec repositories entry in your */etc/apt/sources.list*

Use your distrubution source line (**only one of these**)

```
deb http://packages.irontec.com/ubuntu trusty main
deb http://packages.irontec.com/ubuntu precise main
deb http://packages.irontec.com/ubuntu vivid main
deb http://packages.irontec.com/ubuntu xenial main
deb http://packages.irontec.com/ubuntu bionic main
deb http://packages.irontec.com/ubuntu focal main
deb http://packages.irontec.com/ubuntu jammy main
```

Install Repository key

```
wget http://packages.irontec.com/public.key -q -O - | apt-key add -
```

Install the package

```
apt-get update
apt-get install sngrep
```

Fedora / CentOS / RHEL Linux

sngrep is available from the [community build server]

Enable the repository

```
dnf copr enable irontec/sngrep
```

or

```
yum copr enable irontec/sngrep
```

Install sngrep package

```
dnf install sngrep
```

or

```
yum install sngrep
```

Alpine Linux

sngrep is available in community repositories starting from Alpine v3.3 (Thx Francesco Colista!)

Decomment community repository from /etc/apk/repositories (if commented)

Update your package list

```
apk update
```

Install sngrep

```
apk add sngrep
```

Gentoo

You can find an unofficial ebuilds for sngrep at Gentoo Bugtracker System (Thanks to spacedream)

Feel free to vote if you would like to see sngrep be part of Gentoo portage tree.

Arch

You can find an unofficial PKGBUILD for Arch at ArchLinux User Repositories (thanks to w1ngnutt)

Feel free to vote if you would like to see sngrep at official Arch repositories.

OSX

OSX users can install sngrep using homebrew

```
brew install sngrep
```

OpenWRT/LEDE

You can use official repositories for installing sngrep using:

```
opkg install sngrep
```

Как использовать

Аргументы командной строки

Есть несколько аргументов, которые можно использовать из командной строки, чтобы изменить поведение sngrep по умолчанию

```
sngrep [-hVcivNqrD] [-IO pcap_dump] [-d dev] [-l limit] [-k keyfile] [-LH capture_url] [<match expression>] [<bpf filter>]
```

- `-h --help`: Данное использование
- `-V --version`: Информация о версии
- `-d --device`: Использовать это устройство захвата вместо устройства по умолчанию

- `-I --input`: Считывание захваченных данных из pcap-файла
- `-O --output`: Запись захваченных данных в файл pcap
- `-c --calls`: Отображать только диалоги, начинающиеся с INVITE
- `-r --rtp`: Захват полезной нагрузки RTP-пакетов
- `-l --limit`: Установите ограничение захвата до N диалогов
- `-i --icase`: Сделать <выражение> нечувствительным к регистру
- `-v --invert`: Инвертировать <выражение>
- `-N --no-interface`: Не отображать интерфейс sngrep, только захват
- `-q --quiet`: Не выводить диалоги захвата в режиме отсутствия интерфейса
- `-D --dump-config`: Печать активных настроек конфигурации и выход
- `-f --config`: Чтение конфигурации из файла
- `-R --rotate`: Ротация вызовов при достижении предела захвата.
- `-H --eep-send`: URL захвата Homer (udp:X.X.X.X:XXXX)
- `-L --eep-listen`: Прослушивание инкапсулированных пакетов (udp:X.X.X.X:XXXX)
- `-k --keyfile`: Файл закрытого ключа RSA для расшифровки перехваченных пакетов

Например, перехват всех SIP-пакетов со всех устройств, имеющих порт источника или назначения 5060.

```
sngrep port 5060
```

Или отображение SIP-пакетов с устройства eth0, имеющего в качестве источника или назначения 192.168.0.50 через порт 5061, сохранение их в /tmp/sip_capture.pcap

```
sngrep -d eth0 -O /tmp/sip_capture.pcap host 192.168.0.50 port 5061
```

Or displaying all SIP packets for a given host in sip_capture.pcap PCAP file

```
sngrep -I /tmp/sip_capture.pcap host 10.10.1.50
```

Linux users may add capture permissions to sngrep to avoid run it as root

```
setcap 'CAP_NET_RAW+eip' /usr/local/bin/sngrep

if the above does not work, try this:

setcap 'CAP_NET_RAW+eip' /usr/bin/sngrep
```

Интерфейс

Имеется несколько окон для предоставления различной информации:

- [[Call List Window|CallList]]: Allows to select the calls to be displayed

- [[Call Flow Window|CallFlow]]: Shows a diagram of source and destiny of messages
- [[Call Raw Window|CallRaw]]: Display SIP messages texts (useful for copy messages to clipboard)
- [[Message Diff Window|MessageDiff]]: Displays diferences between two SIP messages

[[Here|Screenshots]] are see some screens of sngrep windows.

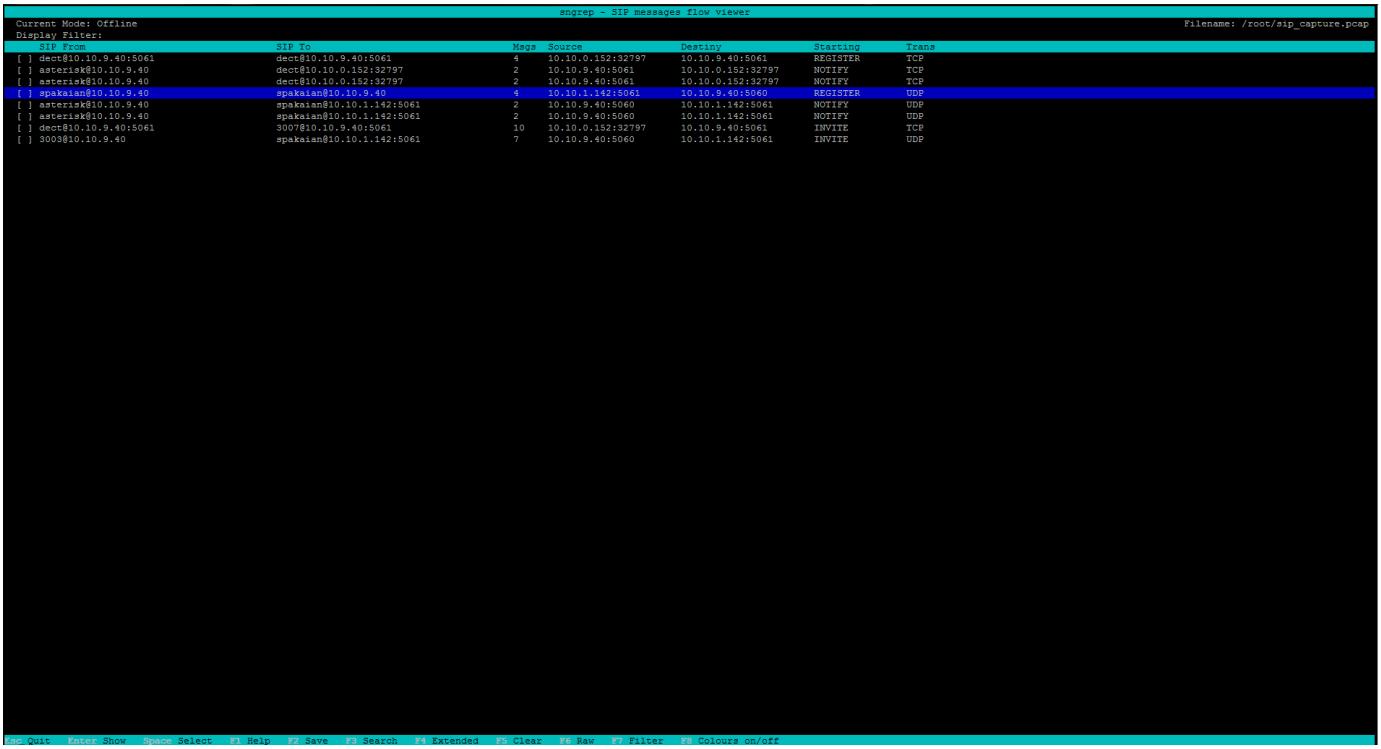
Общие сочетания клавиш

Most of the program windows have a help dialog with a brief description and useful keybindings. There are some keybindings that can be use anywhere in the program:

- **F1 or h**: Show current window help and keybindings.
- **ESC or q**: Go back to the previous window
- **F8 or C**: Toggle Message syntax highlight

Call List window

The first window that sngrep shows is Call List window and display the different SIP Call-Ids found in messages. The displayed columns depends on your terminal width and your custom configuration.



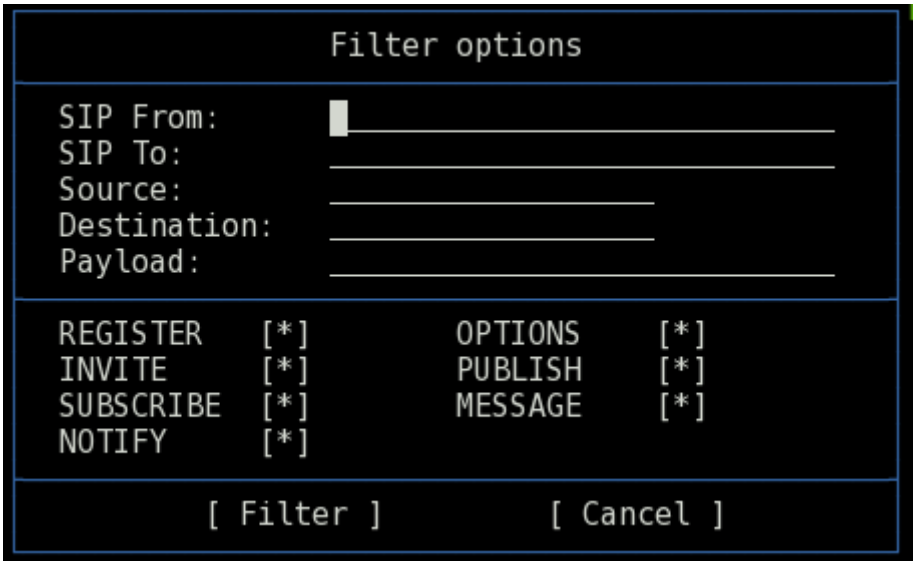
You can move between dialogs with *arrow keys* and selected them using *Spacebar*. Selecting multiple dialogs will display all them in Call flow window and Call Raw window, and will allow to save only the selected message dialogs to a PCAP file.

Keybindings:

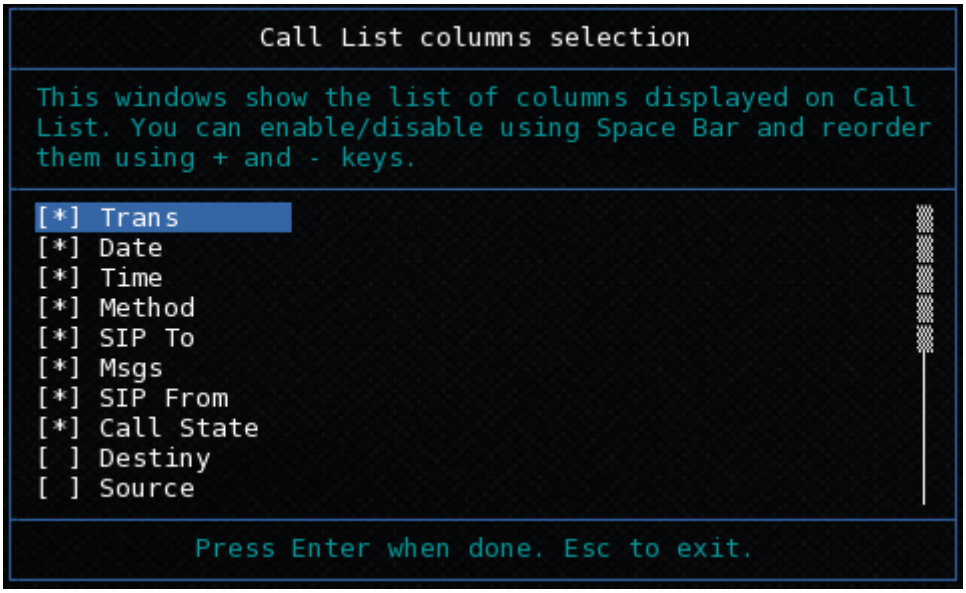
- **Arrow keys**: Move through the list
- **Enter**: Display current or selected dialog(s) message flow
- **A**: Auto scroll to new calls

- **F2 or s**: Save selected/all dialog(s) to a PCAP file
- **F3 or / or TAB**: Enter a display filter. This filter will be applied to the text lines in the list
- **F4 or x**: Display current selected dialog and its related one.
- **F5**: Clear call list
- **F6 or r**: Display selected dialog(s) messages in raw text
- **F7 or f**: Show advanced filters dialogs
- **F9 or l**: Turn on/off address resolution if enabled
- **F10 or t**: Select displayed columns
- **< or >**: Choose sort direction and which column to use for sorting
- **Z**: Swap sort direction
- **p**: Pause

You can do a simple matching filter pressing TAB or / . If you need more specific filter options, use the filtering screen:

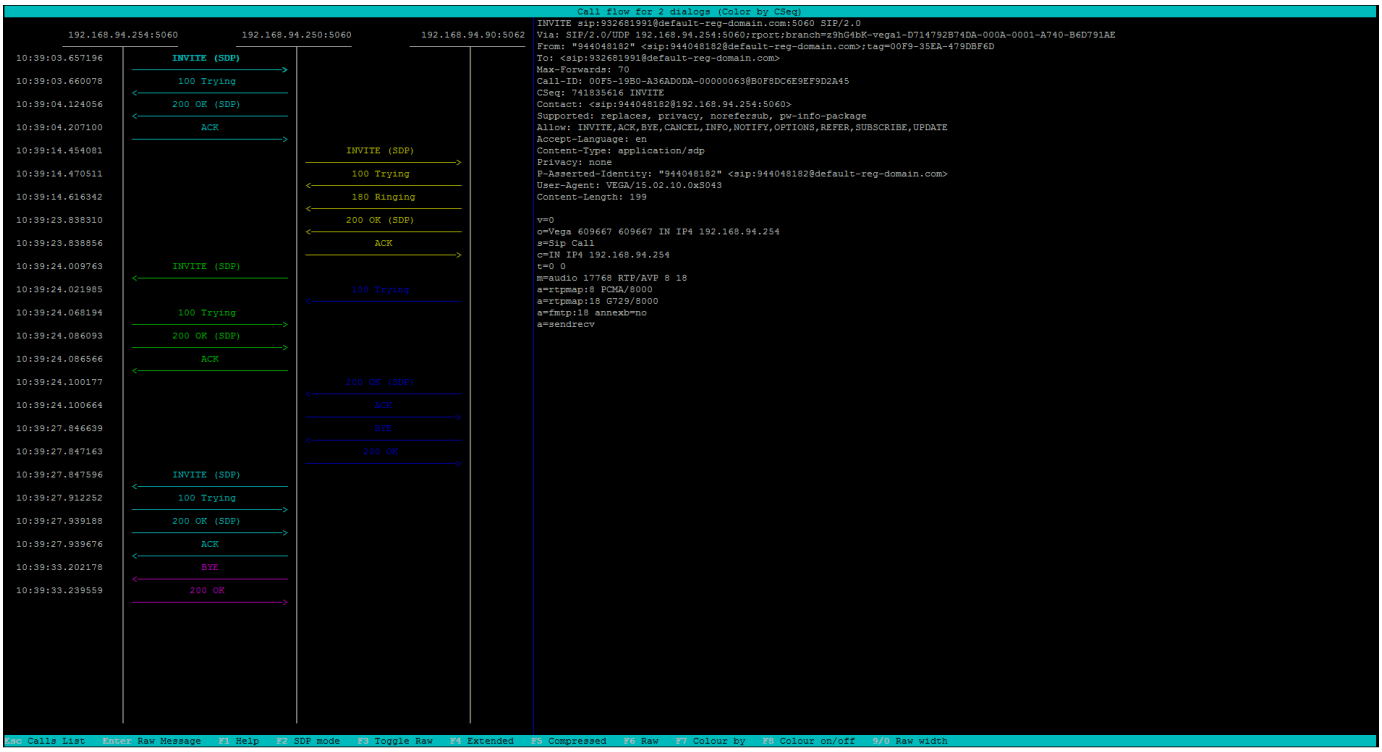


You can also change the displayed columns, setting them on configuration file, or during execution using the column selector:



Call Flow window

This window displays a flow diagram of the selected dialogs' messages.



The selected message payload will be displayed in the right side of the window.

You can move between messages using *arrow keys* and select them using *Spacebar*. Selecting multiple messages will display the Message Diff Window.

Keybindings:

- **Arrow keys**: Move through messages
- **Enter**: Display current message raw (so you can copy payload)
- **F2 or d**: Toggle SDP info instead of Method/ResponseCode in arrows

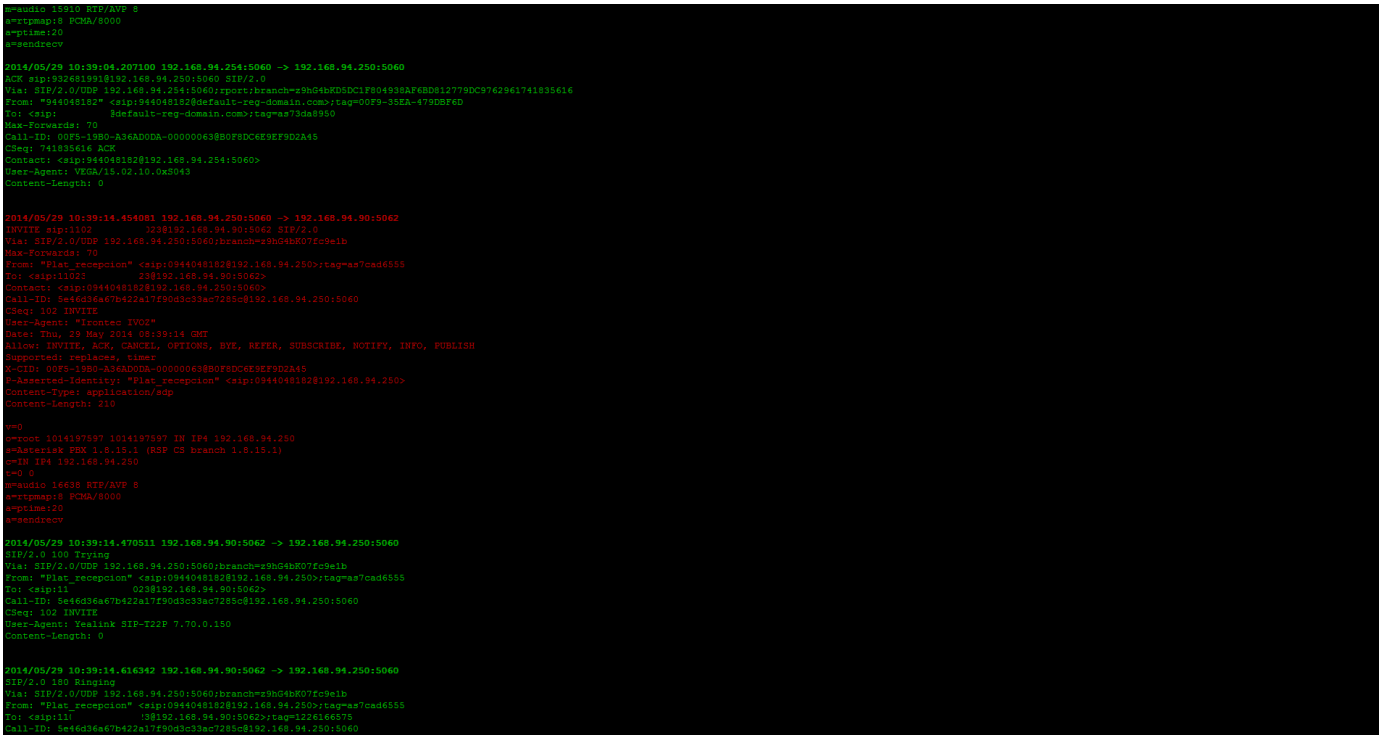
- **F3 or t**: Toggle message preview side panel
- **F4 or x**: Show current dialog and its extended one
- **F5 or s**: Show one column per address
- **F6 or R**: Show raw messages of dialogs
- **F7 or c**: Change flow colormode
- **F9 or l**: Turn on/off address resolution if enabled
- **9 and 0**: Increase/Decrease preview side panel
- **T**: Restore preview side panel size
- **D**: Only show messages that has SDP content

There are several color modes to display the arrows:

- **By Method/Response**: Red for Method, Green for Responses
- **By Call-Id**: Each Call-Id one color, useful when displaying multiple calls flows
- **By CSeq**: Each CSeq one color

Call Raw window

This window will display the selected dialog messages in plain text. It was designed to allow copying the messages payload easily.



(http://irontec.github.io/sngrep/images/call_raw.png)

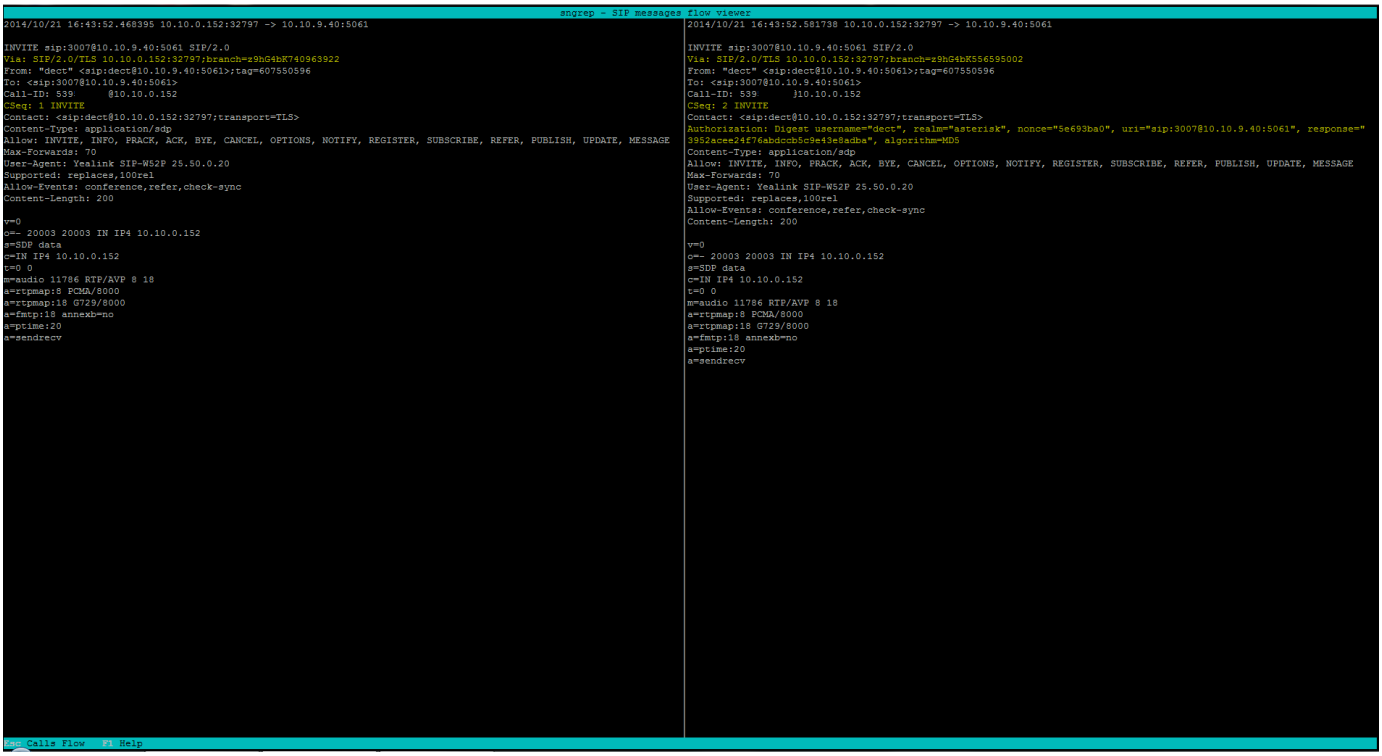
Keybindings:

- **Arrow keys**: Move through the window
- **s**: Save displayed text to file

Message diff window

This window will compare two messages. Right now the comparison is done searching each line in the other message, highlighting those not found exactly.

You can reach this window by selecting two messages using *Spacebar* in [[Call Flow window|CallFlow]]



Configuration

sngrep configuration is done using sngreprc file. This file contains one line directives that can change default sngrep behaviour. Configuration files are readed in this order

- System-wide configuration: Usually `/etc/sngreprc` or `/usr/local/etc/sngreprc`
- User configuration: `$HOME/.sngreprc`

Comments

For any of this configuration files, empty lines or lines starting with # will be totally ignored.
Inline comments (at the end of a configuration setting) are not supported.

Options

Options are configured using `set` directive to modify its default value. This are the available options configurable via `set` directive:

Format: `set <option> <value>`

option	format	default	description
background	black | transparent	black	Changes background printing.

option	format	default	description
syntax	on | off	on	Enable/Disable SIP Payload syntax highlighting.
syntax.tag	on | off	off	Enable/Disable tag syntax highlighting.
syntax.branch	on | off	off	Enable/Disable branch syntax highlighting.
hintkeyalt	on | off	off	Display alternative keybinding hint in bottom bar.
capture.limit	int > 0	20000	Set max number of captured dialogs (-l argument).
capture.lookup	on | off	off	Enable/Disable DNS resolution of captured packets IP addresses.
capture.device	any | <interface>	any	Set default capture interface (-d argument).
capture.outfile	<filename>		Set default capture dump file (-O argument).
capture.keyfile	<filename>		Default capture keyfile for TLS transport (-k argument).
capture.rtp	on| off	off	Store captured RTP packets allowing to save them later. (-r argument).
capture.eep	on| off	off	Enable/Disable capture of HEP/EEP traffic.
sip.ignoreicomplete	on | off	on	Ingore dialogs not starting with some Request Methods.
sip.calls	on | off	off	Ingore dialogs not starting with INVITE Method.
sngrep.savepath	<path>	$HOME	Default path in save dialog.
sngrep.displayhost	on | off	off	Show resolved hostnames instead of IPs (requires capture.lookup).
cl.noexitprompt	on | off	off	Disable exit confirmation prompt.
cl.scrollstep	int	10	Change default scrolling steps in Call List.
cl.colorattr	on | off	on	Display color in attributes in Call List.
cl.autoscroll	on | off	on	Scroll Call List automatically when new rows appear.
cl.sortfield	fieldname	index	Call List sort field (see below a list of field names).
cl.sortorder	asc | desc	asc	Call List sort order.
cf.forceraw	on | off	on	Display Payload preview in Call Flow.
cf.rawminwidth	int	40	Minimun number of columns Payload preview will use.
cf.splitcallid	on | off	off	One Column = One address in Call Flow.

option	format	default	description
cf.highlight	bold | reverse	bold	Change current message arrow highlight mode.
cf.scrollstep	int	4	Change default scrolling steps in Call List.
cr.scrollstep	int	10	Change default scrolling steps in Call Raw.
cr.nonascii	string	.	Character to print non-ascii characters in SIP payload.
cl.autoscroll	on | off	off	Enable/disable autoscroll.
filter.methods	all methods	method(s)	Default value for checkboxs in filter screen.
filter.payload	string		Default value for payload display filter.
aliasport	on | off	off	Take port into account when using aliases.
displayalias	on | off	off	Enable/Disable use of aliases.

Alias

Alias can be handy to replace addresses with a label in flow columns. This was designed to improve the understanding of the message source and destination in flows. You can toggle between addresses and alias with *togglealias* (defaults to `a`, see keybindings below)

Format: `alias <address> <text>`

Also, addresses with the same alias will be displayed in one column in Call flow *compress* mode (default `s`, see keybindings below)

If `aliasport` setting set to `on` then format may be the following:
`alias <address>:<port> <text>`

Call List Columns

Column configuration is also done using `set` directive. You can easily configure your columns during runtime and save displayed layout or configure them manually.

`set cl.column<index> <attribute>` (For example: `set cl.column7 time`)

You can also change default display width using:

`set cl.column<index>.width <value>` (For example: `set cl.column3.width 100`)

Here's a list of Call attributes:

name	width	description
index	4	Dialog capture index for unique identification of dialog.

name	width	description
sipfrom	30	From header sip uri.
sipfromuser	20	Username in From header.
sipto	30	To header sip uri.
siptouser	20	Username in To header.
src	22	Source IP:Port of packet.
srchost	16	Source IP of packet.
dst	22	Destination IP:Port of packet.
dsthost	16	Destination IP of packet.
callid	50	Call-id SIP header value.
xcallid	50	X-Call-id SIP header value.
date	10	Date in YYYY/MM/DD format.
time	8	Time in HH:MM:SS format.
method	15	Request Method or Response code of SIP message.
transport	3	SIP transport (UDP|TCP|TLS|..)
msgcnt	5	Number of messages in the dialog.
state	19	Call State (if dialog is a call)
convdur	7	Conversation duration (since first 200 OK to BYE)
totaldur	8	Total call duration (since INVITE to last message)
reason	25	SIP Reason header text
warning	4	SIP Warning header code

Keybindings

All sngrep keybindings can be configured using `bind` and `unbind` directives. Each screens handles a couple of actions, which can have multiple key binded. You can remove default keybindings and remap the same key to other actions.

`bind <action> <keycode>`

`unbind <action> <keycode>`

Keycode can be:

- A lowercase letter
- An Uppercase letter
- A letter with `^` or `Ctrl-` preffix

- One special keycode: `Space`, `Esc`, `Enter`

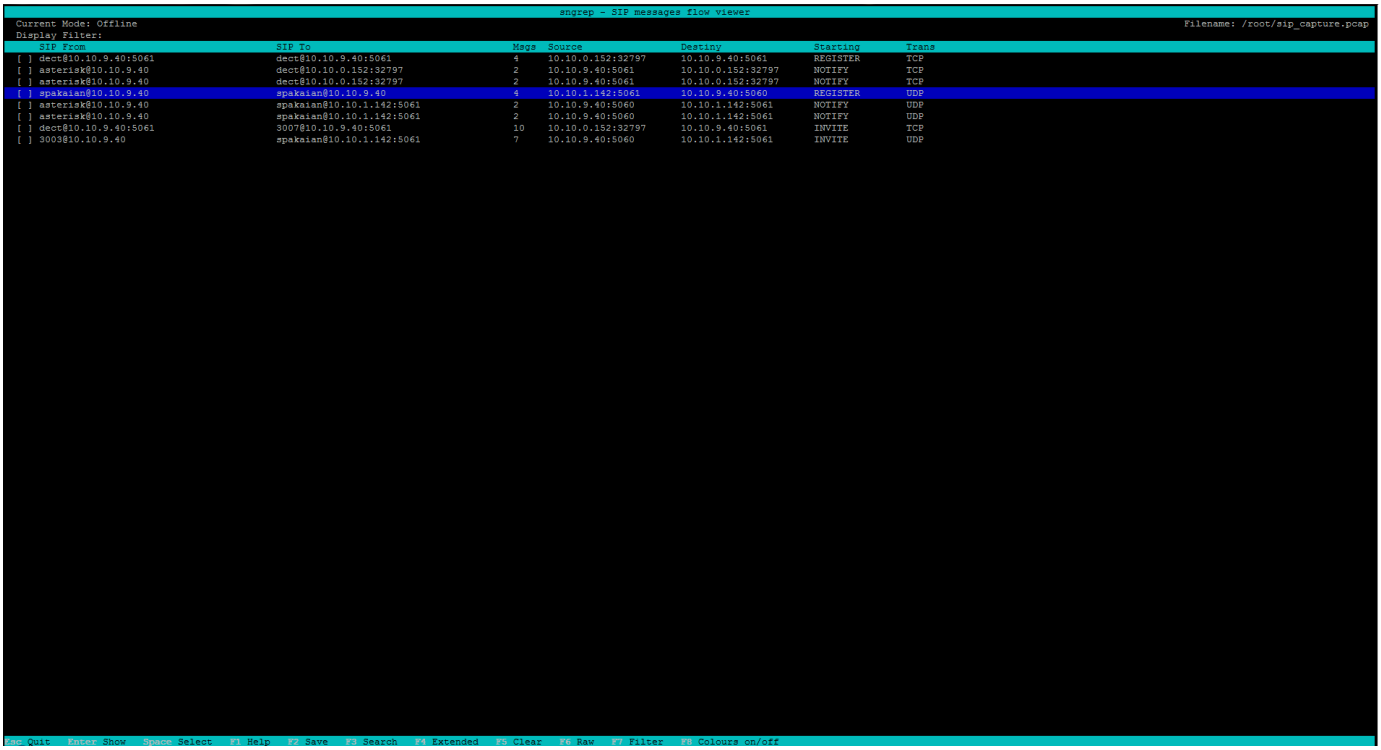
Действие может быть одним из следующих:

Действие	привязка по умолчанию	описание
up	Up,j	Прокрутить вверх
down	Down,k	Прокрутить вниз
left	Left	Переместиться влево
right	Right	Переместиться вправо
delete	Delete	Удалить один символ
backspace	BackSpace	Удалить один символ
npage	NextPage,Ctrl-F	Следующая страница
ppage	PrevPage,Ctrl-B	Предыдущая страница
hnpage	Ctrl-D	Half next page
hppage	Ctrl-U	Half previous page
begin	Home,Ctrl-A	Переместиться в начало поля
end	End,Ctrl-E	Переместиться в конец поля
pfield	Tab	Move to previous field
nfield	Tab	Move to next field
clear	Ctrl-U	Clear current field
clearcalls	F5	Clear call list
togglesyntax	F8,C	Toggle Payload syntax
colormode	F7,c	Change arrows color mode
togglehostname	F9	Toggle displaying hostnames
togglealias	a	Toggle displaying addresses alias (see `address` directive)
pause	p	Pause online capture
prevscreen	Esc,q,Q	Go to previous screen
help	F1,h,H,?	Show help popup for current screen
raw	F6,r,R	Show call raw screen
flow	Enter	Show call flow screen
flowex	F4,x,X	Show call flow extended screen
filters	F7,f,F	Show filters popup
columns	F10,t,T	Show columns popup

Действие	привязка по умолчанию	описание
columnup	-	Move column up in the column list
columndown	+	Move column down in the column list
search	F3,/,Tab	Focus Display filter box
save	F2,s,S	Show save dialog
select	Space	Select current dialog/message
rtp	f	Show current rtp packet flow
rawpreview	F3,t	Toggle payload preview in call flow
morerawpreview	9	Increase payload preview size
lessrawpreview	0	Decrease payload preview size
resetrawpreview	T	Reset payload preview size
onlysdp	D	Only show messages with sdp content
sdpinfo	F2,d	Show First SDP address in message arrows
compress	F5,s	Compress view to only display one column per IP address
hintalt	K	Show alternative keybind in bottom bar

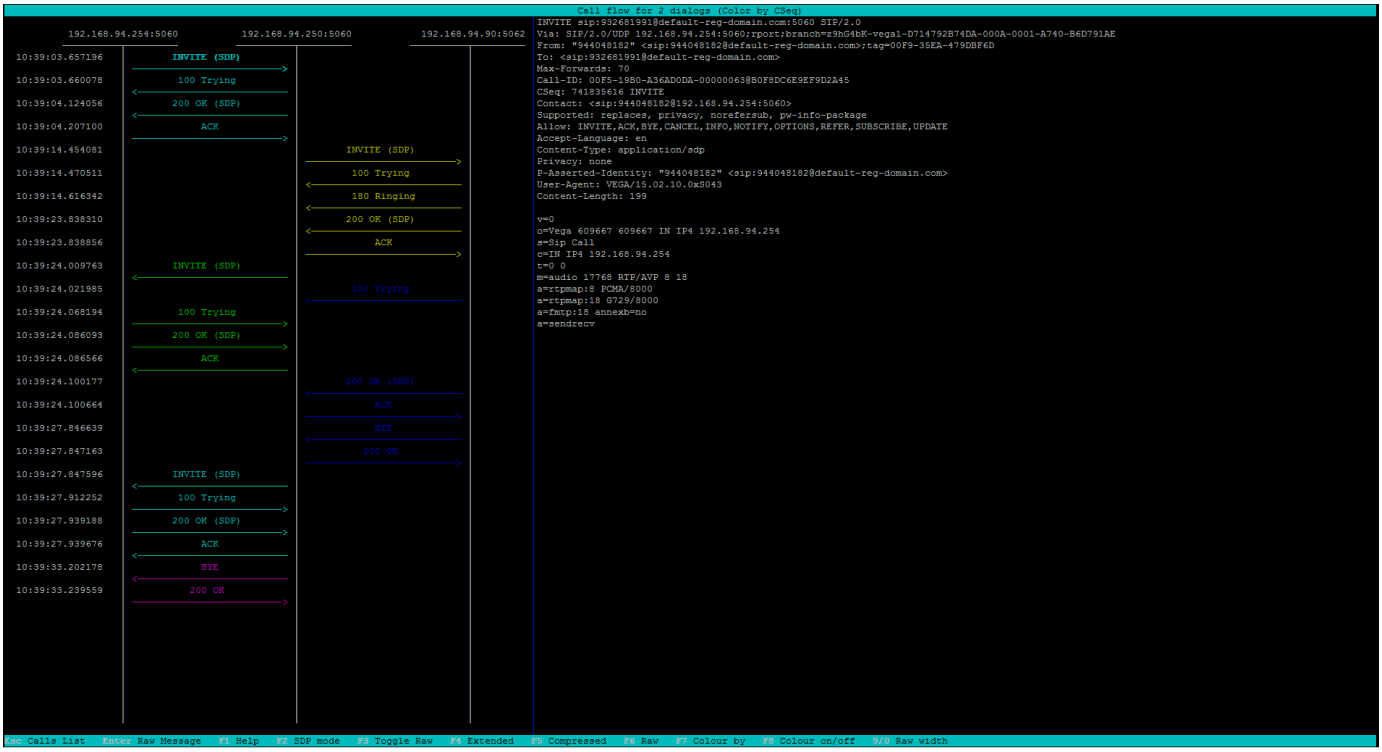
Скриншоты

Call List Window

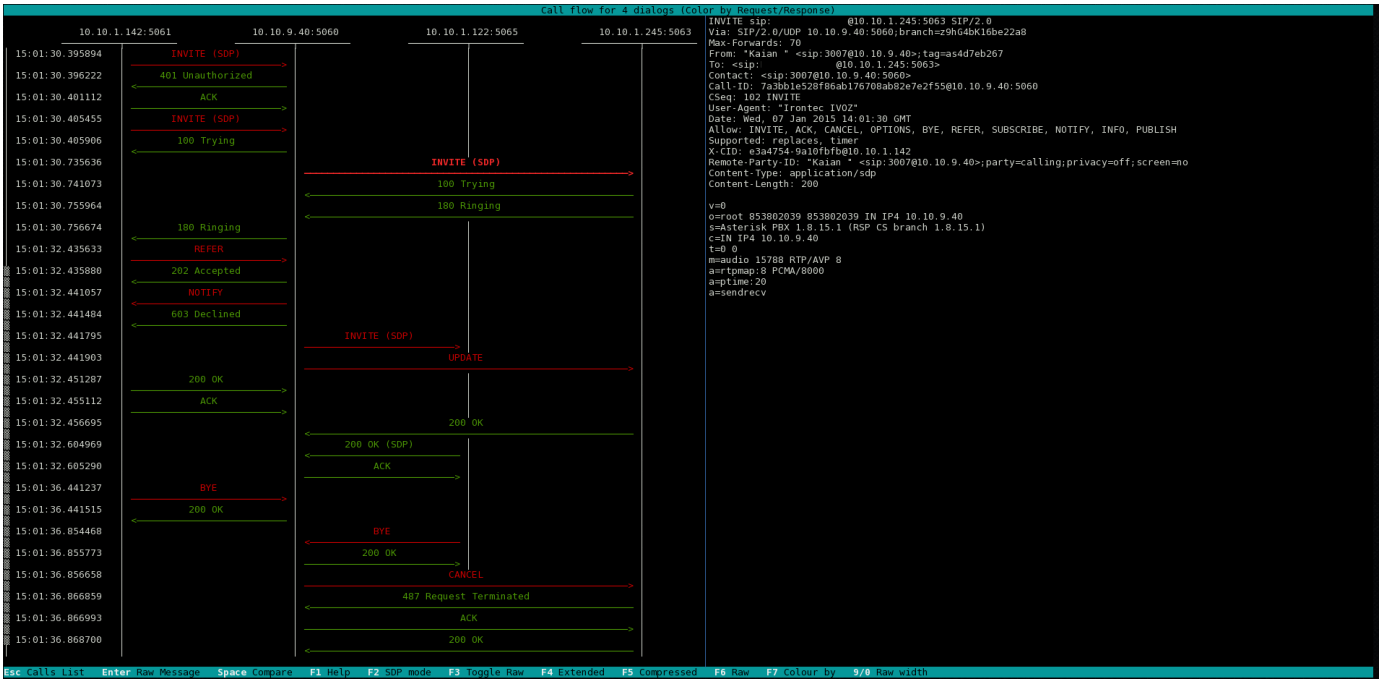


Call Flow Window

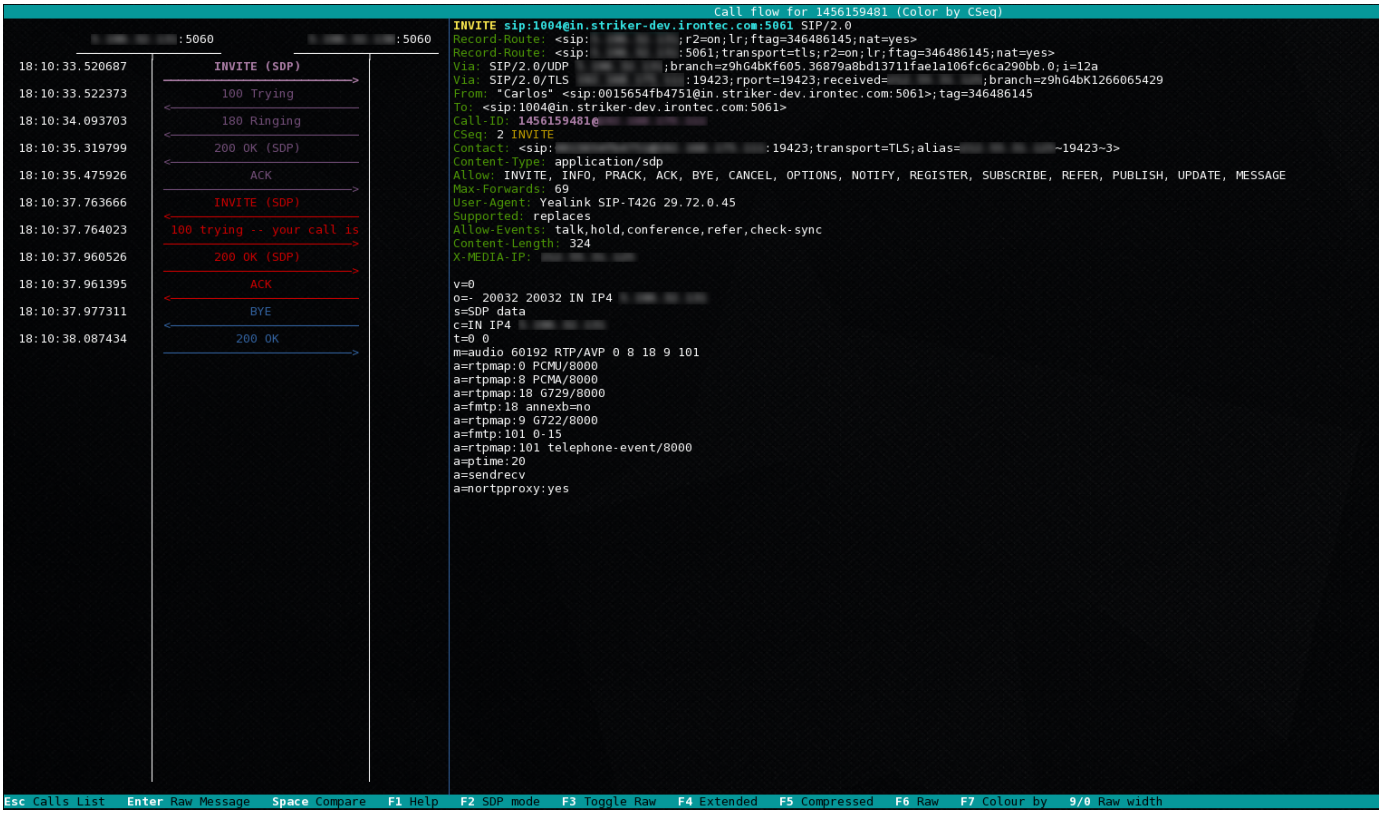
Simple call flow coloring messages by CSeq



Combined view of multiple call flows coloring messages by Request/Response

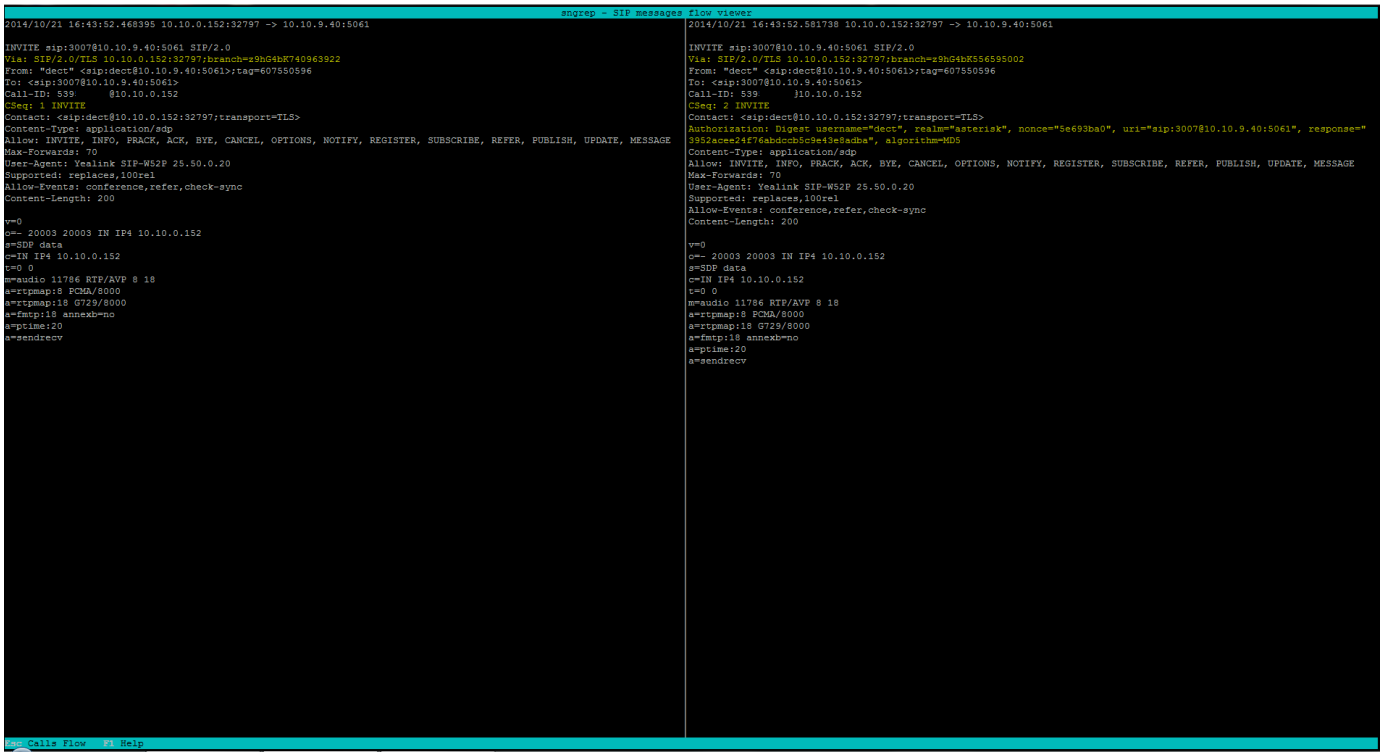


Syntax on SIP messages



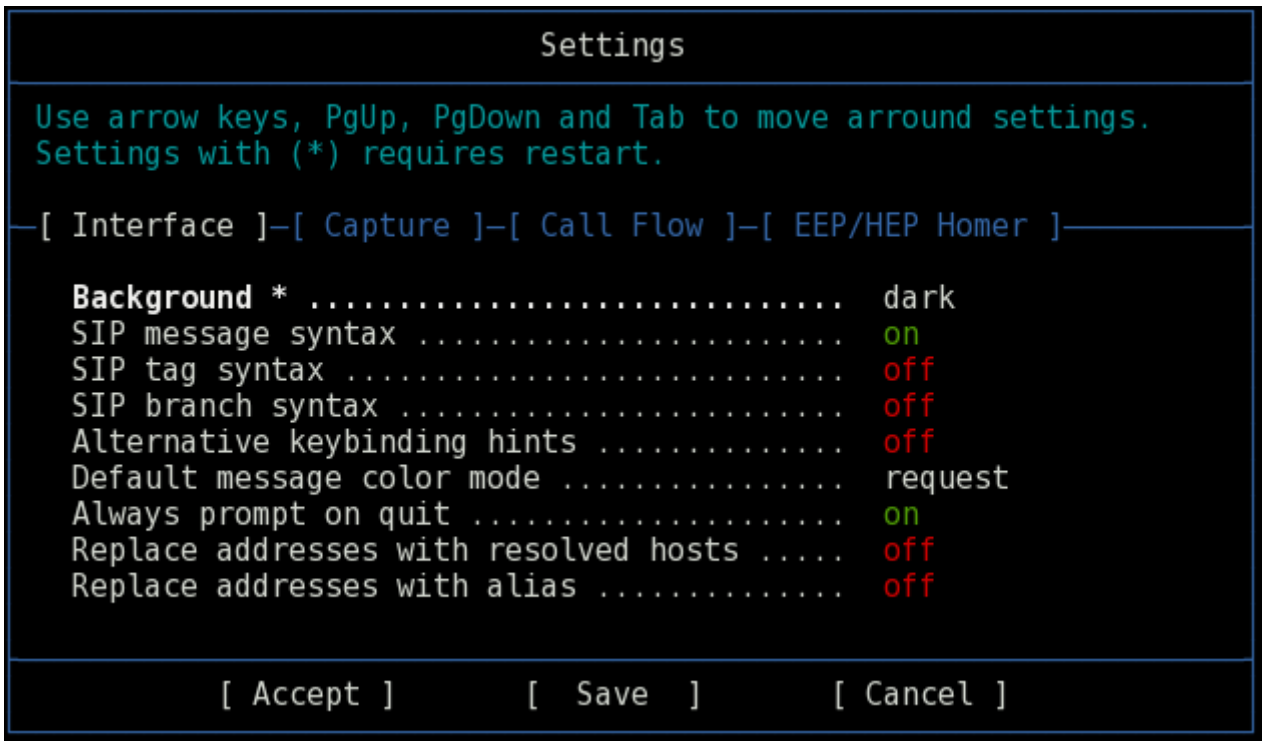
Call Raw Window

Message Diff Window

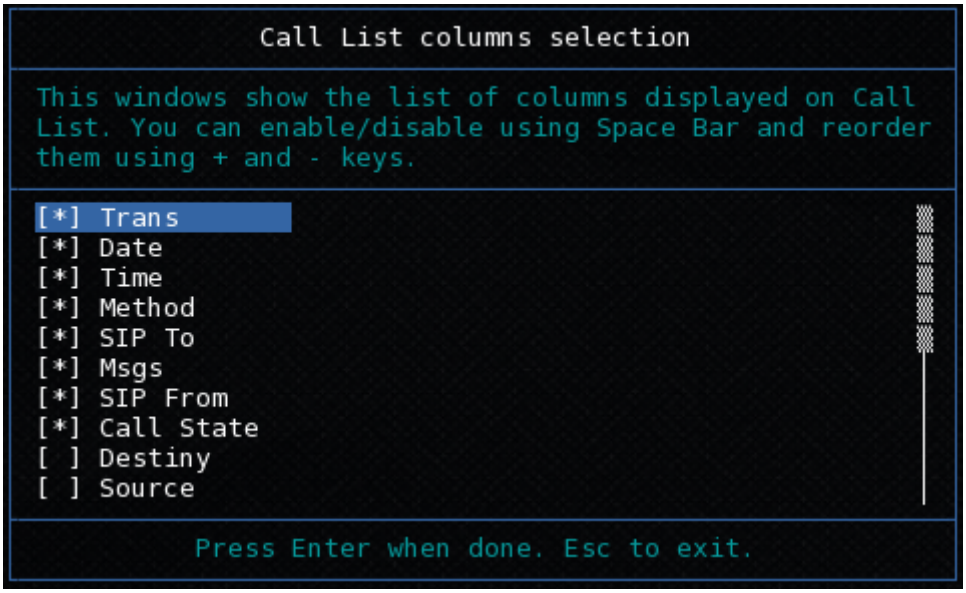


Other dialogs

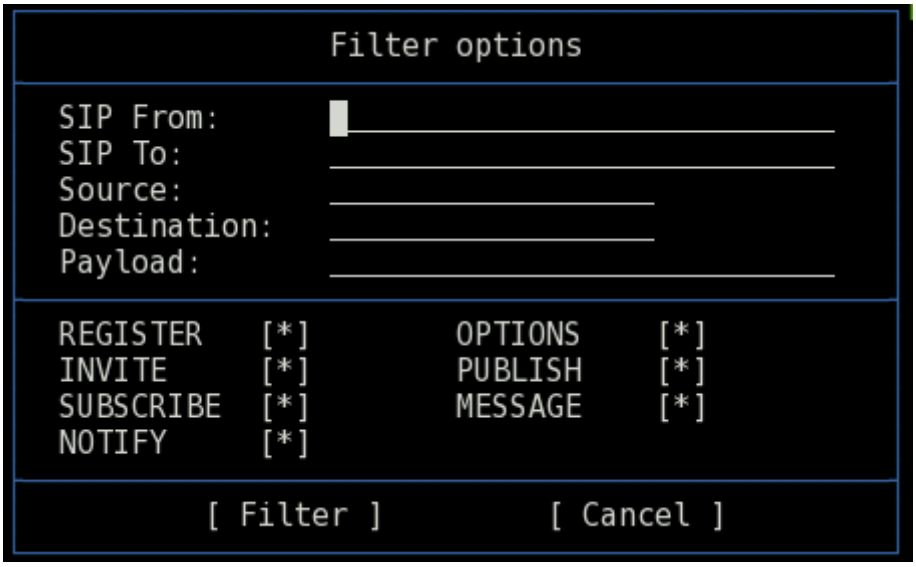
Settings



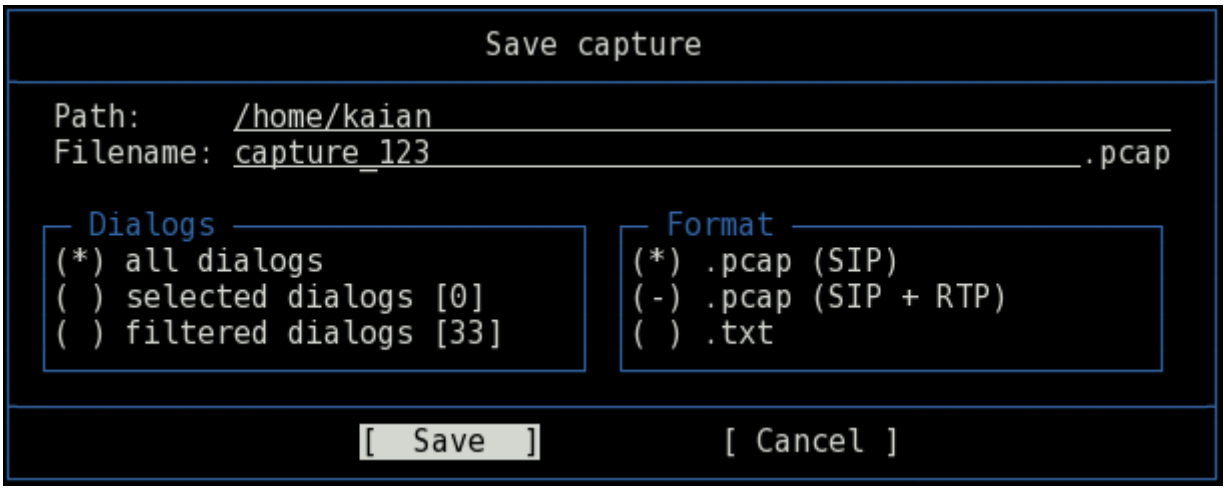
Column List selection



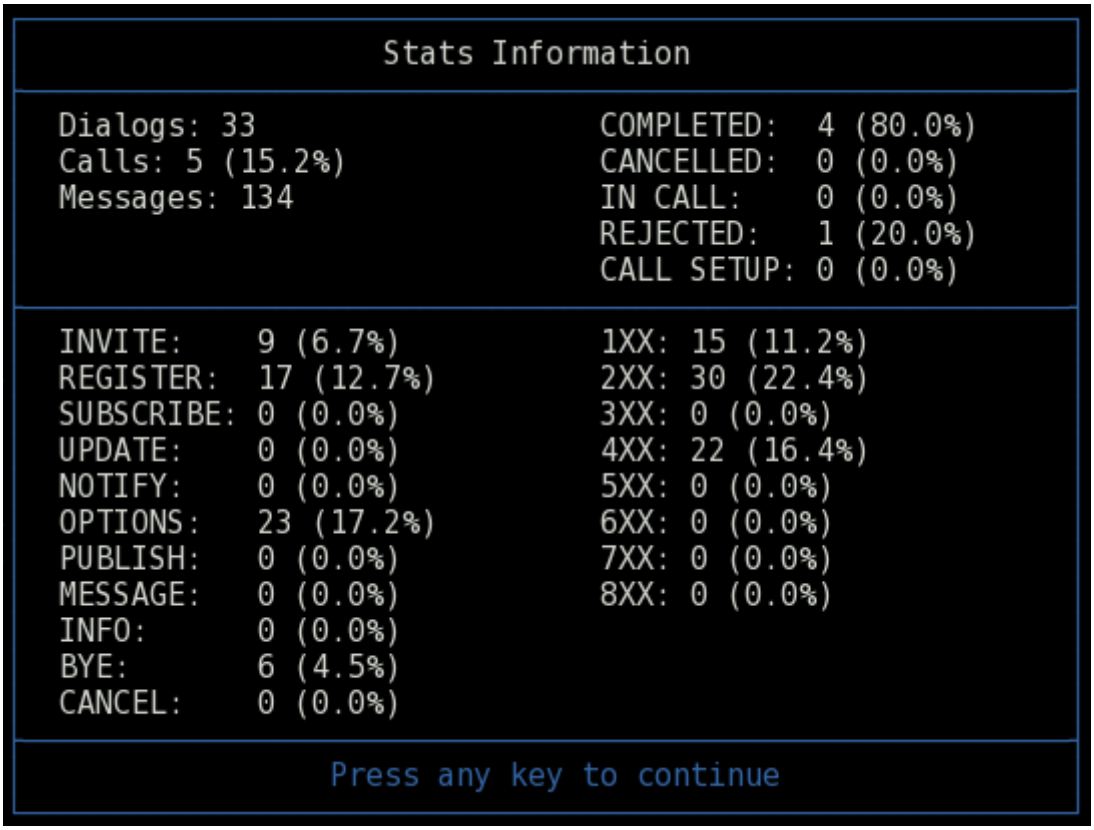
Filters dialog



Save dialog



Stats



At the time writing 1.2.0 has not been released. This will only work with compiled sngrep from master branch

This mini tutorial will allow sngrep to receive kamailio packets and can be used to debug received TLS, HEP or SIP packets. HEPv2 support in sngrep is still under testing and this compatibility may or may not work.

Часто задаваемые вопросы

Что означает sngrep?

> Первые версии sngrep использовали ngrep для захвата sip-пакетов и разбора его вывода. Это изменилось в версии 0.1.0, где вместо него использовался libpcap. sngrep был разработан для использования с теми же аргументами командной строки, которые мои коллеги использовали для ngrep, просто добавив s в начале. Буква s в sngrep будет означать SIP.

Зачем нужен новый инструмент для сетевой фильтрации?

> Не знаю. Я не смог найти ни одного консольного инструмента, который бы отображал потоки вызовов.

Расширенное окно потока вызовов (Call flow) не работает

> Если вы хотите установить связь между различными диалогами (расширенный поток вызовов), в одном из диалогов, ссылающемся на другой, должен присутствовать заголовок. Этот заголовок может быть X-CID или X-Call-ID и должен содержать Call-ID другого связанного диалога.

Сборка

Установка зависимостей

Debian/Ubuntu

Install required packages from repository:

```
# apt-get update
# apt-get install git autoconf automake gcc make \
  libncursesw5-dev libncurses5-dev libpcap-dev libssl-dev libpcre3-dev
```

CentOS/Fedora

Install required packages from repository:

```
# yum install ncurses-devel make libpcap-devel pcre-devel \
    openssl-devel git gcc autoconf automake
```

ArchLinux

Install required packages from repository:

```
# pacman -Sy ncurses libpcap openssl git gcc sed make
```

Mac OS X

Install MacPorts:

- https://www.macports.org/install.php

Install main dependencies:

```
port install pkgconfig
port install libpcap
port install ncurses
```

Install optional dependencies:

```
port install pcre
port install openssl
```

Ncurses library on Mac OS X has wide character support (unicode) by default, there is no ncursesw library.

To enable support for PCRE and SSL/TLS: in order to find the include files and libraries installed by macports, before executing any command for compiling from sources, do:

```
export CFLAGS=$(pkg-config --cflags libpcre openssl)
export LDFLAGS=$(pkg-config --libs libpcre openssl)
```

Whenever an upgrade is performed, do the exports commands every time before running **configure**.

NetBSD

Install required packages from repository:

```
pkgin install autoconf automake
```

Configure command must be run with CFLAGS AND LDFLAGS:

```
CFLAGS="-D_NETBSD_SOURCE -D_XOPEN_SOURCE=600 -I/usr/pkg/include/ncursesw -I/usr/pkg/include" \
LDFLAGS="-L/usr/pkg/lib -lpcre -lssl -lcrypto -Wl,-R/usr/pkg/lib -lncursesw" \
./configure --with-openssl --with-gnutls --enable-unicode --with-pcre
```

Сборка из исходников

Клонируйте репозиторий github и проверьте, что все предварительные условия выполнены.

```
$ git clone https://github.com/irontec/sngrep
$ cd sngrep
$ ./bootstrap.sh
$ ./configure
$ make
# make install    # (от root)
```

Send HEP traffic from Kamailio to local sngrep

Configuring Kamailio to duplicate received packets

- Enable siptrace module in `kamailio.cfg`

```
loadmodule    "siptrace.so"

### siptrace ###
modparam("siptrace", "duplicate_uri", "sip:127.0.0.1:9061")
modparam("siptrace", "hep_mode_on", 1)
modparam("siptrace", "trace_to_database", 0)
modparam("siptrace", "trace_flag", 22)
modparam("siptrace", "trace_on", 1)
modparam("siptrace", "hep_version", 2)
```

- Mark dialogs to be sent with the configured flag

```
route {
    sip_trace();
    setflag(22);
}
```

- On Kamailio working as sipcature collector, It should be required to also trace responses. Also, in this kind of Kamailio that doesn't works as proxy, order of messages may not be received in the same order they were originally sent.

```
onreply_route {
    sip_trace();
}
```

- Reload your kamailio to apply new configuration

Configuring sngrep to received HEP packets

Previous Kamailio configuration uses HEPv2 to send packets, which is only supported in sngrep since 1.2.0

- Enable HEPv2 en `~/.sngreprc` file

```
set eep.listen on
set eep.listen.version 2
set eep.listen.address 127.0.0.1
set eep.listen.port 9061
```

If your capagent send CorrelationID enable this option
`set eep.listen.uuid on`

- Run sngrep and you'll see received packets from kamailio