smalisca Documentation

Release 0.2

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If you ever have looked at Android applications you know to appreciate the ability of analyzing your target at the most advanced level. Dynamic programm analysis will give you a pretty good overview of your applications activities and general behaviour. However sometimes you'll want to just analyze your application **without** running it. You'll want to have a look at its components, analyze how they interact and how data is tainted from one point to another.

This is was the major factor driving the development of *smalisca*. There are indeed some good reasons for a *static code analysis* before the *dynamic* one. Before interacting with the application I like to know how the application has been build, if there is any API and generate all sort of *call flow graphs*. In fact graphs have been very important to me since they *visualize* things. Instead of jumping from file to file, from class to class, I just look at the graphs.

While graph building has been an important reason for me to code such a tool, *smalisca* has some other neat **features** you should read about.

CHAPTER 1

Features

At the moment there are some few major functionalities like:

- **parsing**

  You can parse a whole directory of **Smali** files and **extract**:

  - class information
  - class properties
  - class methods
  - calls between methods of different classes

  You can then **export** the results as **JSON** or **SQLite**.

  Have a loot at the *parsing page* for more information.

- **analyzing**

  After exporting the results you'll get an **interactive prompt** to take a closer look at your parsed data. You can **search** for classes, properties, methods and even method calls. You can then apply several **filters** to your search criterias like:

  ```
  smalisca> sc -c class_name -p test -r 10 -x path -s class_type
  ```

  This command will search for *10* (-r 10) classes which contain the pattern *test* (-p) in their *class name* (-c). Afterwards the command will exclude the column *path* (-x path) from the results and sort them by the *class type* (-s).

  Let's have a look at another example:

  ```
  smalisca> scl -fc com/android -fm init -r 10
  ```

  This will search for all **method calls** whose *calling* class name contains the pattern *com/android* (-fc). Additionally we can look for calls originating from methods whose name contain the pattern *init* (-fm).

  You can of course read your commands from a file and analyze your results in a *batch*- like manner:

  ```
  $ cat cmd.txt
  sc -c class_name -p com/gmail/xlibs -r 10 -x path
  quit
  $ ./smalisca.py analyzer -i results.sqlite -f sqlite -c cmd.txt
  ...
  ```

  Addition in version 0.2: You can access the results via a web API.

  Have a loot at the *analysis page* for more information.

- **web API**

  smalisca provides a REST web service in order to easily interact with the results by just using a web client. This way you can access data in your own (fancy) web application and have a clean separation between backend and frontend.

  Read more about the available REST API at the *web API page*.

- **visualizing**

  I think this the **most** valuable feature of *smalisca*. The ability to visualize your results in a structured way makes your life more comfortable. Depending on what you're interested in, this tool has several graph drawing features I'd like to promote.

  At first you can draw your packages including their classes, properties and methods:

  ```
  smalisca> dc -c class_name -p test -f dot -o /tmp/classes.dot
  :: INFO       Wrote results to /tmp/classes.dot
  smalisca>
  ```

  This will first search classes whose class name contains *test* and then export the results in the **Graphviz DOT** language. You can then manually generate a graph using *dot*, *neato*, *circo* etc. Or you do that using the interactive prompt:

  ```
  smalisca> dc -c class_name -p test -f pdf -o /tmp/classes.pdf --prog neato
  :: INFO       Wrote results to /tmp/classes.pdf
  smalisca>
  ```

  Have a loot at the *drawing page* for more information.

CHAPTER 2

Screenshots

Have a look at the *screenshots page*.

CHAPTER 3

Installation

Refer to the *installation page*.

CHAPTER 4

How to use it

After installing the tool, you may want to first pick up an Android application (APK) to play with. Use apktool or my own tool ADUS to dump the APKs content. For the sake of simplicity I'll be using **FakeBanker** which I've analyzed in a previous blog post.

4.1 First touch

But first let's have a look at the tools main options:

```
$ smalisca --help

                            /\_ \    __
  ____    ___ ___      __  \//\ \  /\_\    ____    ___     __
 /',__\ /' __` __`\  /'__`\  \ \ \ \/\ \  /',__\  /'___\ /'__`\
/\__, `\/\ \/\ \/\ \/\ \L\.\_ \_\ \_\ \ \/\__, `\/\ \__//\ \L\.\_
\/\____/\ \_\ \_\ \_\ \__/.\_\/\____\\ \_\/\____/\ \____\ \__/.\_\
 \/___/  \/_/\/_/\/_/\/__/\/_/\/____/ \/_/\/___/  \/____/\/__/\/_/


--------------------------------------------------------------------------------
:: Author:       Victor <Cyneox> Dorneanu
:: Desc:         Static Code Analysis tool for Smali files
:: URL:          http://nullsecurity.net, http://{blog,www}.dornea.nu
:: Version:      0.2
--------------------------------------------------------------------------------

usage: smalisca (sub-commands ...) [options ...] {arguments ...}

[--] Static Code Analysis (SCA) tool for Baskmali (Smali) files.

commands:

  analyzer
    [--] Analyze results using an interactive prompt or on the command line.

  parser
    [--] Parse files and extract data based on Smali syntax.

  web
    [--] Analyze results using web API.

optional arguments:
```

```
  -h, --help            show this help message and exit
  --debug               toggle debug output
  --quiet               suppress all output
  --log-level {debug,info,warn,error,critical}
                        Change logging level (Default: info)
  -v, --version         show program's version number and exit
```

4.2 Parsing

I'll first **parse** some directory for **Smali** files before doing the analysis stuff:

```
$ smalisca parser -l ~/tmp/FakeBanker2/dumped/smali -s java -f sqlite  -o fakebanker.sqlite

...

:: INFO       Parsing .java files in /home/victor/tmp/FakeBanker2/dumped/smali ...
:: INFO       Finished parsing!
:: INFO       Exporting results to SQLite
:: INFO         Extract classes ...
:: INFO         Extract class properties ...
:: INFO         Extract class methods ...
:: INFO         Extract calls ...
:: INFO         Commit changes to SQLite DB
:: INFO         Wrote results to fakebanker.sqlite
:: INFO       Finished scanning
```

Also have a look at the *parsing page* for further information.

4.3 Analyzing

Now you're free to do whatever you want with your generated exports. You can inspect the **SQLite DB** directly or use *smaliscas* **analysis** features:

```
$ smalisca analyzer -f sqlite -i fakebanker.sqlite

...


smalisca>sc -x path -r 10
+----+-------------------------------------------------------------------------------------+-----
| id | class_name                                                                          | clas
+----+-------------------------------------------------------------------------------------+-----
| 1  | Landroid/support/v4/net/ConnectivityManagerCompat                                   | publ
| 2  | Landroid/support/v4/view/AccessibilityDelegateCompat$AccessibilityDelegateJellyBeanImpl |
| 3  | Landroid/support/v4/view/ViewCompat$ViewCompatImpl                                  | inte
| 4  | Landroid/support/v4/app/ActivityCompatHoneycomb                                     |
| 5  | Landroid/support/v4/app/NoSaveStateFrameLayout                                      |
| 6  | Landroid/support/v4/net/ConnectivityManagerCompatHoneycombMR2                       |
| 7  | Lcom/gmail/xpack/BuildConfig                                                        | publ
| 8  | Landroid/support/v4/app/BackStackRecord$Op                                          | fina
| 9  | Landroid/support/v4/app/FragmentManagerImpl                                         | fina
| 10 | Landroid/support/v4/app/ShareCompat$ShareCompatImpl                                 | inte
+----+-------------------------------------------------------------------------------------+-----
```

Also refer to the *analysis page* for more available **commands** and options.

4.4 Drawing

Please refer to the *drawing page* for full examples.

4.5 Contents

4.5.1 Installation

The installation process is quite straight forward. Download tool from GitHub or clone the whole project locally:

```
$ git clone https://github.com/dorneanu/smalisca
...
```

Virtual environment

You may now want to setup a virtual local environment:

```
$ mkdir env
$ virtualenv env
...
$ source env/bin/activate
```

Install package

Now into the packages root directory and install the package:

> $ cd smalisca $ make install ...

Using PyPI

smalisca is also available at PyPI. You may want to install it using:

```
$ pip install smalisca
```

That's it! Now you're ready to run *smalisca*.

Uninstall package

From the root directory run:

```
$ cd smalisca
$ make uninstall
```

4.5.2 Parsing files

As a very first step before conducting any analysis, you'll have to parse your Smali files for valueble information like:

- class names
- class properties
- class methods
- method calls

Once you have extracted this information from the files, you're ready to go with the analysis. Using the **parser** sub-command you can parse a directory for Smali files:

```
$ smalisca parser --help

...

usage: smalisca (sub-commands ...) [options ...] {arguments ...}

[--] Parse files and extract data based on Smali syntax.

optional arguments:
  -h, --help            show this help message and exit
  --debug               toggle debug output
  --quiet               suppress all output
  --log-level {debug,info,warn,error,critical}
                        Change logging level (Default: info)
  -j JOBS, --jobs JOBS  Number of jobs/processes to be used
  -l LOCATION, --location LOCATION
                        Set location (required)
  -d DEPTH, --depth DEPTH
                        Path location depth
  -s SUFFIX, --suffix SUFFIX
                        Set file suffix (required)
  -f {json,sqlite}, --format {json,sqlite}
                        Files format
  -o OUTPUT, --output OUTPUT
                        Specify output file
```

The most important options for parsing are the *location* (-l) and the *suffix* (-s). For exporting the results you'll have to specify the *output format* (-f) and the correponding *output file* (-o).

Note: Make sure you **delete** the sqlite file before re-running the parser. Otherwise you might get confronted with DB errors.

Example:

```
$ smalisca -l /tmp/APK-dumped -s java -f sqlite -o apk.sqlite
...
```

Concurrency

In order to improve performance concurrency has been added to smalisca sincer *version 0.2*. You can read more in this blog post about the problems I have encountered and their solution.

Using the *-d* (depth) parameter you can now specify up to which **folder depth** smalisca should look up for files and directories. When a file list has been identified for parsing then you can use the *-j* (jobs) parameter to split your initial

list into multiple sub-lists. Afterwards for every sub-list a new process will be spawned and the parsing stuff can then take place. Just say we have following folder structure:

```
a
-- b1
|   -- c1
|   -- c2
-- b2
|   -- d1
|   -- d2
-- b3
    -- e1
    -- e2
    -- e3
```

You can now either:

1. Parse files in directories: c1, c2, d1, d2, e1, e2, e3 + sub-folders
2. Parse files in directories: b1, b2, b3 + sub-folders
3. Parse in folder a + sub-folders

Depending on the scenario you would then specify like this:

1. smalisca ... -d **3**...
2. smalisca ... -d **2** ...
3. smalisca ... -d **1** ...

Note: Concurrency is available in smalisca since version 0.2.

Create new parser

You may also want to parse the files programmatically

```
from smalisca.core.smalisca_main import SmaliscaApp
from smalisca.modules.module_smali_parser import SmaliParser

# Create new smalisca app
# You'll have to create a new app in order to set logging
# settins and so on.
app = SmaliscaApp()
app.setup()

# Set log level
app.log.set_level('info')

# Specify the location where your APK has been dumped
location = '/tmp/APK-dumped'

# Specify file name suffix
suffix = 'java'

# Create a new parser
parser = SmaliParser(location, suffix)

# Go for it!
parser.run()
```

```
# Get results
results = parser.get_results()
```

4.5.3 Analyze results

Basic usage

After having parsed and collected valuable information about your application, you're ready to go with the analysis stuff.

Note: At the moment only SQLite analysis is supported.

Your previously generated results should be located in a *SQLite* DB. But first let's have a look at the main options:

```
$ smalisca analyzer --help

...

usage: smalisca (sub-commands ...) [options ...] {arguments ...}

[--] Analyze results using an interactive prompt or on the command line.

optional arguments:
  -h, --help            show this help message and exit
  --debug               toggle debug output
  --quiet               suppress all output
  --log-level {debug,info,warn,error,critical}
                        Change logging level (Default: info)
  --config CONFIG_FILE  Specify config file
  -i FILENAME, --input FILENAME
                        Specify results file to read from
  -f {sqlite}, --format {sqlite}
                        Files format
  -c COMMANDS_FILE      Read commands from file instead of interactive prompt
```

At the moment there are 2 ways how to interact with the results:

- using the provided **interactive prompt** (default)
- specifying a **file** containing **commands** to be executed (-c)

Note: SQL ninjas could of course analyze the SQLite DB directly without any 3rd party applications.

Interactive

In the **interactive** modus all you have to do is to specify the location of the SQLite DB and the format (which will be of course *sqlite*):

```
$ smalisca analyzer -i /tmp/fakebanker.sqlite -f sqlite

...

:: INFO       Successfully opened SQLite DB
:: INFO       Creating analyzer framework ...
```

```
:: INFO       Starting new analysis shell

-- Analyzer ------------------------------------------------------------------
Welcome to smalisca analyzer shell.
Type ? or help to list available commands.
Type "<command> --help" for additional help.

smalisca>
```

Now you're ready to interact with the results. Just type **help** to see a list of available *commands*:

```
smalisca>help

Documented commands (type help <topic>):
----------------------------------------
dc  dcl  dxcl  help  q  quit  sc  scl  sm  sp  sxcl

smalisca>
```

For every provided type **<command> –help** to see a list of available options:

```
smalisca>sc --help
usage: sc [-h] [-c SEARCH_TYPE] [-p SEARCH_PATTERN] [-s SORTBY] [--reverse]
          [-r RANGE] [--max-width MAX_WIDTH] [-x EXCLUDE_FIELDS]

[--] Search for classes

Specify by '-c' in which column you'd like to search for a pattern (specified by '-p').
Examples:

a) List available columns
    sc -c ?

b) Search for pattern "test" in column "class_name" (first 10 results)
    sc -c class_name -p test -r 10

c) Search for pattern "test2" in column "class_type" (print only from index 10 to 20)
    sc -c class_type -p test2 -r 10,20

You can also exclude table fields using '-x':

a) Exclude only one column
    sc -c class_type -p test2 -x depth

b) Exclude multiple columns:
    sc -c class_type -p test2 -x depth,id,class_name

optional arguments:
  -h, --help            show this help message and exit
  -c SEARCH_TYPE        Specify column.
                        Type ? for list
  -p SEARCH_PATTERN     Specify search pattern
  -s SORTBY             Sort by column name
  --reverse             Reverse sort order
  -r RANGE              Specify output range by single integer or separated by ','
  --max-width MAX_WIDTH
                        Global column max width
  -x EXCLUDE_FIELDS     Exclude table fields
smalisca>
```

In this specific case you could run:

```
smalisca>sc -c ?
['id', 'class_name', 'class_type', 'class_package', 'depth', 'path']
No results! :(
smalisca>sc -c class_name -p gmail -x path -r 10
+----+---------------------------------------------+--------------+-----------------------+-------+
| id | class_name                                  | class_type   | class_package         | depth |
+----+---------------------------------------------+--------------+-----------------------+-------+
| 7  | Lcom/gmail/xservices/XService$MyRun         |              | Lcom.gmail.xservices  | 4     |
| 13 | Lcom/gmail/xpack/R$id                       | public final | Lcom.gmail.xpack      | 4     |
| 24 | Lcom/gmail/xlibs/myFunctions                | public       | Lcom.gmail.xlibs      | 4     |
| 35 | Lcom/gmail/xpack/R$menu                     | public final | Lcom.gmail.xpack      | 4     |
| 59 | Lcom/gmail/xservices/XSmsIncom$1RequestTask |              | Lcom.gmail.xservices  | 4     |
| 68 | Lcom/gmail/xpack/R$raw                      | public final | Lcom.gmail.xpack      | 4     |
| 69 | Lcom/gmail/xlibs/myFunctions$1RequestTask   |              | Lcom.gmail.xlibs      | 4     |
| 81 | Lcom/gmail/xservices/XRepeat$1RequestTask   |              | Lcom.gmail.xservices  | 4     |
| 88 | Lcom/gmail/xpack/R$style                    | public final | Lcom.gmail.xpack      | 4     |
| 97 | Lcom/gmail/xbroadcast/OnBootReceiver        | public       | Lcom.gmail.xbroadcast | 4     |
+----+---------------------------------------------+--------------+-----------------------+-------+
```

Batch like

In the **batch** modues one could provide the commands in a file. These will be executed in that specific order:

```
$ cat cmd.txt
sc -c class_name -p gmail -x path -r 10
quit
$ smalisca analyzer -i /tmp/fakebanker.sqlite -f sqlite -c cmd.txt

...

:: INFO       Successfully opened SQLite DB
:: INFO       Creating analyzer framework ...
:: INFO       Reading commands from cmd.txt

-- Analyzer ----------------------------------------------------------------
Welcome to smalisca analyzer shell.
Type ? or help to list available commands.
Type "<command> --help" for additional help.

+----+---------------------------------------------+--------------+-----------------------+-------+
| id | class_name                                  | class_type   | class_package         | depth |
+----+---------------------------------------------+--------------+-----------------------+-------+
| 7  | Lcom/gmail/xservices/XService$MyRun         |              | Lcom.gmail.xservices  | 4     |
| 13 | Lcom/gmail/xpack/R$id                       | public final | Lcom.gmail.xpack      | 4     |
| 24 | Lcom/gmail/xlibs/myFunctions                | public       | Lcom.gmail.xlibs      | 4     |
| 35 | Lcom/gmail/xpack/R$menu                     | public final | Lcom.gmail.xpack      | 4     |
| 59 | Lcom/gmail/xservices/XSmsIncom$1RequestTask |              | Lcom.gmail.xservices  | 4     |
| 68 | Lcom/gmail/xpack/R$raw                      | public final | Lcom.gmail.xpack      | 4     |
| 69 | Lcom/gmail/xlibs/myFunctions$1RequestTask   |              | Lcom.gmail.xlibs      | 4     |
| 81 | Lcom/gmail/xservices/XRepeat$1RequestTask   |              | Lcom.gmail.xservices  | 4     |
| 88 | Lcom/gmail/xpack/R$style                    | public final | Lcom.gmail.xpack      | 4     |
| 97 | Lcom/gmail/xbroadcast/OnBootReceiver        | public       | Lcom.gmail.xbroadcast | 4     |
+----+---------------------------------------------+--------------+-----------------------+-------+
```

Available commands

s

[S]search for a **pattern** (-p) inside **all** tables. But you can also specify the **table** (-t) you'd like to lookup your pattern:

```
smalisca>s -p decrypt
- Classes ----------------------------------------------------------------
:: WARNING    No found classes.

- Properties -------------------------------------------------------------
:: WARNING    No found properties.

- Const strings ----------------------------------------------------------
:: WARNING    No found const strings.

- Methods ----------------------------------------------------------------
:: INFO       Found 1 results

:: ID: 131

        [+] Name:       decrypt
        [+] Type:       public
        [+] Args:       Ljava/lang/String;
        [+] Ret:        Ljava/lang/String;
        [+] Class:      Lcom/gmail/xlibs/Blowfish
```

And now specifying the table:

```
smalisca>s -t const -p container=
- Classes ----------------------------------------------------------------
:: WARNING    No found classes.

- Properties -------------------------------------------------------------
:: WARNING    No found properties.

- Const strings ----------------------------------------------------------
:: INFO       Found 2 results

:: ID: 39

        [+] Variable:   v0
        [+] Value:      mContainer=
        [+] Class:      Landroid/support/v4/app/Fragment



:: ID: 833

        [+] Variable:   v6
        [+] Value:        mContainer=
        [+] Class:      Landroid/support/v4/app/FragmentManagerImpl


- Methods ----------------------------------------------------------------
:: WARNING    No found methods.
```

sc

[S]earch for [c]lasses. You can search for a specific **pattern** (-p) in the available **columns**:

```
smalisca>sc -c ?
['id', 'class_name', 'class_type', 'class_package', 'depth', 'path']
```

Example:

```
smalisca>sc -c class_type -p public
```

sp

[S]earch for [p]roperties. You can search for a specific **pattern** (-p) in the available **columns**:

```
smalisca>sp -c ?
['id', 'property_name', 'property_type', 'property_info', 'property_class']
```

Example:

```
smalisca>sp -c property_class -p com/gmail
```

scs

[S]earch for [c]onstant [s]trings. You can search for a specific **pattern** (-p) in the available **columns**:

```
smalisca>scs -c ?
['id', 'const_string_var', 'const_string_value', 'const_string_class']
```

Example:

```
smalisca>scs -c const_string_value -p http
+-----+------------------+--------------------+-----------------------------+
| id  | const_string_var | const_string_value | const_string_class          |
+-----+------------------+--------------------+-----------------------------+
| 321 | v11              | HTTP               | Lcom/gmail/xlibs/myFunctions |
| 337 | v10              | HTTP               | Lcom/gmail/xlibs/myFunctions |
+-----+------------------+--------------------+-----------------------------+
```

sm

[S]earch for [m]ethods. You can search for a specific **method** (-m) in the available **columns**:

```
smalisca>sm -c ?
['id', 'method_name', 'method_type', 'method_args', 'method_ret', 'method_class']
```

Example:

```
smlisca>sm -c method_ret -p I
```

scl

[S]earch for calls [cl]. Every call has a **source** (class, method) and a **destination** (class, method). Additionally a call can have several **parameters** and a **return** value. Using this command you can apply several **filters** to each call

"component":

```
smalisca>scl --help
usage: scl [-h] [-fc FROM_CLASS] [-fm FROM_METHOD] [-tc TO_CLASS]
           [-tm TO_METHOD] [-fa LOCAL_ARGS] [-ta DEST_ARGS] [-s SORTBY]
           [--reverse] [-r RANGE] [--max-width MAX_WIDTH] [-x EXCLUDE_FIELDS]

>> Search for calls

You can apply filters by using the optional arguments.
Without any arguments the whole 'calls' table will
be printed.

optional arguments:
  -h, --help            show this help message and exit
  -fc FROM_CLASS        Specify calling class (from)
  -fm FROM_METHOD       Specify calling method (from)
  -tc TO_CLASS          Specify destination class (to)
  -tm TO_METHOD         Specify destination method (to)
  -fa LOCAL_ARGS        Local arguments (from)
  -ta DEST_ARGS         Destination arguments (to)
  -s SORTBY             Sort by column name
  --reverse             Reverse sort order
  -r RANGE              smecify output range by single integer or separated by ','
  --max-width MAX_WIDTH
                        Global column max width
  -x EXCLUDE_FIELDS     Exclude table fields
```

Examples:

```
smalisca>scl -fc com/gmail -fm init -r 10
...
smalisca>scl -tm create
...
```

sxcl

[S]earch for cross [x] calls [cl]. This command is very similar to the *scl* one and searches for calls as well. *sxcl* allows you to search for calls that:

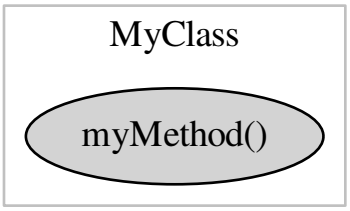
- *refer* to a class and/or method or
- are *invoked from* a class and/or method

These are the main options:

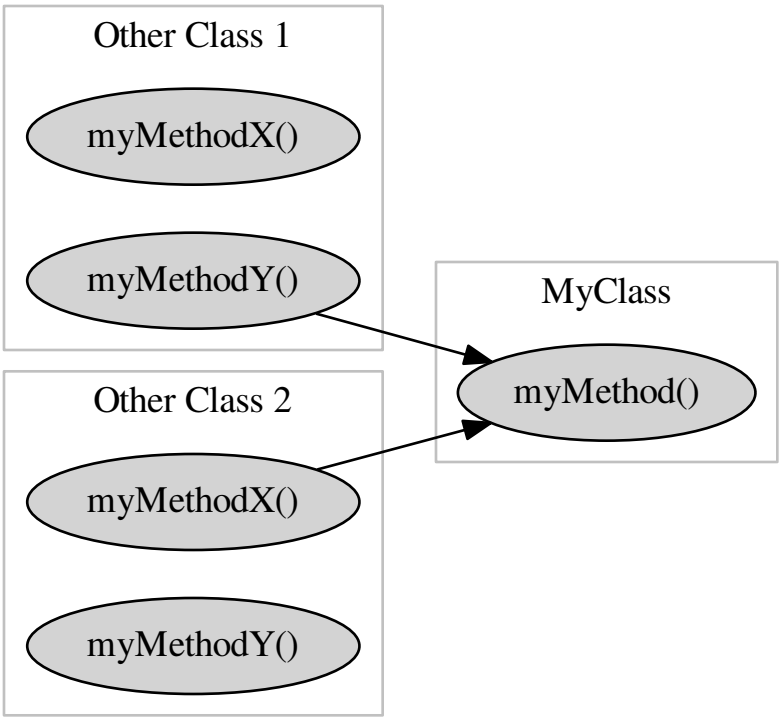
```
smalisca>sxcl --help
usage: sxcl [-h] [-c CLASS_NAME] [-m METHOD_NAME] -d {to,from}
            [--max-depth [XREF_DEPTH]] [-s SORTBY] [--reverse] [-r RANGE]
            [--max-width MAX_WIDTH] [-x EXCLUDE_FIELDS]

>> Search for calls

You can apply filters by using the optional arguments.
Without any arguments the whole 'calls' table will
be printed.

optional arguments:
  -h, --help            show this help message and exit
```

```
  -c CLASS_NAME         Specify class name
  -m METHOD_NAME        Specify method name
  -d {to,from}          Cros-reference direction
  --max-depth [XREF_DEPTH]
                        Cross-References max depth
                        Default: 1
  -s SORTBY             Sort by column name
  --reverse             Reverse sort order
  -r RANGE              smecify output range by single integer or separated by ','
  --max-width MAX_WIDTH
                        Global column max width
  -x EXCLUDE_FIELDS     Exclude table fields
```

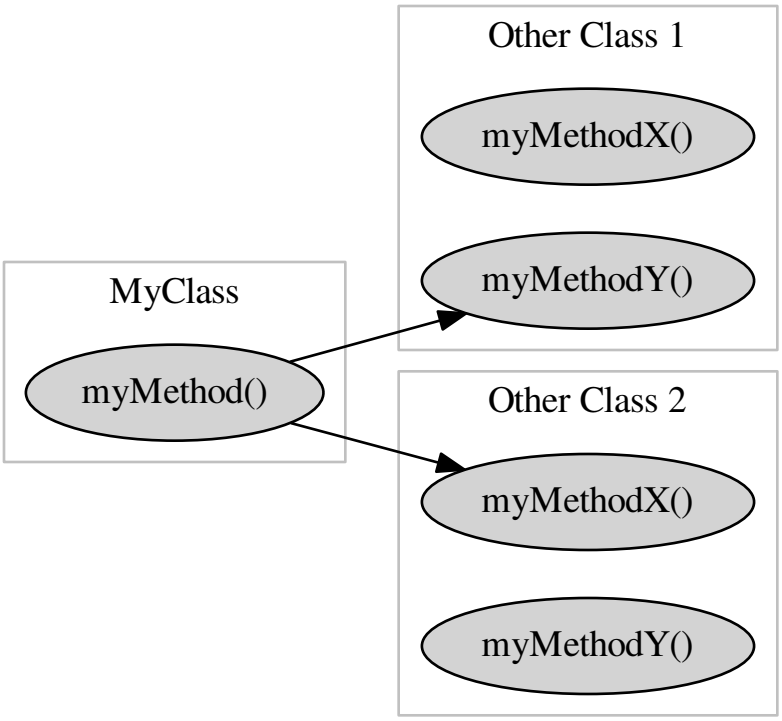
You can specify a *class name* (-c) and/or a *method name* (-m). You can then define the *direction* cross calls should be searched. To give you a better understand what this is about, let's say you have a method *myMethod* in class *MyClass*.



You may now want to find out classes/method which **point to** (-d to) to this class/method:

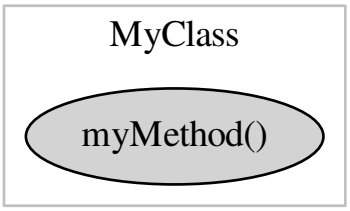


On the other side you may want to search for classes/methods which are **called/invoked** (-d from) by *MyClass/myMethod*:

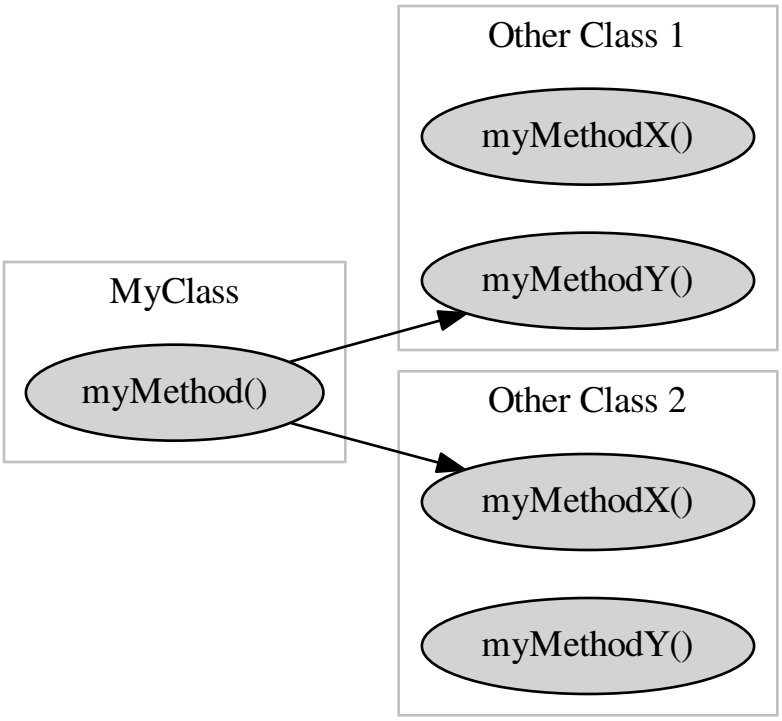


Ok, what about classes/methods that are **invoked by the invoked** classes/methods? :) Well for this purpose there is the **–max-depth** parameter which specifies to which depth the cross calls should be searchd. Let's have a look at some examples:

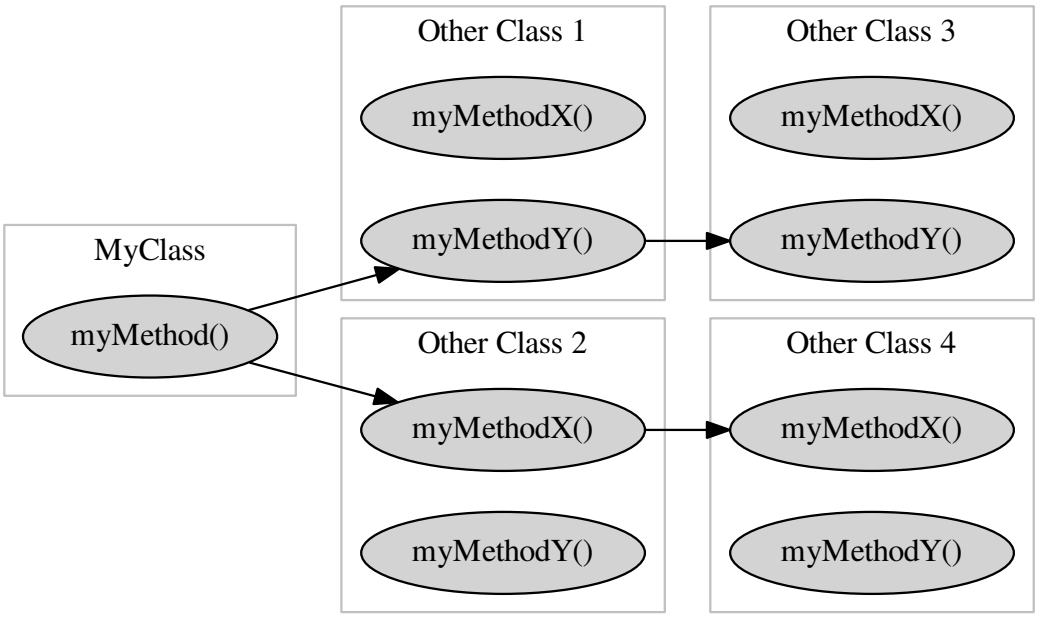
- *-d from –max-depth 0*



- *-d from –max-depth 1*



- *-d from –max-depth 2*



Got it? :)

Examples:

```
smalisca>sxcl -c gmail -m init -d to --max-depth 1
...
smalisca>sxcl -c gmail -m create -d from --max-depth 2
...
```

4.5.4 Web API

In order to improve usability one could use a web API to access previously generated results. At the moment a *REST* like API is available to access:

- classes
- class methods
- class properties
- constant strings
- calls
- cross-calls

Actually you should be able to access every *table* inside your DB using a web client.

Basic usage

Before being able to access any data make sure you have parsed your Smali files properly and exported the results to a **SQLite** (*-f sqlite*) DB. Afterwards you can start your web service:

```
$ smalisca web --help

...
Usage: smalisca (sub-commands ...) [options ...] {arguments ...}

[--] Analyze results using web API.

optional arguments:
  -h, --help            show this help message and exit
  --debug               toggle debug output
  --quiet               suppress all output
  --log-level {debug,info,warn,error,critical}
                        Change logging level (Default: info)
  -f FILENAME, --file FILENAME
                        Specify SQLite DB (required)
  -H HOST, --host HOST  Specify hostname to listen on
  -p PORT, --port PORT  Specify port to listen on
```

As an example you start the web server this way:

```
$ smalisca web -H localhost -p 1337 -f /tmp/fakebanker.sqlite

                           /\_ \    __
  ____    ___ ___      __  \//\ \  /\_\    ____    ___     __
 /',__\ /' __` __`\  /'__`\  \ \ \ \/\ \  /',__\  /'___\ /'__`\
/\__, `\/\ \/\ \/\ \/\ \L\.\_ \_\ \_\ \ \/\__, `\/\ \__//\ \L\.\_
\/\____/\ \_\ \_\ \_\ \__/.\_\/\____\\ \_\/\____/\ \____\ \__/.\_\
 \/___/  \/_/\/_/\/_/\/__/\/_/\/____/ \/_/\/___/  \/____/\/__/\/_/


...


:: INFO       Successfully opened SQLite DB
:: INFO       Starting web application ...
 * Running on http://localhost:1337/ (Press CTRL+C to quit)
```

Now you can fetch data from the web application using a **HTTP client** or a web browser.

REST API

The REST API of smalisca is based on Flask and Flask-Restless. As stated in the documenation:

```
Flask-Restless provides simple generation of ReSTful APIs for database
models defined using SQLAlchemy (or Flask-SQLAlchemy). The generated APIs
send and receive messages in JSON format.
```

Dito. So let's have a look at the basic functionalities:

- retrieve *data* via GET requests:

  GET /api/<table name>

- depending on the SQL table you'd like to receive entries from, you can specify the ID of a certain entry:

GET /api/<table name>/(int: id)

- you can apply **filters** to the queried results:

  GET /api/<table name>?q=<filters>

Note:

At the moment only following HTTP methods are allowed:

- GET
- POST

Now let's have a look at some examples:

1. Retrieve *some* classes:

```
$ curl http://localhost:1337/api/classes

{
  "num_results": 335,
  "objects": [
    {
      "class_name": "Landroid/support/v4/app/BackStackRecord$Op",
      "class_package": "Landroid.support.v4.app",
      "class_type": "final",
      "const_strings": [],
      "depth": 5,
      "id": 1,
      "methods": [
        {
          "id": 1,
          "method_args": "",
          "method_class": "Landroid/support/v4/app/BackStackRecord$Op",
          "method_name": "<init>",
          "method_ret": "V",
          "method_type": "constructor"
        }
      ],
      "path": "/home/victor/tmp/FakeBanker2/dumped/smali/android/support/v4/app/BackStackRecord$
      "properties": [
        {
          "id": 1,
          "property_class": "Landroid/support/v4/app/BackStackRecord$Op",
          "property_info": "",
          "property_name": "fragment",
          "property_type": "Landroid/support/v4/app/Fragment"
        },
        {
          "id": 2,
          "property_class": "Landroid/support/v4/app/BackStackRecord$Op",
          "property_info": "",
          "property_name": "next",
          "property_type": "Landroid/support/v4/app/BackStackRecord$Op"
        },
        {
          "id": 3,
          "property_class": "Landroid/support/v4/app/BackStackRecord$Op",
          "property_info": "",
```

```
          "property_name": "prev",
          "property_type": "Landroid/support/v4/app/BackStackRecord$Op"
        },
        {
          "id": 4,
          "property_class": "Landroid/support/v4/app/BackStackRecord$Op",
          "property_info": "",
          "property_name": "removed",
          "property_type": "Ljava/util/ArrayList"
        }

      ...
  "page": 1,
  "total_pages": 34
  }
```


2. Get *class* entry (id = **2**):

```
$ curl http://localhost:1337/api/classes/2
```


```
{
  "class_name": "Landroid/support/v4/view/accessibility/AccessibilityRecordCompatIcsMr1",
  "class_package": "Landroid.support.v4.view.accessibility",
  "class_type": "",
  "const_strings": [],
  "depth": 6,
  "id": 2,
  "methods": [
    {
      "id": 2,
      "method_args": "",
      "method_class": "Landroid/support/v4/view/accessibility/AccessibilityRecordCompatIcsMr1",
      "method_name": "<init>",
      "method_ret": "V",
      "method_type": "constructor"
    },
    {
      "id": 3,
      "method_args": "Ljava/lang/Object;",
      "method_class": "Landroid/support/v4/view/accessibility/AccessibilityRecordCompatIcsMr1",
      "method_name": "getMaxScrollX",
      "method_ret": "I",
      "method_type": "public static"
    },
    {
      "id": 4,
      "method_args": "Ljava/lang/Object;",
      "method_class": "Landroid/support/v4/view/accessibility/AccessibilityRecordCompatIcsMr1",
      "method_name": "getMaxScrollY",
      "method_ret": "I",
      "method_type": "public static"
    },
    {
      "id": 5,
      "method_args": "Ljava/lang/Object;I",
      "method_class": "Landroid/support/v4/view/accessibility/AccessibilityRecordCompatIcsMr1",
      "method_name": "setMaxScrollX",
      "method_ret": "V",
      "method_type": "public static"
```

```
      },
      {
        "id": 6,
        "method_args": "Ljava/lang/Object;I",
        "method_class": "Landroid/support/v4/view/accessibility/AccessibilityRecordCompatIcsMr1",
        "method_name": "setMaxScrollY",
        "method_ret": "V",
        "method_type": "public static"
      }
    ],
    "path": "/home/victor/tmp/FakeBanker2/dumped/smali/android/support/v4/view/accessibility/Acces
    "properties": []
  }%
```


3. Get **4**-th page of the results:

```
$ curl http://localhost:1337/api/classes?p=4
```

4. Apply filters to query results

   - Get all classes where class_name LIKE %android%:

```
$ curl -v -G -H "Content-Type: application/json" \
        -d 'q={"filters":[{"name":"class_name","op":"like","val":"%Creator%"}]}' \
        http://localhost:1337/api/classes
```


```
{
  "num_results": 4,
  "objects": [
    {
      "class_name": "Landroid/support/v4/os/ParcelableCompatCreatorCallbacks",
      "class_package": "Landroid.support.v4.os",
      "class_type": "public interface abstract",
      "const_strings": [],
      "depth": 5,
      "id": 10,
      "methods": [
        {
          "id": 89,
          "method_args": "Landroid/os/Parcel;Ljava/lang/ClassLoader;",
          "method_class": "Landroid/support/v4/os/ParcelableCompatCreatorCallbacks",
          "method_name": "createFromParcel",
          "method_ret": "Ljava/lang/Object;",
          "method_type": "public abstract"
        },
        {
          "id": 90,
          "method_args": "I",
          "method_class": "Landroid/support/v4/os/ParcelableCompatCreatorCallbacks",
          "method_name": "newArray",
          "method_ret": "[Ljava/lang/Object;",
          "method_type": "public abstract"
        }
      ],
      "path": "/home/victor/tmp/FakeBanker2/dumped/smali/android/support/v4/os/ParcelableCom
      "properties": []
    },

    ...
```

```
}
```

- Get all classes where id > 10:

```
$ curl -v -G -H "Content-Type: application/json" \
       -d 'q={"filters":[{"name":"id","op":"ge","val":10}]}' \
        http://localhost:1337/api/classes

...
```

- Get all classes where id > 10 AND class_type like "%final%":

```
$ curl -v -G -H "Content-Type: application/json" \
       -d 'q={"filters":[{"and":[{"name":"id","op":"ge","val":10},{"name":"class_type","op":
       http://localhost:1337/api/classes

...
```

Note: For additional examples make sure you have a look at Making search queries inside the Flask-Restless documentation.

4.5.5 Draw results

Basic usage

All **drawing** commands start with a **d**. The d-commands will first invoke a s-command (search) to get the results and generate a graph afterwards. You can specify different output formats (by -f) which best fit to your needs. A required output file name (-o) also has to be specified.

Note: Don't miss the *screenshots*.

Styling

The layout styles are available via a config file (*–config*). If you don't specify any config file then the default one will be used: *smalisca/data/config/config.conf*.

Available commands

dc

[D]raws [c]lass graphs. Similar to the *sc* command you can search for classes by specifying the column type (-c) and a pattern (-p). General usage:

```
smalisca>dc --help
usage: dc [-h] [-c SEARCH_TYPE] [-p SEARCH_PATTERN]
          [-f {dot,xdot,png,pdf,jpg,svg}]
          [--prog {dot,neato,circo,twopi,fdp,sfdp,nop}] [--args OUTPUT_ARGS]
          -o OUTPUT

>> Draw class graphs

optional arguments:
```

```
  -h, --help            show this help message and exit
  -c SEARCH_TYPE        Specify column.
                        Type ? for list
  -p SEARCH_PATTERN     Specify search pattern
  -f {dot,xdot,png,pdf,jpg,svg}
                        Output format
                        Default: dot
  --prog {dot,neato,circo,twopi,fdp,sfdp,nop}
                        Graphviz layout method
                        Default: dot
  --args OUTPUT_ARGS    Additional graphviz arguments
  -o OUTPUT             Specify output file
```

Examples:

```
smalisca>dc -c class_name -p com/gmail/xservices -f dot -o /tmp/calls.dot
:: INFO       Wrote results to /tmp/calls.dot
```

You can of course use other **output formats**:

```
smalisca>dc -c class_name -p com/gmail/xservices -f png -o /tmp/calls.png
:: INFO       Wrote results to /tmp/calls.png
```

Or a different **graphviz engine**:

```
smalisca>dc -c class_name -p com/gmail/xservices -f png --prog fdp -o /tmp/calls.png
:: INFO       Wrote results to /tmp/calls.png
```

dcl

[D]raws calls [cl]. Similar to the *scl* command you can search for calls by specifiny the calling method/class and/or the destinated method/class. General usage:

```
smalisca>dcl --help
usage: dcl [-h] [-fc FROM_CLASS] [-fm FROM_METHOD] [-tc TO_CLASS]
           [-tm TO_METHOD] [-fa LOCAL_ARGS] [-ta DEST_ARGS]
           [-f {dot,xdot,png,pdf,jpg,svg}]
           [--prog {dot,neato,circo,twopi,fdp,sfdp,nop}] [--args OUTPUT_ARGS]
           -o OUTPUT

>> Draw calls graphs

optional arguments:
  -h, --help            show this help message and exit
  -fc FROM_CLASS        Specify calling class (from)
  -fm FROM_METHOD       Specify calling method (from)
  -tc TO_CLASS          Specify destination class (to)
  -tm TO_METHOD         Specify destination method (to)
  -fa LOCAL_ARGS        Local arguments (from)
  -ta DEST_ARGS         Destination arguments (to)
  -f {dot,xdot,png,pdf,jpg,svg}
                        Output format
                        Default: dot
  --prog {dot,neato,circo,twopi,fdp,sfdp,nop}
                        Graphviz layout method
                        Default: dot
  --args OUTPUT_ARGS    Additional graphviz arguments
  -o OUTPUT             Specify output file
```

Let's have a look at some examples:

```
smalisca>dcl -fc gmail -tm create -f pdf --prog fdp -o /tmp/smalisca/calls.pdf
:: INFO       Wrote results to /tmp/smalisca/calls.pdf
```

dxcl

[D]raws cross [x] calls [cl]. Similar to the *sxcl* command you can search for cross-calls by specifying class name and/or method name. General usage:

```
smalisca>dxcl --help
usage: dcxl [-h] [-c CLASS_NAME] [-m METHOD_NAME] -d {to,from}
            [--max-depth [XREF_DEPTH]] [-f {dot,xdot,png,pdf,jpg,svg}]
            [--prog {dot,neato,circo,twopi,fdp,sfdp,nop}] [--args OUTPUT_ARGS]
            -o OUTPUT

>> Draw cross-calls graphs

optional arguments:
  -h, --help            show this help message and exit
  -c CLASS_NAME         Specify class name
  -m METHOD_NAME        Specify method name
  -d {to,from}          Cros-reference direction
  --max-depth [XREF_DEPTH]
                        Cross-References max depth
                        Default: 1
  -f {dot,xdot,png,pdf,jpg,svg}
                        Output format
                        Default: dot
  --prog {dot,neato,circo,twopi,fdp,sfdp,nop}
                        Graphviz layout method
                        Default: dot
  --args OUTPUT_ARGS    Additional graphviz arguments
  -o OUTPUT             Specify output file
```

Let's have a look at some examples:

```
smalisca>dxcl -c gmail/xlibs -d to --max-depth 1 -f pdf --prog dot -o /tmp/smalisca/xcalls.pdf
:: INFO       Namespace(to_class='gmail/xlibs')
:: INFO       Wrote results to /tmp/smalisca/xcalls.pdf
```

4.5.6 Screenshots

General usage

```
$ smalisca --help

$ smalisca parser -l ~/tmp/FakeBanker2/dumped/smali -s java -f sqlite  -o /tmp/fakebanker.sqlite
```

```
└─>  smalisca --help

:: Author:       Victor <Cyneox> Dorneanu
:: Desc:         Static Code Analysis tool for Smali files
:: URL:          http://nullsecurity.net, http://{blog,www}.dornea.nu
:: Version:      0.1

usage: smalisca (sub-commands ...) [options ...] {arguments ...}

[--] Static Code Analysis (SCA) tool for Baskmali (Smali) files.

commands:

  analyzer
    [--] Analyze results using an interactive prompt or on the command line.

  parser
    [--] Parse files and extract data based on Smali syntax.

optional arguments:
  -h, --help            show this help message and exit
  --debug               toggle debug output
  --quiet               suppress all output
  --log-level {debug,info,warn,error,critical}
                        Change logging level (Default: info)
  -v, --version         show program's version number and exit
```

```
└─>  smalisca parser -l ~/tmp/FakeBanker2/dumped/smali -s java -f sqlite  -o /tmp/fakebanker.sqlite

:: Author:       Victor <Cyneox> Dorneanu
:: Desc:         Static Code Analysis tool for Smali files
:: URL:          http://nullsecurity.net, http://{blog,www}.dornea.nu
:: Version:      0.1

:: INFO       Parsing .java files in /home/victor/tmp/FakeBanker2/dumped/smali ...
:: INFO       Finished parsing!
:: INFO       Exporting results to SQLite
:: INFO         Extract classes ...
:: INFO         Extract class properties ...
:: INFO         Extract class methods ...
:: INFO         Extract calls ...
:: INFO         Commit changes to SQLite DB
:: INFO         Wrote results to /tmp/fakebanker.sqlite
:: INFO       Finished scanning
```

```
└─>  ./smalisca.py analyzer -i neu.sqlite -f sqlite

:: Author:       Victor <Cyneox> Dorneanu
:: Desc:         Static Code Analysis tool for Smali files
:: URL:          http://nullsecurity.net, http://{blog,www}.dornea.nu
:: Version:      0.1

:: INFO       Successfully opened SQLite DB
:: INFO       Creating analyzer framework ...
:: INFO       Starting new analysis shell

-- Analyzer ------------------------------------------------------------
Welcome to smalisca analyzer shell.
Type ? or help to list available commands.
Type "<command> --help" for additional help.

smalisca>sc -c class_name -p com/gmail/xpack -r 10
+-----+-------------------------------+--------------+-----------------+-------+-----------------------------------------------------------------+
| id  | class_name                    | class_type   | class_package   | depth | path                                                            |
+-----+-------------------------------+--------------+-----------------+-------+-----------------------------------------------------------------+
| 1   | Lcom/gmail/xpack/R$style      | public final | Lcom.gmail.xpack | 4     | /home/victor/tmp/FakeBanker2/dumped/smali/com/gmail/xpack/R$style.java |
| 3   | Lcom/gmail/xpack/ActUpdate    | public       | Lcom.gmail.xpack | 4     | /home/victor/tmp/FakeBanker2/dumped/smali/com/gmail/xpack/ActUpdate.java |
| 89  | Lcom/gmail/xpack/R$raw        | public final | Lcom.gmail.xpack | 4     | /home/victor/tmp/FakeBanker2/dumped/smali/com/gmail/xpack/R$raw.java |
| 101 | Lcom/gmail/xpack/MainActivity$1 |              | Lcom.gmail.xpack | 4     | /home/victor/tmp/FakeBanker2/dumped/smali/com/gmail/xpack/MainActivity$1.java |
| 151 | Lcom/gmail/xpack/R            | public final | Lcom.gmail.xpack | 4     | /home/victor/tmp/FakeBanker2/dumped/smali/com/gmail/xpack/R.java |
| 168 | Lcom/gmail/xpack/BuildConfig  | public final | Lcom.gmail.xpack | 4     | /home/victor/tmp/FakeBanker2/dumped/smali/com/gmail/xpack/BuildConfig.java |
| 245 | Lcom/gmail/xpack/R$id         | public final | Lcom.gmail.xpack | 4     | /home/victor/tmp/FakeBanker2/dumped/smali/com/gmail/xpack/R$id.java |
| 268 | Lcom/gmail/xpack/R$drawable   | public final | Lcom.gmail.xpack | 4     | /home/victor/tmp/FakeBanker2/dumped/smali/com/gmail/xpack/R$drawable.java |
| 273 | Lcom/gmail/xpack/R$string     | public final | Lcom.gmail.xpack | 4     | /home/victor/tmp/FakeBanker2/dumped/smali/com/gmail/xpack/R$string.java |
| 290 | Lcom/gmail/xpack/R$layout     | public final | Lcom.gmail.xpack | 4     | /home/victor/tmp/FakeBanker2/dumped/smali/com/gmail/xpack/R$layout.java |
+-----+-------------------------------+--------------+-----------------+-------+-----------------------------------------------------------------+
smalisca>_
```

Figure 4.1: Search for classes using interactive prompt

```
smalisca>scl -fc com/gmail/xpack -x local_args,dst_args -r 30 -s dst_method
+-------+--------------------------------+-------------+--------------------------------+----------------+-------------------------+
| id    | from_class                     | from_method | dst_class                      | dst_method     | ret                     |
+-------+--------------------------------+-------------+--------------------------------+----------------+-------------------------+
| 1     | Lcom/gmail/xpack/R$style       | <init>      | Ljava/lang/Object              | <init>         | V                       |
| 10    | Lcom/gmail/xpack/ActUpdate     | doUpdate    | Landroid/content/Intent        | <init>         | V                       |
| 1742  | Lcom/gmail/xpack/R$raw         | <init>      | Ljava/lang/Object              | <init>         | V                       |
| 1811  | Lcom/gmail/xpack/MainActivity$1 | <init>      | Ljava/lang/Object              | <init>         | V                       |
| 2500  | Lcom/gmail/xpack/R             | <init>      | Ljava/lang/Object              | <init>         | V                       |
| 2824  | Lcom/gmail/xpack/BuildConfig   | <init>      | Ljava/lang/Object              | <init>         | V                       |
| 5077  | Lcom/gmail/xpack/R$id          | <init>      | Ljava/lang/Object              | <init>         | V                       |
| 5798  | Lcom/gmail/xpack/R$drawable    | <init>      | Ljava/lang/Object              | <init>         | V                       |
| 5832  | Lcom/gmail/xpack/R$string      | <init>      | Ljava/lang/Object              | <init>         | V                       |
| 5896  | Lcom/gmail/xpack/R$layout      | <init>      | Ljava/lang/Object              | <init>         | V                       |
| 5922  | Lcom/gmail/xpack/R$attr        | <init>      | Ljava/lang/Object              | <init>         | V                       |
| 6005  | Lcom/gmail/xpack/R$menu        | <init>      | Ljava/lang/Object              | <init>         | V                       |
| 6239  | Lcom/gmail/xpack/MainActivity  | <init>      | Landroid/app/Activity          | <init>         | V                       |
| 6240  | Lcom/gmail/xpack/MainActivity  | <init>      | Lcom/gmail/xpack/MainActivity$1 | <init>         | V                       |
| 8     | Lcom/gmail/xpack/ActUpdate     | <init>      | Landroid/app/Activity          | <init>         | V                       |
| 6241  | Lcom/gmail/xpack/MainActivity  | doCheckPass | Lcom/gmail/xpack/MainActivity  | findViewById   | Landroid/view/View;     |
| 6242  | Lcom/gmail/xpack/MainActivity  | doCheckPass | Lcom/gmail/xpack/MainActivity  | findViewById   | Landroid/view/View;     |
| 9     | Lcom/gmail/xpack/ActUpdate     | doUpdate    | Landroid/net/Uri               | fromParts      | Landroid/net/Uri;       |
| 6243  | Lcom/gmail/xpack/MainActivity  | doCheckPass | Landroid/widget/EditText       | getText        | Landroid/text/Editable; |
| 6246  | Lcom/gmail/xpack/MainActivity  | doCheckPass | Landroid/widget/EditText       | getText        | Landroid/text/Editable; |
| 6249  | Lcom/gmail/xpack/MainActivity  | doCheckPass | Ljava/lang/String              | length         | I                       |
| 6250  | Lcom/gmail/xpack/MainActivity  | doCheckPass | Ljava/lang/String              | length         | I                       |
| 12    | Lcom/gmail/xpack/ActUpdate     | onCreate    | Landroid/app/Activity          | onCreate       | V                       |
| 13    | Lcom/gmail/xpack/ActUpdate     | onCreate    | Lcom/gmail/xpack/ActUpdate     | setContentView | V                       |
| 6251  | Lcom/gmail/xpack/MainActivity  | doCheckPass | Lcom/gmail/xpack/MainActivity  | showDialog     | V                       |
| 11    | Lcom/gmail/xpack/ActUpdate     | doUpdate    | Lcom/gmail/xpack/ActUpdate     | startActivity  | V                       |
| 6244  | Lcom/gmail/xpack/MainActivity  | doCheckPass | Landroid/text/Editable         | toString       | Ljava/lang/String;      |
| 6247  | Lcom/gmail/xpack/MainActivity  | doCheckPass | Landroid/text/Editable         | toString       | Ljava/lang/String;      |
| 6245  | Lcom/gmail/xpack/MainActivity  | doCheckPass | Ljava/lang/String              | trim           | Ljava/lang/String;      |
| 6248  | Lcom/gmail/xpack/MainActivity  | doCheckPass | Ljava/lang/String              | trim           | Ljava/lang/String;      |
+-------+--------------------------------+-------------+--------------------------------+----------------+-------------------------+
```

Figure 4.2: Search for calls using interactive prompt

```
smalisca>help

Documented commands (type help <topic>):
----------------------------------------
dc  dcl  dxcl  help  q  quit  sc  scl  sm  sp  sxcl

smalisca>help sxcl
Search for cross calls. Type 'sxcl --help' for help.
smalisca>sxcl --help
usage: sxcl [-h] [-c CLASS_NAME] [-m METHOD_NAME] -d {to,from}
            [--max-depth [XREF_DEPTH]] [-s SORTBY] [--reverse] [-r RANGE]
            [--max-width MAX_WIDTH] [-x EXCLUDE_FIELDS]

>> Search for calls

You can apply filters by using the optional arguments.
Without any arguments the whole 'calls' table will
be printed.

optional arguments:
  -h, --help            show this help message and exit
  -c CLASS_NAME         Specify class name
  -m METHOD_NAME        Specify method name
  -d {to,from}          Cros-reference direction
  --max-depth [XREF_DEPTH]
                        Cross-References max depth
                        Default: 1
  -s SORTBY             Sort by column name
  --reverse             Reverse sort order
  -r RANGE              smecify output range by single integer or separated by ','
  --max-width MAX_WIDTH
                        Global column max width
  -x EXCLUDE_FIELDS     Exclude table fields
```

Figure 4.3: General help / usage

Analysis

Drawing

dc

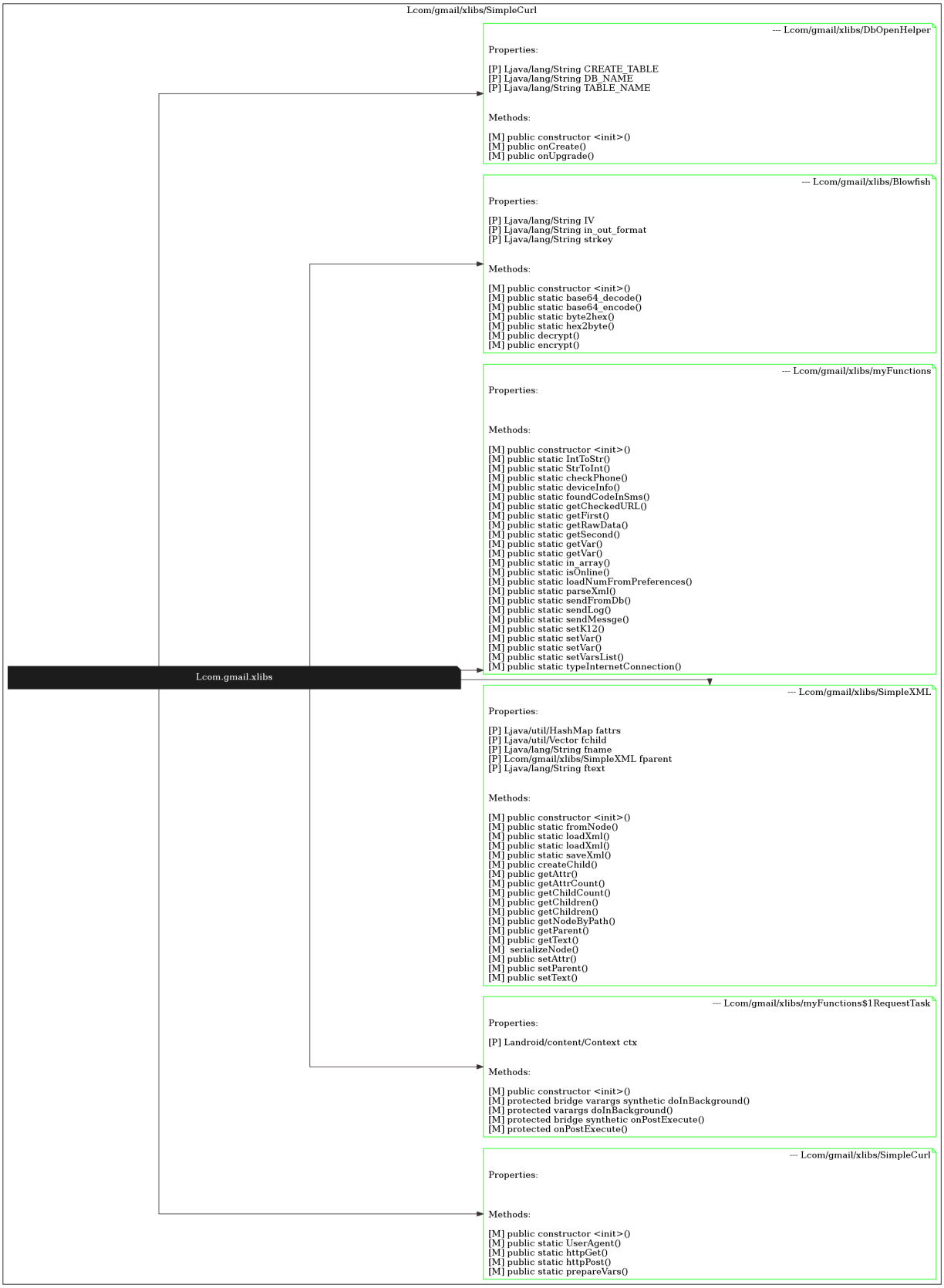
```
smalisca>dc -c class_name -p gmail/xlibs -f png --prog dot -o /tmp/smalisca/classes.png
smalisca>dc -c class_name -p gmail/xlibs -f png --prog fdp -o /tmp/smalisca/classes.png
```

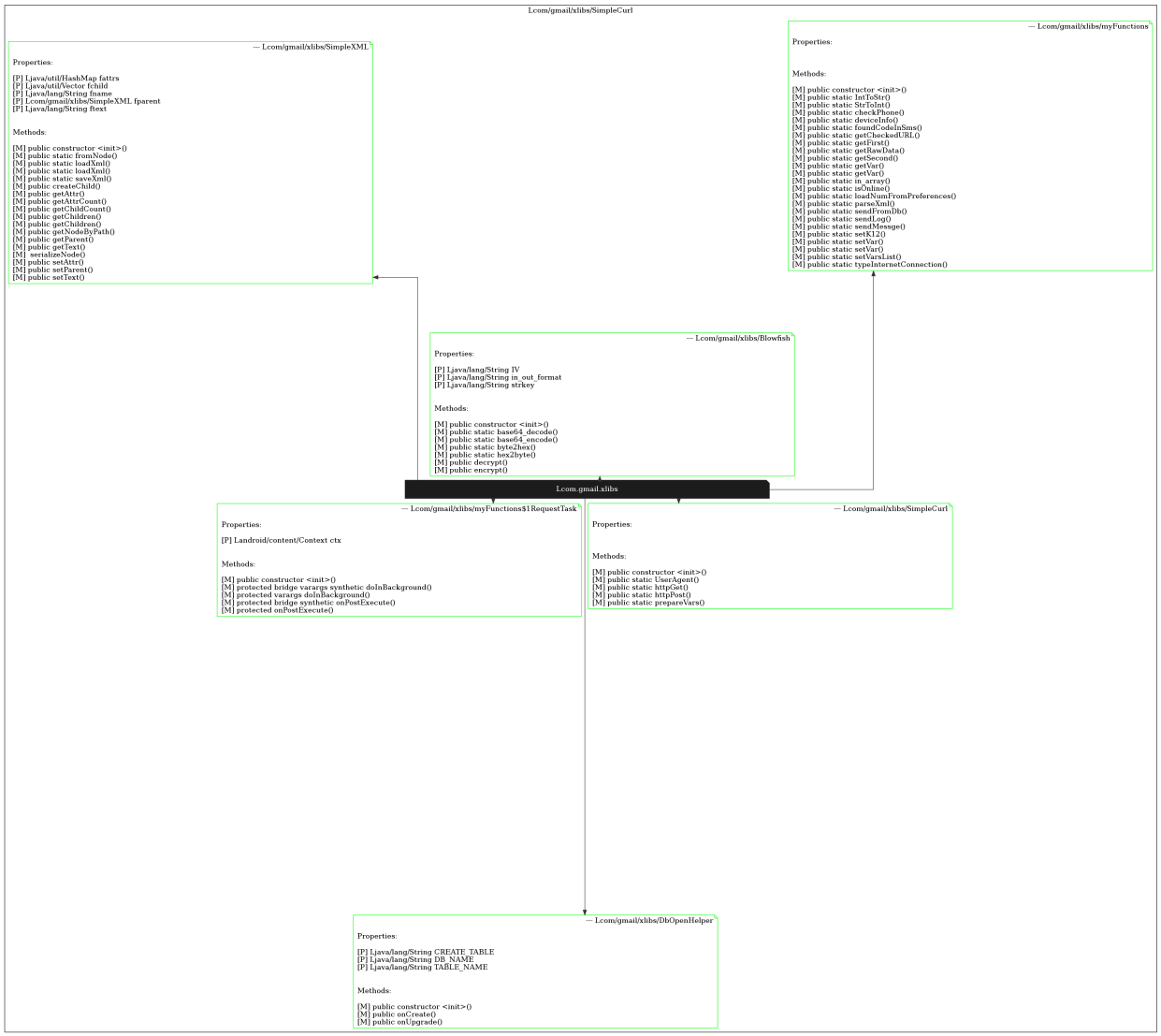
dcl

```
smalisca>dcl -fc gmail/xlibs -fm init -f png --prog dot -o /tmp/smalisca/calls.png
smalisca>dcl -fc gmail/xlibs -fm init -f png --prog fdp -o /tmp/smalisca/calls.png
```

dxcl

```
smalisca>dxcl -c gmail/xlibs -d to --max-depth 0 -f png --prog dot -o /tmp/smalisca/xcalls.png
smalisca>dxcl -c gmail/xlibs -d to --max-depth 1 -f png --prog dot -o /tmp/smalisca/xcalls.png
smalisca>dxcl -c gmail -m create -d from --max-depth 1 -f png --prog dot -o /tmp/smalisca/xcalls.png
```


Lcom/gmail/xlibs/SimpleCurl
--- Lcom/gmail/xlibs/DbOpenHelper
Properties:
[P] Ljava/lang/String CREATE_TABLE
[P] Ljava/lang/String DB_NAME
[P] Ljava/lang/String TABLE_NAME
Methods:
[M] public constructor <init>()
[M] public onCreate()
[M] public onUpgrade()
--- Lcom/gmail/xlibs/Blowfish
Properties:
[P] Ljava/lang/String IV
[P] Ljava/lang/String in_out_format
[P] Ljava/lang/String strkey
Methods:
[M] public constructor <init>()
[M] public static base64_decode()
[M] public static base64_encode()
[M] public static byte2hex()
[M] public static hex2byte()
[M] public decrypt()
[M] public encrypt()
--- Lcom/gmail/xlibs/myFunctions
Properties:
Methods:
[M] public constructor <init>()
[M] public static IntToStr()
[M] public static StrToInt()
[M] public static checkPhone()
[M] public static deviceInfo()
[M] public static foundCodeInSms()
[M] public static getCheckedURL()
[M] public static getFirst()
[M] public static getRawData()
[M] public static getSecond()
[M] public static getVar()
[M] public static getVar()
[M] public static in_array()
[M] public static isOnline()
[M] public static loadNumFromPreferences()
[M] public static parseXml()
[M] public static sendFromDb()
[M] public static sendLog()
[M] public static sendMessge()
[M] public static setK12()
[M] public static setVar()
[M] public static setVar()
[M] public static setVarsList()
[M] public static typeInternetConnection()
Lcom.gmail.xlibs
--- Lcom/gmail/xlibs/SimpleXML
Properties:
[P] Ljava/util/HashMap fattrs
[P] Ljava/util/Vector fchild
[P] Ljava/lang/String fname
[P] Lcom/gmail/xlibs/SimpleXML fparent
[P] Ljava/lang/String ftext
Methods:
[M] public constructor <init>()
[M] public static fromNode()
[M] public static loadXml()
[M] public static loadXml()
[M] public static saveXml()
[M] public createChild()
[M] public getAttr()
[M] public getAttrCount()
[M] public getChildCount()
[M] public getChildren()
[M] public getChildren()
[M] public getNodeByPath()
[M] public getParent()
[M] public getText()
[M] serializeNode()
[M] public setAttr()
[M] public setParent()
[M] public setText()
--- Lcom/gmail/xlibs/myFunctions$1RequestTask
Properties:
[P] Landroid/content/Context ctx
Methods:
[M] public constructor <init>()
[M] protected bridge varargs synthetic doInBackground()
[M] protected varargs doInBackground()
[M] protected bridge synthetic onPostExecute()
[M] protected onPostExecute()
--- Lcom/gmail/xlibs/SimpleCurl
Properties:
Methods:
[M] public constructor <init>()
[M] public static UserAgent()
[M] public static httpGet()
[M] public static httpPost()
[M] public static prepareVars()


Lcom/gmail/xlibs/SimpleCurl
--- Lcom/gmail/xlibs/SimpleXML
Properties:
[P] Ljava/util/HashMap fattrs
[P] Ljava/util/Vector fchild
[P] Ljava/lang/String fname
[P] Lcom/gmail/xlibs/SimpleXML fparent
[P] Ljava/lang/String ftext
Methods:
[M] public constructor <init>()
[M] public static fromNode()
[M] public static loadXml()
[M] public static loadXml()
[M] public static saveXml()
[M] public createChild()
[M] public getAttr()
[M] public getAttrCount()
[M] public getChildCount()
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[M] public getChildran()
[M] public getNodeByPath()
[M] public getParent()
[M] public getText()
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--- Lcom/gmail/xlibs/myFunctions
Properties:
Methods:
[M] public constructor <init>()
[M] public static IntToStr()
[M] public static StrToInt()
[M] public static checkPhone()
[M] public static deviceInfo()
[M] public static foundCodeInSms()
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[M] public static getRawData()
[M] public static getSecond()
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[M] public static getVar()
[M] public static in_array()
[M] public static isOnline()
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[M] public static setVar()
[M] public static setVar()
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[M] public static typeInternetConnection()
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Properties:
[P] Ljava/lang/String IV
[P] Ljava/lang/String in_out_format
[P] Ljava/lang/String strkey
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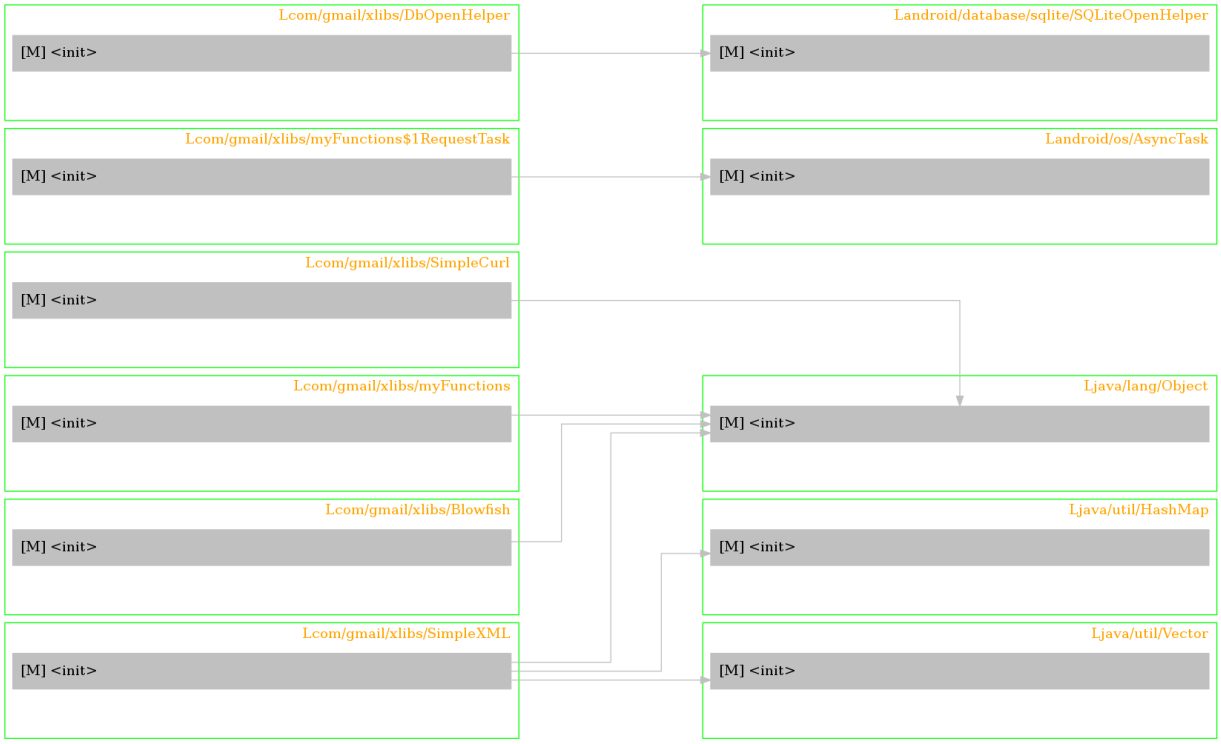
[M] public static base64_encode()
[M] public static byte2hex()
[M] public static hex2byte()
[M] public decrypt()
[M] public encrypt()
Lcom.gmail.xlibs
--- Lcom/gmail/xlibs/myFunctions$1RequestTask
Properties:
[P] Landroid/content/Context ctx
Methods:
[M] public constructor <init>()
[M] protected bridge varargs synthetic doInBackground()
[M] protected varargs doInBackground()
[M] protected bridge synthetic onPostExecute()
[M] protected onPostExecute()
--- Lcom/gmail/xlibs/SimpleCurl
Properties:
Methods:
[M] public constructor <init>()
[M] public static UserAgent()
[M] public static httpGet()
[M] public static httpPost()
[M] public static prepareVars()
--- Lcom/gmail/xlibs/DbOpenHelper
Properties:
[P] Ljava/lang/String CREATE_TABLE
[P] Ljava/lang/String DB_NAME
[P] Ljava/lang/String TABLE_NAME
Methods:
[M] public constructor <init>()
[M] public onCreate()
[M] public onUpgrade()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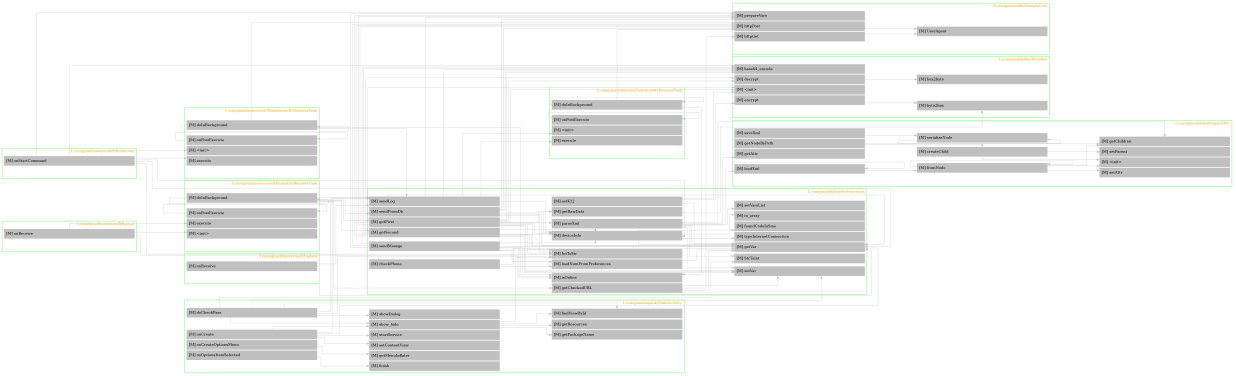

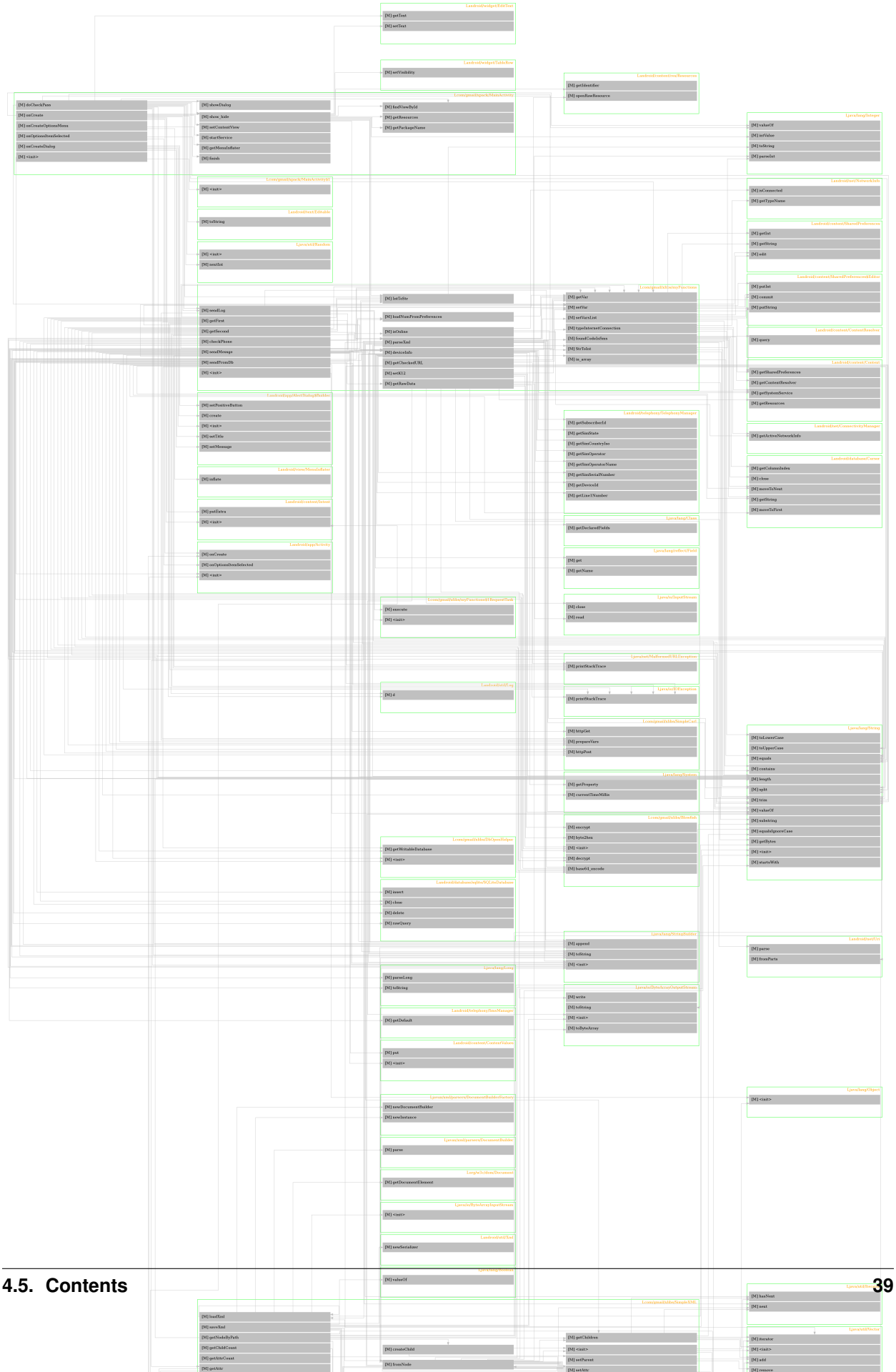
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[M] getDefault
Landroid/content/ContentValues
[M] put
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Ljava/util/Iterator
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[M] iterator
[M] <init>
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[M] remove

CHAPTER 5

Indices and tables

- *genindex*
- *modindex*
- *search*