



METerological frame**WORK**

*An opensource meteorological framework to build our
projects of tomorrow*

Meteo-France/Fabien MARTY, november 2017

who me?



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Synopsis¹ project

¹ our new operational forecasting workstation

Agenda

What is it ?

Why ?

What is our plan ?

What is it technically ?

Agenda

What is it ?

Why ?

What is our plan ?

What is it technically ?

It's software

(not servers or services)

It's a framework

So mainly tools, philosophy and
(empty) structures

(and not a "deployment ready" product)

It targets developers and sys-admins

(and not end-users)

It should be really free and open
(github)

Technically, it does already exist

Politically, it's a pre-project with a formal decision at the beginning of next year

Agenda


What is it ?

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A little bit of history...

A detailed meteorological map of Europe and the surrounding oceans. The map displays isobars (lines of equal pressure) in orange and isotherms (lines of equal temperature) in blue. Wind vectors are shown as small arrows, and various numerical values for pressure, temperature, and wind speed are scattered across the map. The map covers a large area, including the North Atlantic, the British Isles, and parts of Western Europe and North Africa.

**We are nearly at the end of the migration to our new
"cloud ready" meteorological workstation : Synopsis**

The project started in 2010 and it was a huge effort (700 man-months cumulated)



{SYNOPSIS}

Graphical User Interface

Meteorological (web) services

Meteorological framework

"Off the shelf" free softwares

So even if it wasn't completely designed for that, this
framework already exists

(inside Synopsis)

And it's already used by other internal projects

Agenda

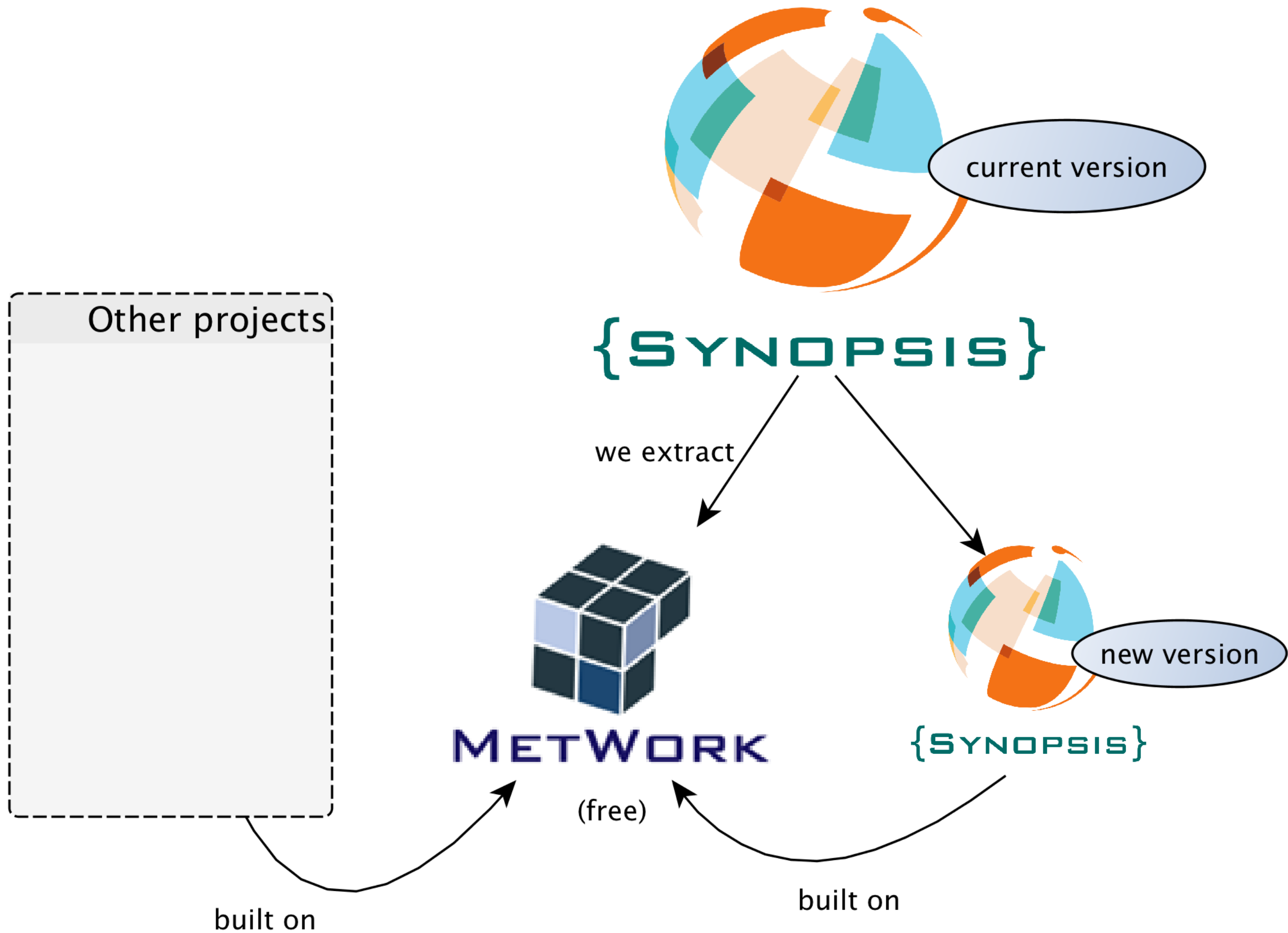
What is it ?

Why ?

What is our plan ?

What is it technically ?

So we want to release MetWork as a
real and separately maintained
product





{SYNOPSIS}

current version

Graphical User Interface

Meteorological (web) services

Meteorological framework

"Off the shelf" free softwares



{SYNOPSIS}

new version

Graphical User Interface

Meteorological (web) services

Meteorological framework

"Off the shelf" free softwares



NETWORK

(our plan, continued)

Continue to fully document the framework in english

Continue to remove remaining technical adherences
to Synopsis or to Météo-France

Leave our private github account for
a public one

at the beginning of next year



And find new users and contributors !

Because we want to collaborate internally and externally on parts...

... where it's really possible to collaborate **easily**

(like on frameworks)

Agenda

What is it ?

Why ?

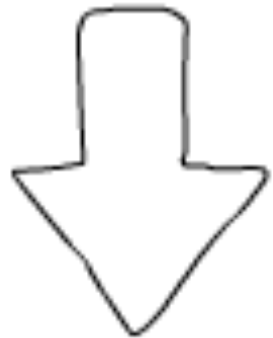
What is our plan ?

What is it technically ?

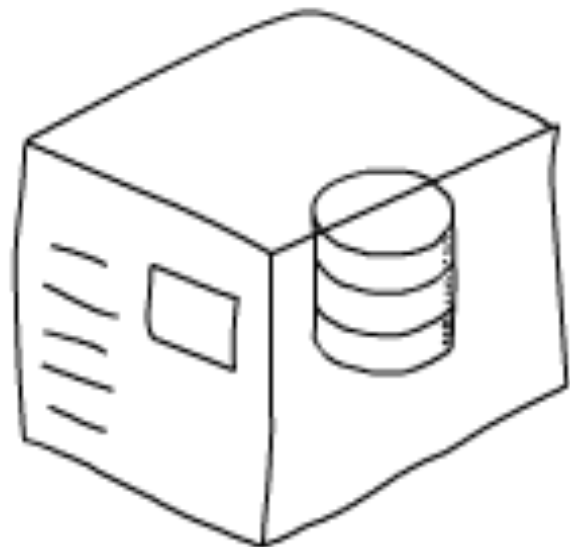
Let's return to ~~home~~ Synopsis

Architecture of Synopsis workstation

Raw datas



FTP



Synopsis servers



HTTP

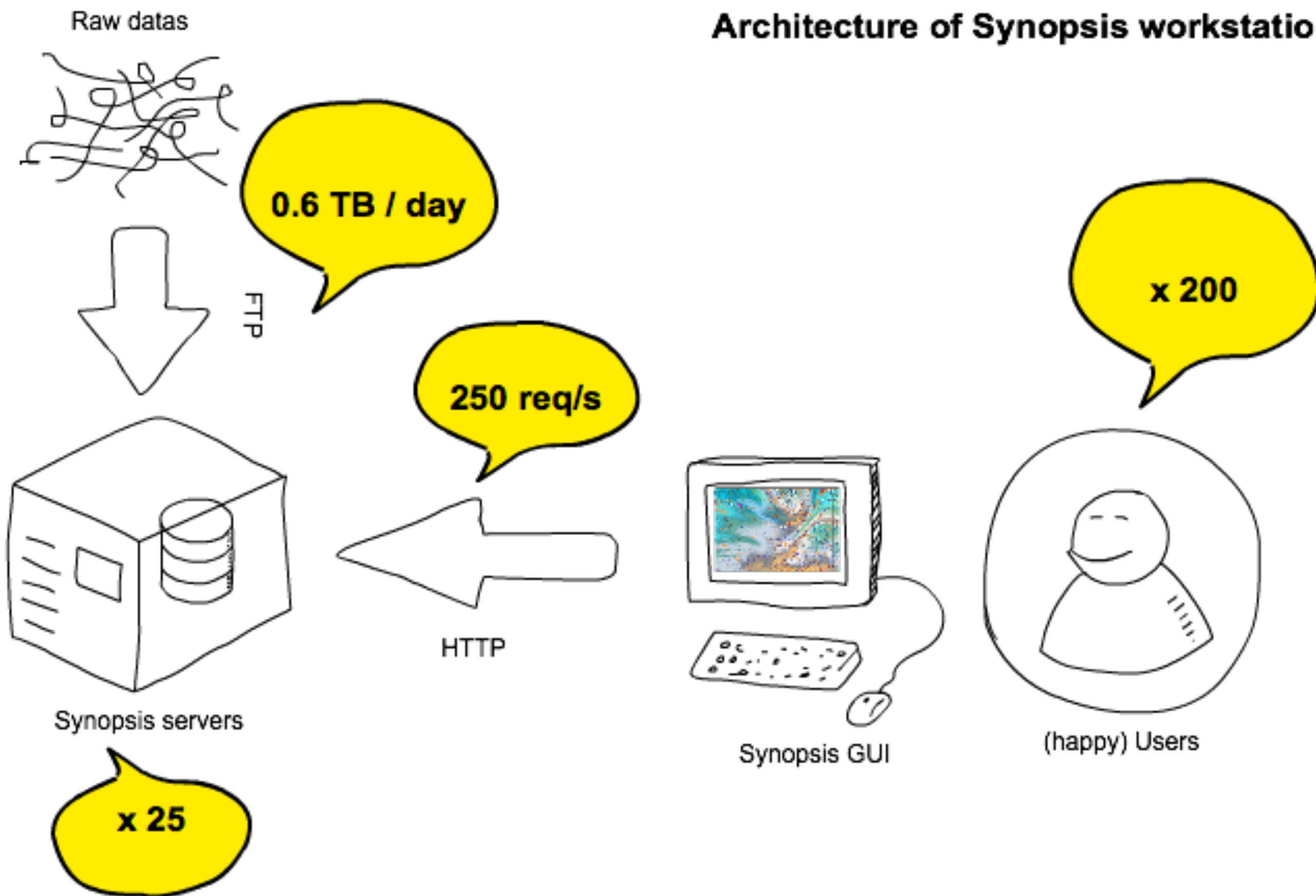


Synopsis GUI



(happy) Users

Architecture of Synopsis workstation



So MetWork is a modular Python framework with a plugin system for:

- configuring and executing custom actions on incoming files
- storing geospatial and time based datas
- implementing REST microservices (including async routing and priority/QOS system)
- with all "production ready" and "battle tested" batteries included

(of course, you can use only some parts of it if you want)

But MetWork is **NOT** a "ready to use" software

For example, MetWork can't assimilate GRIB datas by itself

(but because all necessary stuff is included, it's easy to write a python plugin to do that in the way you want)

The big MetWork picture to finish



first grade included monitoring system



"lightning fast" communication bus



(incoming) data
processing module



data storage module



(web) services module



"http router" module
(QOS, rate limiting...)



> 200 free softwares distribution
(including Magics, eccodes, numpy, gdal, postgis, Python2, Python3...)



**=> you have to provide your own logic/features as plugins
(because MetWork is just a framework)**

Agenda

What is it ?

Why ?

What is our plan ?

What is it technically ?

A grayscale photograph of a person in a classroom setting, raising their right hand. The person is wearing a dark long-sleeved shirt and has long, light-colored hair. The background is blurred, showing other people and classroom furniture. The text "Questions ?" is overlaid in the center.

Questions ?

Extra slides: demo

Demo with network/data component :

- you receive a lot of files by FTP (some of them are compressed with gzip)
- you have to filter only PNG files
- you have to convert this into JPEG
- and then send these JPEG to another machine by FTP
- **and your work must be "really production ready"**

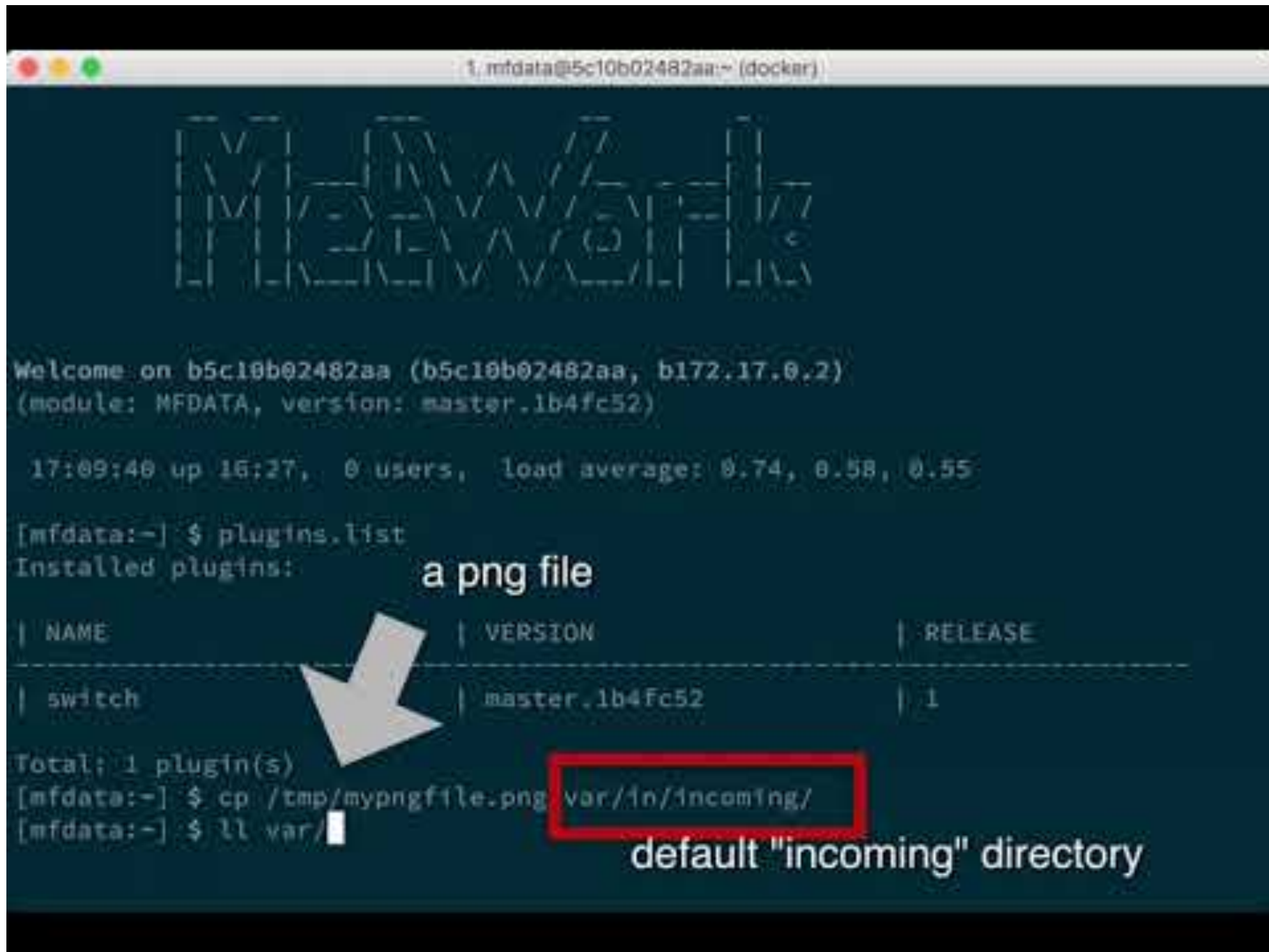
youtube videos playlist of this demo if following
embedded links don't work for you

- (1) Network installation

```
1. @5c10b02482aa ~ (docker)
[root@5c10b02482aa ~]# ll
total 138268
-rwxr-xr-x 1 root root 1318876 Oct  5 14:12 network-mcom-master-84.x86_64.rpm
-rwxr-xr-x 1 root root 1518106 Oct  5 14:12 network-mfdm-master-146.x86_64.rpm
-rwxr-xr-x 1 root root 130555452 Oct  5 14:12 network-mfext-master-76.x86_64.rpm
[root@5c10b02482aa ~]# rpm -Uvh *.rpm
Preparing...
1:network-mfext
```

No questions, just install a bunch of RPMs packages

- (2) Just a silly test



```
1. mfddata@5c10b02482aa:~ (docker)

Welcome on b5c10b02482aa (b5c10b02482aa, b172.17.0.2)
(module: MFDATA, version: master.1b4fc52)

17:09:40 up 16:27,  0 users,  load average: 0.74, 0.58, 0.55

[mfddata:~] $ plugins.list
Installed plugins:

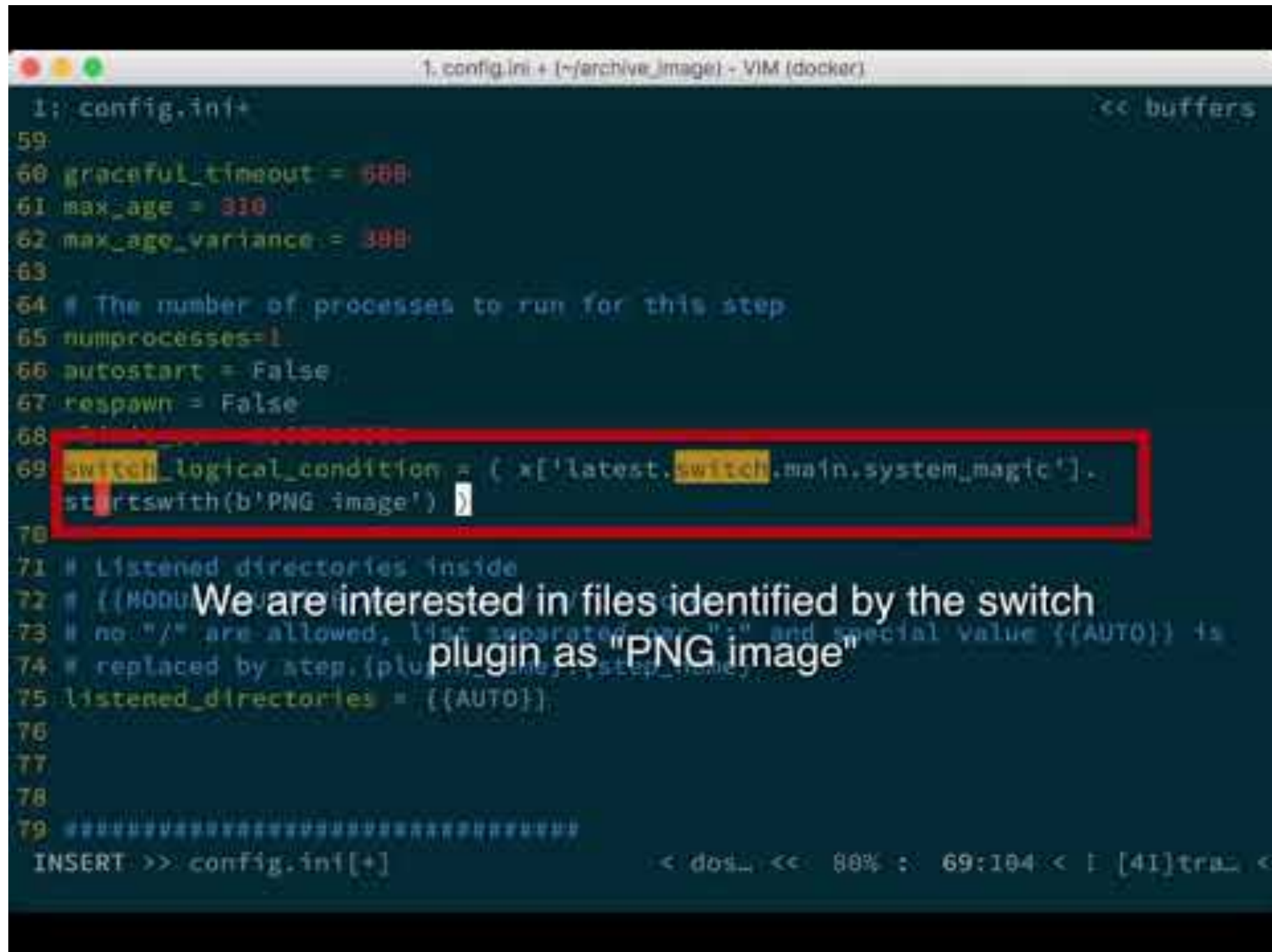
| NAME          | VERSION          | RELEASE |
| switch        | master.1b4fc52   | 1       |

Total: 1 plugin(s)
[mfddata:~] $ cp /tmp/mypngfile.png var/in/incoming/
[mfddata:~] $ ll var/
```

a png file

default "incoming" directory

- (3) Our first plugin



```
1. config.ini + [~/archive_image] - VIM (docker)
1: config.ini+
59
60 graceful_timeout = 600
61 max_age = 310
62 max_age_variance = 300
63
64 # The number of processes to run for this step
65 numprocesses=1
66 autostart = False
67 respawn = False
68
69 switch_logical_condition = ( x['latest.switch.main.system_magic'].
70     startswith(b'PNG image') )
71
72 # Listed directories inside
73 # no "/" are allowed, list separated by ":" and special value {{AUTO}} is
74 # replaced by step.{plugin_name}:{step_name}
75 listened_directories = [{{AUTO}}]
76
77
78
79 #####
INSERT >> config.ini[+] 88% : 69:104 < | [4I]tra <
```

We are interested in files identified by the switch plugin as "PNG image"

- (4) **ungzip** plugin

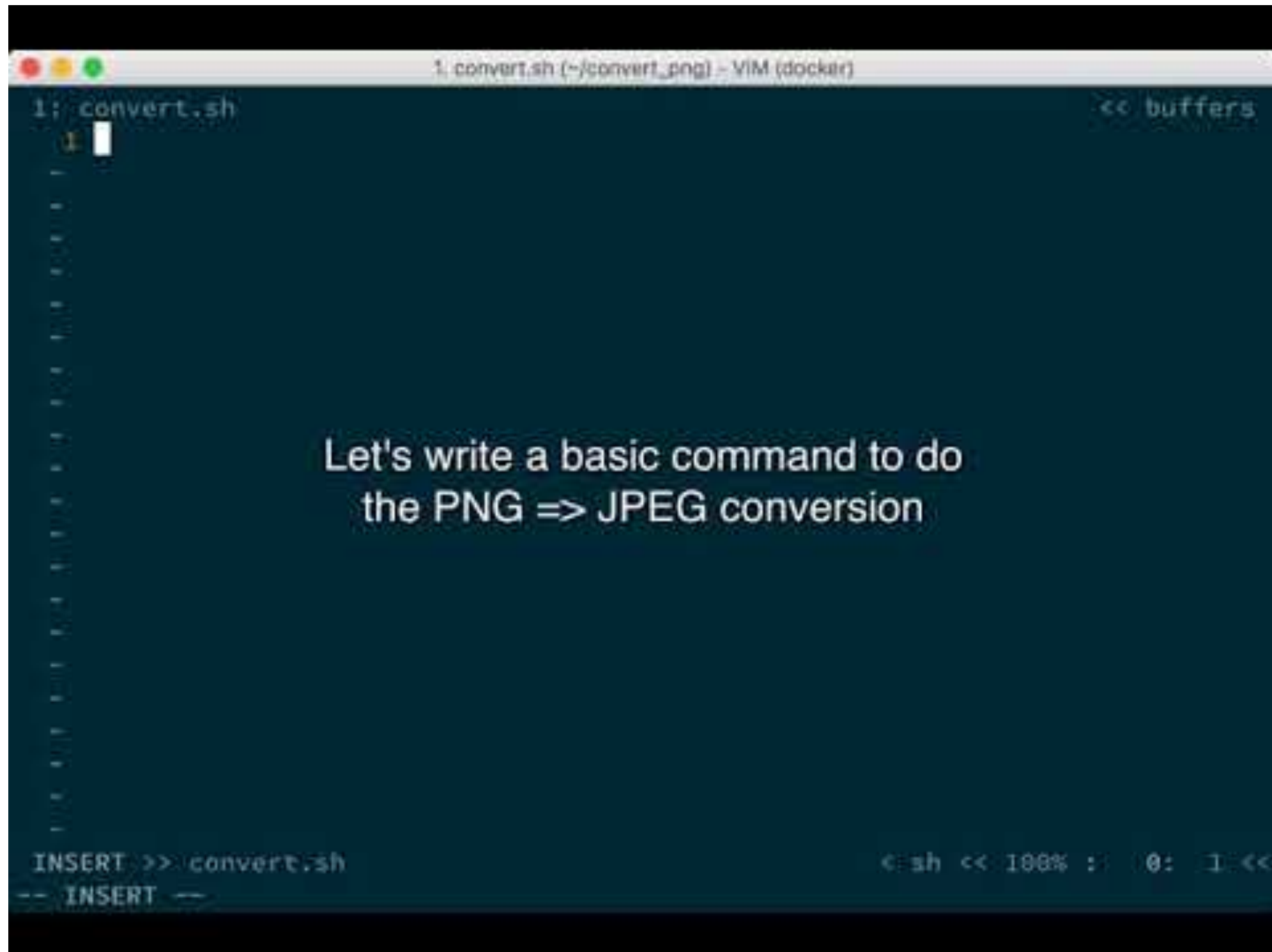
```
1 mfddata@5c10b02482aa:~ (docker)
[mfddata:~] $ plugins.list
Installed plugins:

| NAME                | VERSION                | RELEASE |
|-----|-----|-----|
| ungzip               | master.1b4fc52         | 1        |
| archive_image       | dev_link               | dev_link |
| archive_image       | dev_link               | dev_link |

Total: 3 plugin(s)
[mfddata:~] $ cp /tmp/
```

Le'ts reinject our compressed PNG file

- (5) convert plugin



```
1: convert.sh (~/.convert_png) - VIM (docker)
1: convert.sh
2
3
4
5
6
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13
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15
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17
18
19

Let's write a basic command to do
the PNG => JPEG conversion

INSERT >>> convert.sh
-- INSERT --
c:sh << 100% : 0: 1 <<
```

- (6) ftpsend plugin

```
1. mfddata@5c10b02482aa:~ (docker)
[mfddata:~] $ bootstrap_plugin.py create --template=ftpsend ftpsend_to_mybox
INFO : The plugin ftpsend_to_mybox is correctly create with the template ftpsend
[mfddata:~] $ cd ftpsend_to_mybox/
[mfddata:~/ftpsend_to_mybox] $ ls
config.ini  Makefile  reinject.py  send.py
[mfddata:~/ftpsend_to_mybox] $ vi config.ini
[mfddata:~/ftpsend_to_mybox] $ make develop
_plugins.develop ftpsend_to_mybox
[mfddata:~/ftpsend_to_mybox] $ cd ..
total 16
-rw-r--r-- 1 mfddata network 3136 Oct  5 19:01 config.ini
-rw-r--r-- 1 mfddata network   38 Oct  5 19:01 Makefile
-rwxr-xr-x 1 mfddata network  294 Oct  5 19:01 reinject.py
-rwxr-xr-x 1 mfddata network 3917 Oct  5 19:01 send.py
[mfddata:~/ftpsend_to_mybox] $ cd ..
[mfddata:~] $ ll
total 28
drwxr-xr-x 2 mfddata network 4096 Oct  5 18:50 archive_image
drwxr-xr-x 3 mfddata network 4096 Oct  5 17:13 config
drwxr-xr-x 2 mfddata network 4096 Oct  5 18:54 convert_png
drwxr-xr-x 2 mfddata network 4096 Oct  5 19:01 ftpsend_to_mybox
drwxr-xr-x 2 mfddata network 4096 Oct  5 18:59 log
drwxr-xr-x 4 mfddata network 4096 Oct  5 19:01 tmp
drwxr-xr-x 6 mfddata network 4096 Oct  5 15:46 var
[mfddata:~] $ cd c
```

Now, let's change the "convert_png" plugin to feed our new "ftpsend_to_mybox" plugin

- (7) release !

```
1, mfddata@5c10b02482aa:~/convert_png [docker]
+ test -d /home/mfddata/tmp/plugin/BUILDROOT/convert_png-master.1b4fc52-1.x86_64/
network_plugin/convert_png/bin
+ test -f /home/mfddata/tmp/plugin/BUILDROOT/convert_png-master.1b4fc52-1.x86_64/
network_plugin/main.py
+ /opt/network-mfext/opt/rpm/lib/rpm/brp-compress
+ /opt/network-mfext/opt/rpm/lib/rpm/brp-strip /usr/bin/strip
+ /opt/network-mfext/opt/rpm/lib/rpm/brp-strip-static-archive /usr/bin/strip
+ /opt/network-mfext/opt/rpm/lib/rpm/brp-strip-comment-note /usr/bin/strip /usr/
bin/objdump
Processing files: convert_png-master.1b4fc52-1.x86_64
Requires(rpmlib): rpmlib(PayloadFilesHavePrefix) <= 4.8-1 rpmlib(CompressedFileN
ames) <= 3.8.4-1
Checking for unpackaged file(s): /opt/network-mfext/opt/rpm/lib/rpm/check-files
/home/mfddata/tmp/plugin/BUILDROOT/convert_png-master.1b4fc52-1.x86_64
Wrote: /home/mfddata/tmp/plugin/RPMS/x86_64/convert_png-master.1b4fc52-1.x86_64.r
pm
Executing(%clean): /bin/sh -e /var/tmp/rpm-tmp.IZYn4m
+ umask 022
+ cd /home/mfddata/tmp/plugin/BUILDROOT/convert_png-master.1b4fc52-1.x86_64/
+ rm -fr /home/mfddata/tmp/plugin/BUILDROOT/convert_png-master.1b4fc52-1.x86_64
+ exit 0

/home/mfddata/convert_png/convert_png-master.1b4fc52-1.network.mfddata.plugin is r
eady
[mfddata:~/convert_png] $ cp
```


- (8) deploy !

```
1. mfddata@5c10b02482aa:~/released_plugins (docker)

| switch | master.1b4fc52 | 1

Total: 1 plugin(s)
[mfddata:~/released_plugins] $ ll
total 20
-rw-r--r-- 1 mfddata network 4269 Oct  5 19:07 convert_png-master.1b4fc52-1.network.mfddata.plugin
-rw-r--r-- 1 mfddata network 5142 Oct  5 19:07 ftpsend_to_mybox-master.1b4fc52-1.network.mfddata.plugin
-rw-r--r-- 1 mfddata network 3704 Oct  5 19:09 ungzip-master.1b4fc52-1.network.mfddata.plugin
[mfddata:~/released_plugins] $ plugins:install ungzip-master.1b4fc52-1.network.mfddata.plugin
Preparing... ##### [100%]
1:ungzip ##### [100%]
[mfddata:~/released_plugins] $ plugins:install convert_png-master.1b4fc52-1.network.mfddata.plugin
Preparing... ##### [100%]
1:convert_png ##### [100%]
[mfddata:~/released_plugins] $ plugins:install ftpsend_to_mybox-master.1b4fc52-1.network.mfddata.plugin
Preparing... ##### [100%]
1:ftpsend_to_mybox ##### [100%]
[mfddata:~/released_plugins] $ plug
```