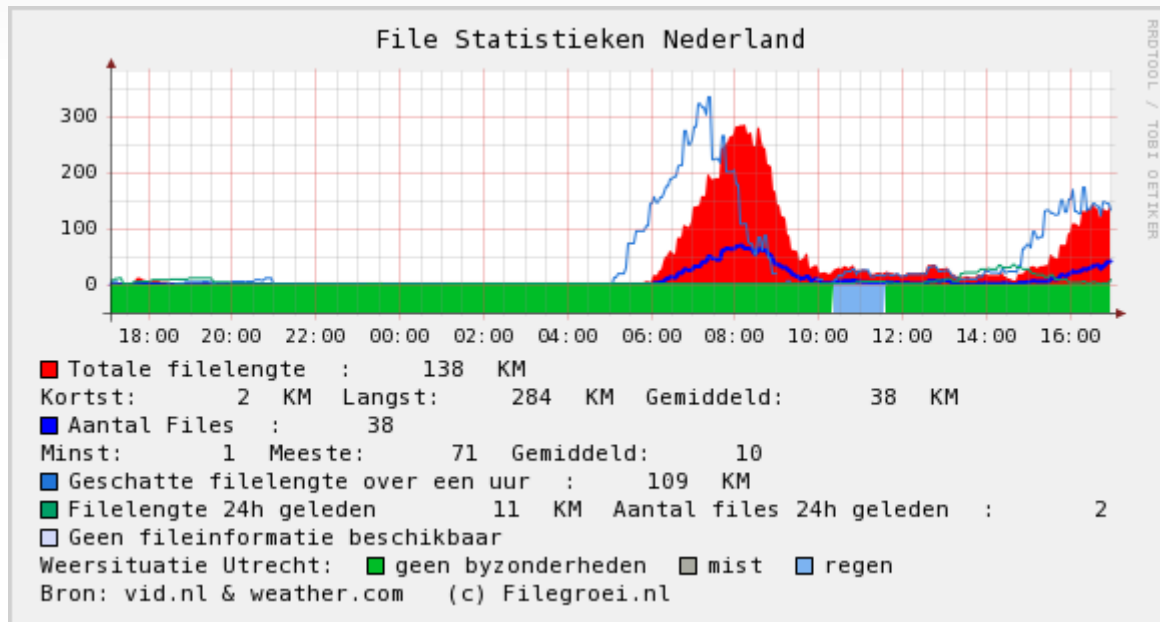


RRDTool @ Optiver Europe



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Introduction

- A few words about Optiver
- What is RRDTool
- Where do we use it within Optiver?
- Using RRDTool in a special way.
- RRDTool demonstration...

Optiver in a Nutshell

The logo for Optiver, featuring the word "optiver" in a lowercase, sans-serif font, followed by a red triangle symbol.

**Optiver is a proprietary trading company.
As a market maker, we price and trade financial products.
We do this 24 hours a day at our own risk and using our own capital.**

The dynamic industry in which we operate means that state-of-the-art IT is as vital to us as the skills of our traders. Real time efforts equate to real time results, therefore we foster an environment of creativity, ambition and commitment to excellence.

The logo for Optiver, featuring the word "optiver" in a lowercase, sans-serif font, followed by a red triangle symbol.

Example

- `$ rrdtool create test.rrd --start 920804400 \
DS:speed:COUNTER:600:U:U RRA:AVERAGE:0.5:1:24 \
RRA:AVERAGE:0.5:6:10`
- `$ rrdtool update test.rrd 920804700:12345 920805000:12357 \
920805300:12363 && rrdtool update test.rrd 920805600:12363
920805900:12363 \ 920806200:12373`
- `$ rrdtool fetch test.rrd AVERAGE --start 920804400 --end
920809200`
- `$ rrdtool graph speed.png --start 920804400 --end 920808000 \
DEF:myspeed=test.rrd:speed:AVERAGE LINE2:myspeed#FF0000`

What is RRDTool

- OpenSource industry standard, high performance data logging and graphing system for time series data.
- Easily integrated in shell scripts, perl, python, ruby, lua or tcl applications.

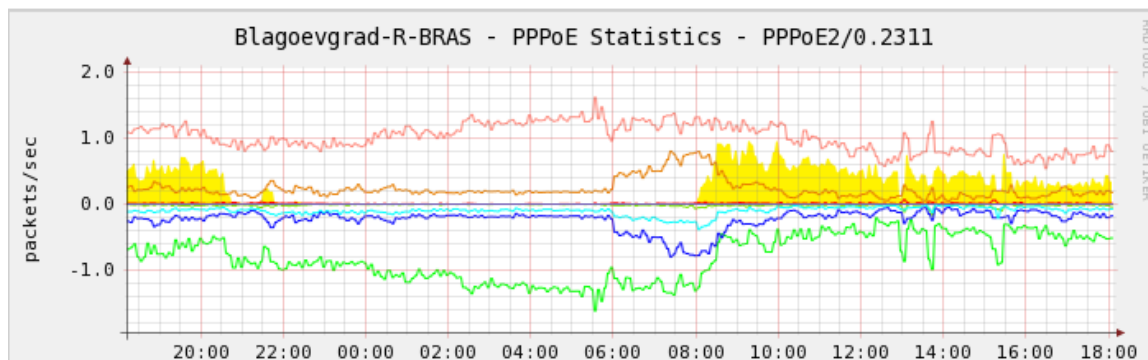
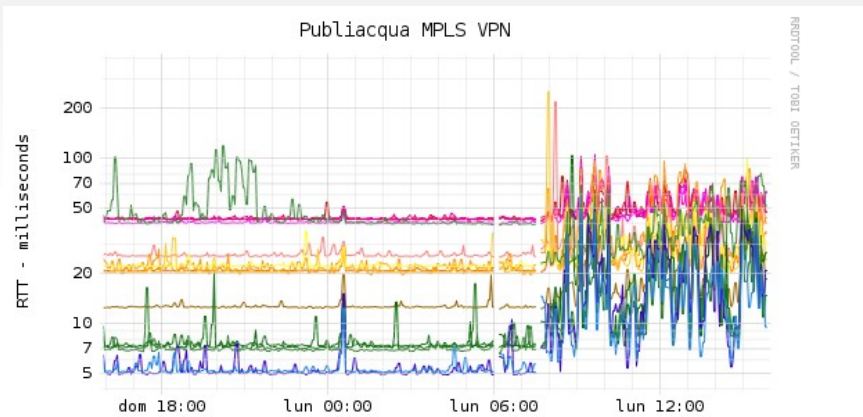
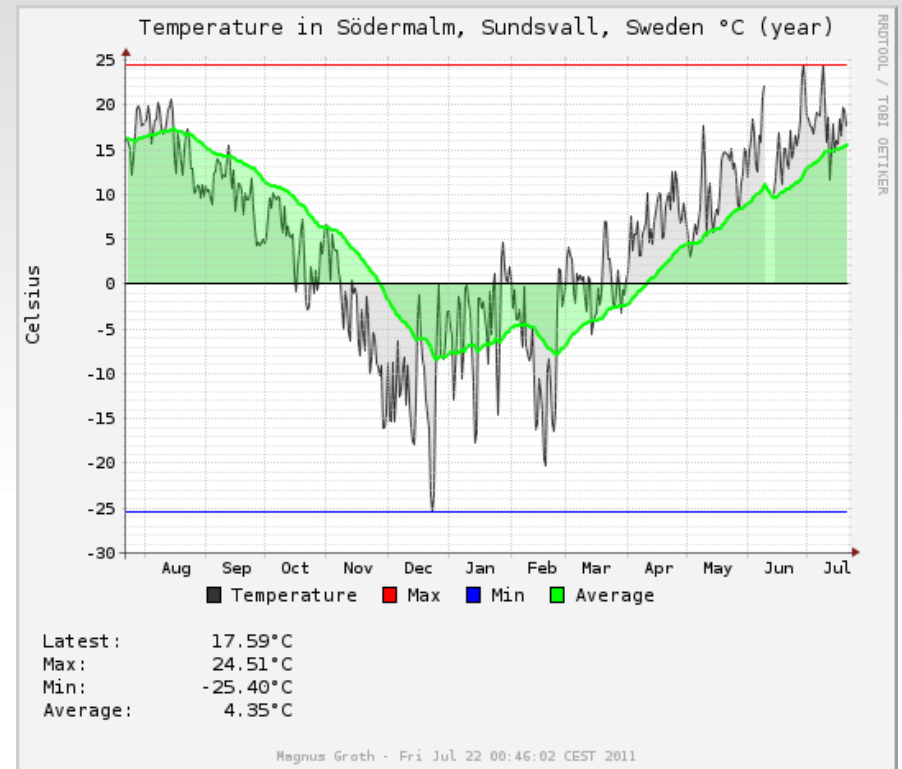
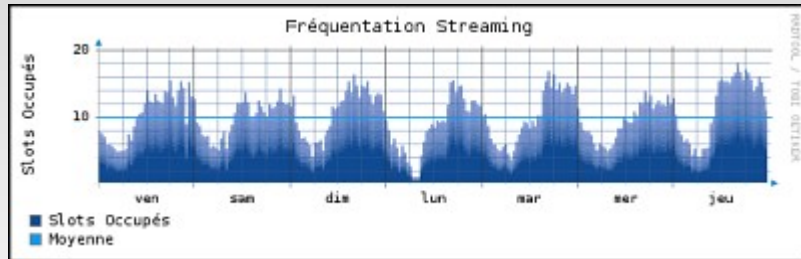


RRDTool is written by:

Tobias Oetiker

optiver 

How does it look like?



The pro's

- Databases have a fixed size.
- Data inserts are is very fast.
- The desired results are calculated upfront.
- Averages and other features build-in.

The Cons

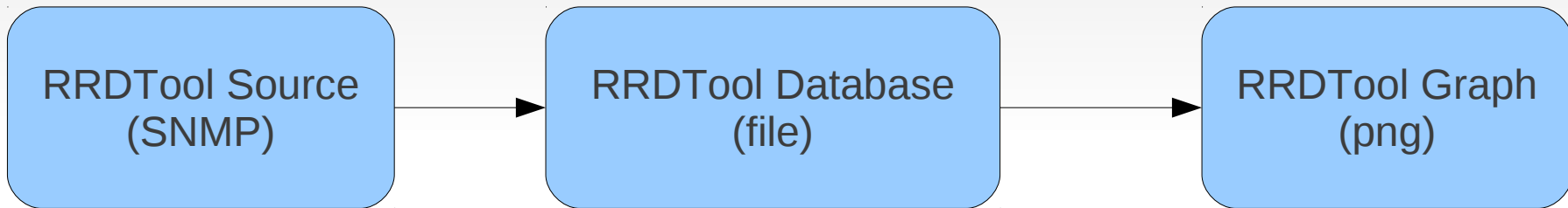
- Database has fixed size
(no typo, creating 10000 empty databases could easily take up a lot of disk-space)
- Every database is stored in single file
(combining is possible, but not very much done if end result is not combined).
- Needs a backend generator for displaying.
- Data degrades over time (if set).

RRDTool @ Optiver

- Within our Monitoring Software (Nagios).
- 3th party equipment (embedded).
- Datawall and reporting engines.
- Trading statistics.

Using RRDTool ``special''

Normal Flow

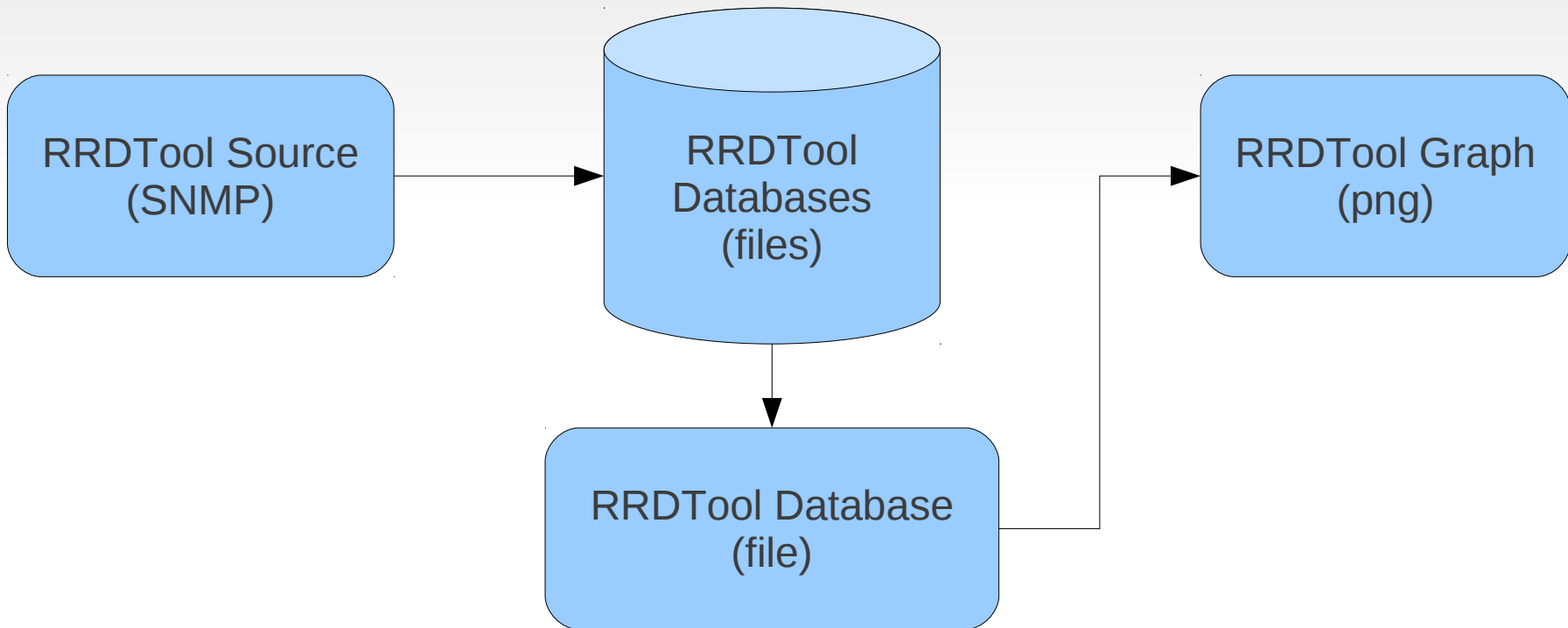


We needed a graph of a graph.

- Error counters are stored per interface (per file), but we needed a graph which displays all errors on the interfaces.
- We cannot query data sources twice due to speed constrains (we design stuff to be really fast and without extra).
- We want to map technical details to business process statistics.

Using RRDTool ``special''

Special Flow



Demo Time

```
$ rrdtool create ...  
$ rrdtool update ...  
$ rrdtool fetch ...  
$ rrdtool graph ...
```

```
rvdzwet@rvdzwet-MacBookPro: ~  
#!/bin/sh  
#  
# http://oss.oetiker.ch/rrdtool/tut/rrdtutorial.en.html  
#  
rrdtool create test.rrd \\\n    --start 920804400 \\\n    DS:speed:COUNTER:600:U:U \\\n    RRA:AVERAGE:0.5:1:24 \\\n    RRA:AVERAGE:0.5:6:10  
rrdtool update test.rrd 920804700:12345 920805000:12357 920805300:12363  
rrdtool update test.rrd 920805600:12363 920805900:12363 920806200:12373  
rrdtool update test.rrd 920806500:12383 920806800:12393 920807100:12399  
rrdtool update test.rrd 920807400:12405 920807700:12411 920808000:12415  
rrdtool update test.rrd 920808300:12420 920808600:12422 920808900:12423  
rrdtool fetch test.rrd AVERAGE --start 920804400 --end 920809200  
rrdtool graph speed.png \\\n    --start 920804400 --end 920808000 \\\n    DEF:nyspeed=test.rrd:speed:AVERAGE \\\n    LINE2:nyspeed#FF0000  
rrdtool graph speed2.png \\\n    --start 920804400 --end 920808000 \\\n    --vertical-label m/s \\\n    DEF:nyspeed=test.rrd:speed:AVERAGE \\\n    CDEF:realspeed=nyspeed,1000,* \\\n    LINE2:realspeed#FF0000  
rrdtool graph speed3.png \\\n    --start 920804400 --end 920808000 \\\n    --vertical-label km/h \\\n    DEF:nyspeed=test.rrd:speed:AVERAGE \\\n    "CDEF:kmh=nyspeed,3600,*" \\\n    CDEF:fast=kmh,100,GT,kmh,0,IF \\\n    CDEF:good=kmh,100,GT,0,kmh,IF \\\n    HRULE:100#0000FF:"Maximum allowed" \\\n    AREA:good#00FF00:"Good speed" \\\n    AREA:fast#FF0000:"Too fast"  
rrdtool graph speed4.png \\\n    --start 920804400 --end 920808000 \\\n    --vertical-label km/h \\\n    DEF:nyspeed=test.rrd:speed:AVERAGE \\\n    CDEF:nonans=nyspeed,UN,0,nyspeed,IF \\\n    CDEF:kmh=nonans,3600,* \\\n    CDEF:fast=kmh,100,GT,100,0,IF \\\n    CDEF:over=kmh,100,GT,kmh,100,-,0,IF \\\n    CDEF:good=kmh,100,GT,0,kmh,IF \\\n    HRULE:100#0000FF:"Maximum allowed" \\\n    AREA:good#00FF00:"Good speed" \\\n    AREA:fast#550000:"Too fast" \\\n    STACK:over#FF0000:"Over speed"  
4,1 Top
```



Thanks & Summary

- Use RRDTool to provide graphs on places where want pretty static graphs.
- Re-use your RRDTool data if you do not want to query your systems twice.
- Please do mind that your RRDTool data ``degrades'' over time, so please do mind to set your resolution right.