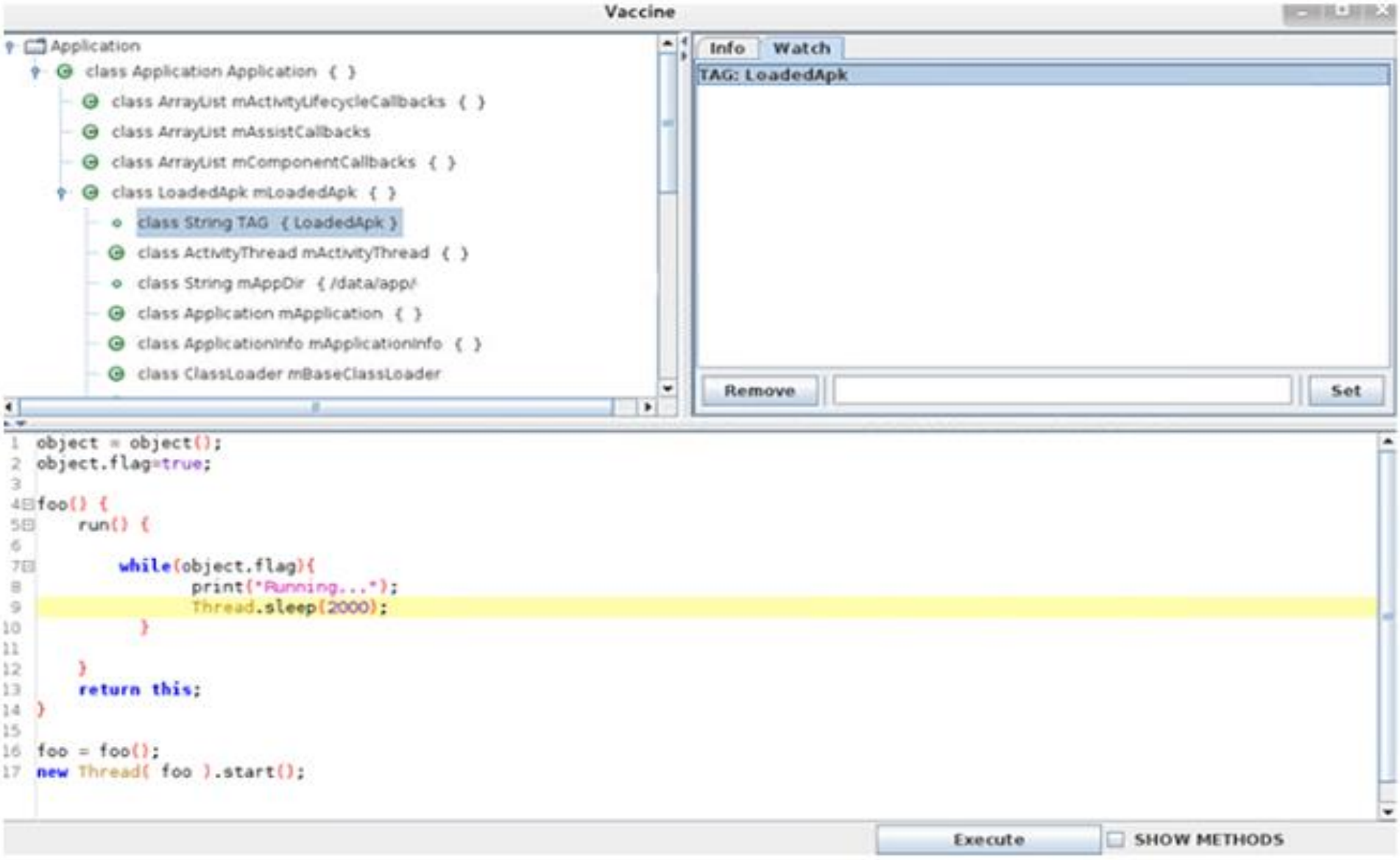
Visualizing Wi-Fi Packets the Hacker's Way

Milan Gabor

#/viris[# *]

DEEPSEC

Blast from the past




OUR
TERMS
PLEASE
READ
Wi Fi

Agenda

insert into elasticsearch (E) logstash (L) kibana (K) values

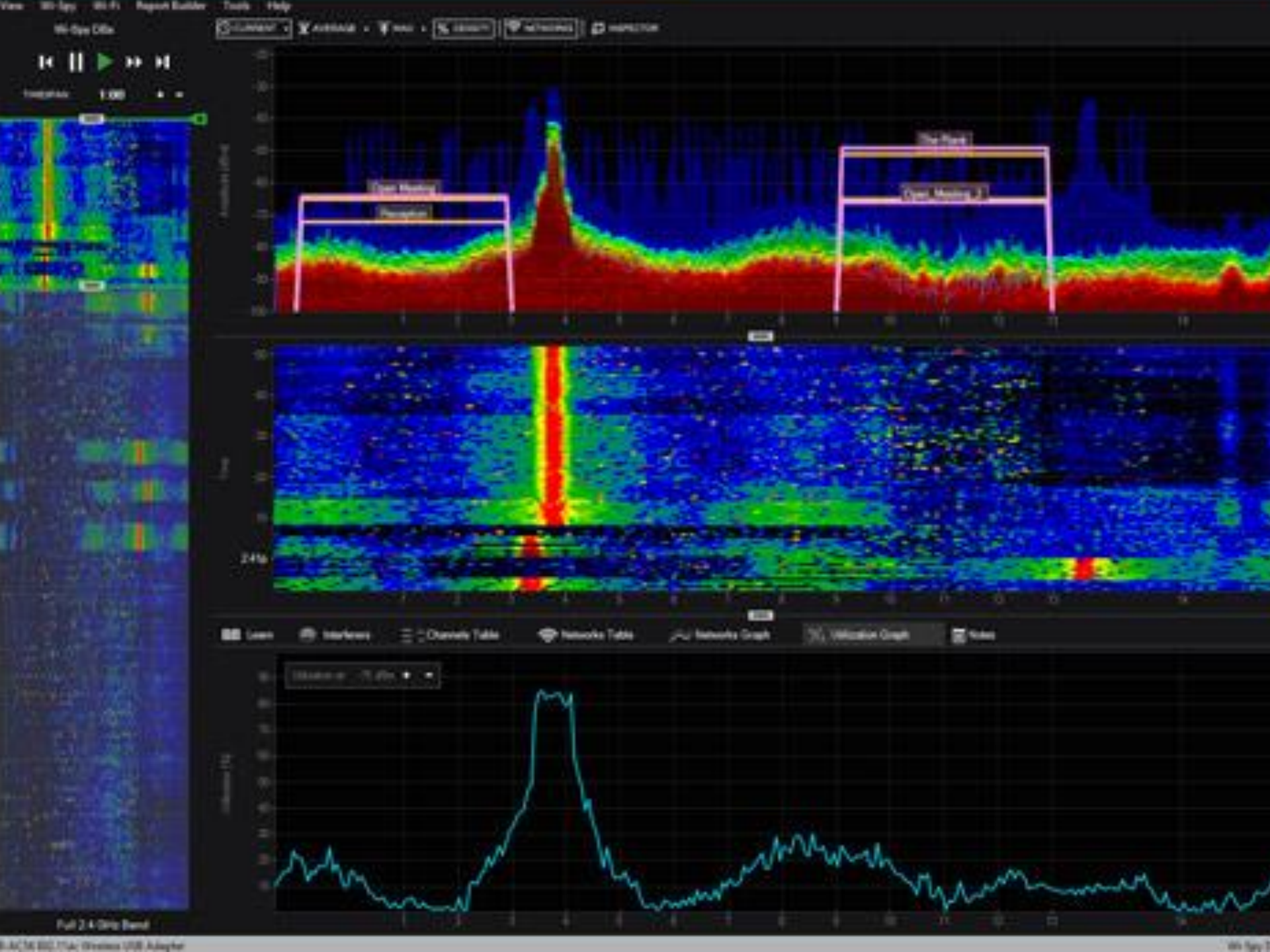
select * from Wi-fi packets;

create view

where Bigdata = strange patterns

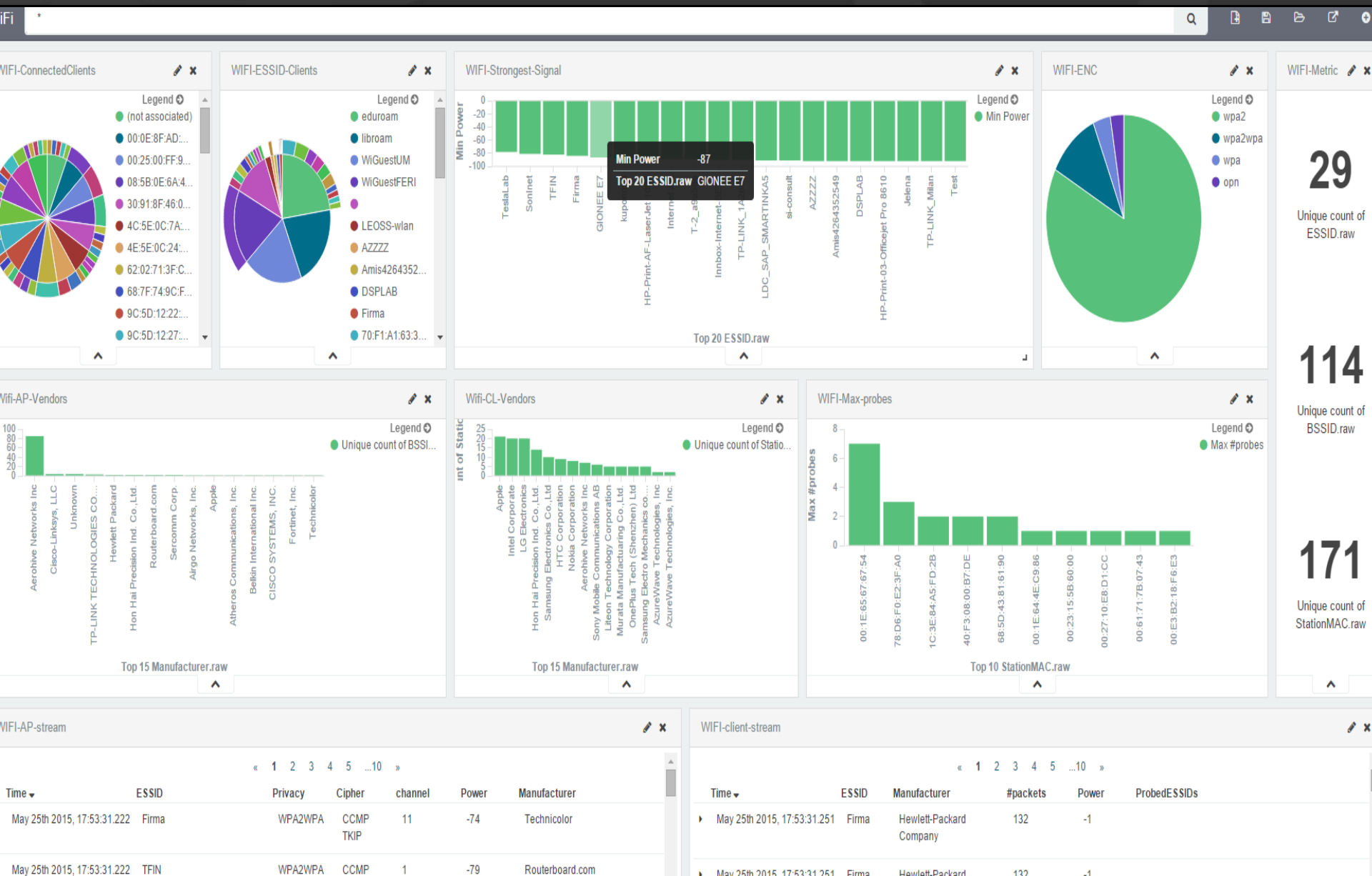
++ Ideas;


problem
problem
problem
problem
problem
problem
problem
problem
problem
problem
solution

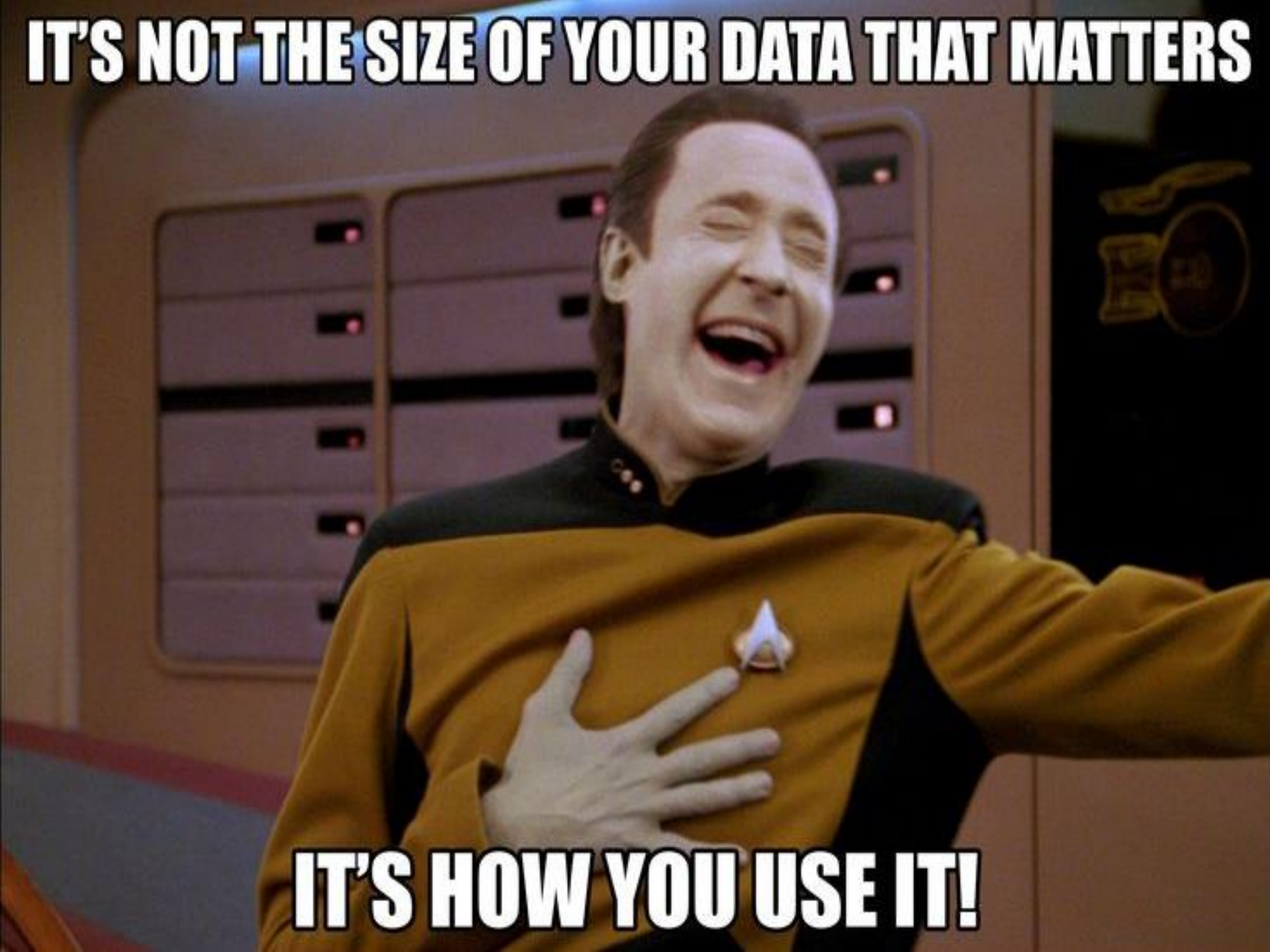

Open Meeting
Reception
The Plank
Open Meeting 2
Learn
Interferers
Channels Table
Networks Table
Networks Graph
Utilization Graph
Notes
Full 2.4 GHz Band


FREE
WiFi
AVAILABLE
Solve this for
WiFi Password
$f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos\frac{n\pi x}{L} + b_n \sin\frac{n\pi x}{L}\right)$

Transformation




computing
semi-structured
algorithms
classification
a/b
complexity
collection
data
storage
set
parallel
technology
methodology
regression
statistics
sharing
big
data
trend
complex
quintillion
billion
millions
devices
visualiza
cameras
permutations
networks
time series analysis
information
traditional
mpp
finance
large
business
information
velocity
private
sector


IT'S NOT THE SIZE OF YOUR DATA THAT MATTERS
IT'S HOW YOU USE IT!


WELCOME TO
REALITY
ENJOY THE JOURNEY

```
CH  6 ][ Elapsed: 1 min ][ 2010-07-18 14:53

BSSID              PWR RXQ  Beacons    #Data, #/s  CH  MB   ENC  CIPHER AUTH ESSID

00:1B:11:91:70:BA    0   2       34        0    0   6  54 . WEP  WEP         Cortesi
00:1F:C6:51:63:9C    0   0        4       14    0   6  54   WEP  WEP         CONY
00:19:5B:8A:1C:F6    0   0        9        0    0   6  54 . WEP  WEP         samissions2
00:1B:FC:6B:6B:76    0   0       22      470    6   6  54   WEP  WEP         CONSTANZA1
00:15:E9:E1:F6:23    0  63      212        0    0   6  54 . WEP  WEP         www.conocechile.cl
00:0F:3D:5A:CE:42    0   6       92        4    0   6  54 . WEP  WEP         REDRSM
00:02:CF:95:55:EB    0  39      344        2    0   6  54 . WEP  WEP         PABLO
00:22:B0:43:4E:C7    0  35      270        0    0   6  54 . WEP  WEP         vecinos
00:A0:C5:F9:D8:C2    0  49      394        0    0   6  11   WEP  WEP         Pilar
00:1B:11:90:82:E4    0  37      381        0    0   6  54 . WEP  WEP         learn
00:02:CF:95:47:EA    0  48      377        0    0   6  54 . WEP  WEP         loretito
00:18:39:71:F9:78    0   3       60        3    0   6  54   WEP  WEP         Fabulosa
00:21:91:4D:84:6E    0  43      344        0    0   6  54e  WEP  WEP         QQ
00:1F:33:2F:1B:E8    0   0       34        0    0   6  54e  WEP  WEP         RoomApart
00:1B:11:24:D3:91    0  38      400        5    0   6  54 . WEP  WEP         samissions
00:1F:C6:71:D1:9A    0  38      132     4603   47   6  54   WEP  WEP         natcam
00:17:9A:5A:BA:E1    0   0        4        0    0   6  54 . WEP  WEP         buenavista5
00:17:9A:62:EF:11    0   0        6        0    0   6  54 . WEP  WEP         jorge
00:02:CF:95:55:BD    0   0        4        0    0   6  54 . WEP  WEP         Casa
00:1A:73:B4:00:74    0   0        0        2    0 133  -1   WEP  WEP         <length:  0>

BSSID              STATION            PWR   Rate    Lost  Packets  Probes

(not associated)   2C:A8:35:A8:6B:9D    0    0 - 2      0        5  morazan,Rep. Dominicana
(not associated)   00:23:7A:D9:0A:81    0    0 - 2      0        1  Defran
(not associated)   0C:EE:E6:9E:36:54    0    0 - 1      0        1  cpereira
(not associated)   00:19:7E:42:1E:81    0    0 - 1      0        1  XPA
(not associated)   00:04:23:8C:76:45    0    0 - 1      0        5
(not associated)   00:1B:77:00:D3:2E    0    0 - 1      0        1
```

nas | Execute SQL

be	toDS	fromDS	moreFragments	retry	powerMgmt	moreData	protectedFrame	ord	durationId	addr1	addr2	addr3
	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter
	1	0	0	0	1	0	0	0	314	BC:AE:C5:C3:5E:01	44:94:FC:12:61:BE	BC:AE:C5:C3:5E:01
	0	0	0	0	0	0	0	0	0	FF:FF:FF:FF:FF:FF	BC:AE:C5:C3:5E:01	BC:AE:C5:C3:5E:01
	0	0	0	0	0	0	0	0	0	FF:FF:FF:FF:FF:FF	B0:C5:54:86:5E:88	B0:C5:54:86:5E:88
	0	0	0	0	0	0	0	0	0	FF:FF:FF:FF:FF:FF	BC:AE:C5:C3:5E:01	BC:AE:C5:C3:5E:01
	1	0	0	0	0	0	0	0	314	BC:AE:C5:C3:5E:01	44:94:FC:12:61:BE	BC:AE:C5:C3:5E:01
	0	0	0	0	0	0	0	0	0	FF:FF:FF:FF:FF:FF	B0:C5:54:86:5E:88	B0:C5:54:86:5E:88
	0	0	0	0	0	0	0	0	0	FF:FF:FF:FF:FF:FF	BC:AE:C5:C3:5E:01	BC:AE:C5:C3:5E:01
	0	0	0	0	0	0	0	0	0	FF:FF:FF:FF:FF:FF	B0:C5:54:86:5E:88	B0:C5:54:86:5E:88
	0	0	0	0	0	0	0	0	0	FF:FF:FF:FF:FF:FF	BC:AE:C5:C3:5E:01	BC:AE:C5:C3:5E:01
	0	0	0	0	0	0	0	0	0	FF:FF:FF:FF:FF:FF	B0:C5:54:86:5E:88	B0:C5:54:86:5E:88
	1	0	0	0	1	0	0	0	314	BC:AE:C5:C3:5E:01	44:94:FC:12:61:BE	BC:AE:C5:C3:5E:01
	0	0	0	0	0	0	0	0	0			
	0	0	0	0	0	0	0	0	314			
	0	0	0	0	0	0	0	0	0			
	0	0	0	0	0	0	0	0	314			
	0	0	0	0	0	0	0	0	0			
	0	0	0	0	0	0	0	0	0			
	1	0	0	0	0	0	0	0	314			
	0	0	0	0	0	0	0	0	0			
	0	0	0	0	0	0	0	0	0			
	0	0	0	0	0	0	0	0	0			
	1	0	0	0	0	0	0	0	314			
	0	0	0	0	0	0	0	0	0			


WE CAN DO IT!


Programming


Where do we start?


Hardware
and
Software
A Great Combination

Hardware

> Your favorite Alfa card/s

> USB cable/s ☺

> Power

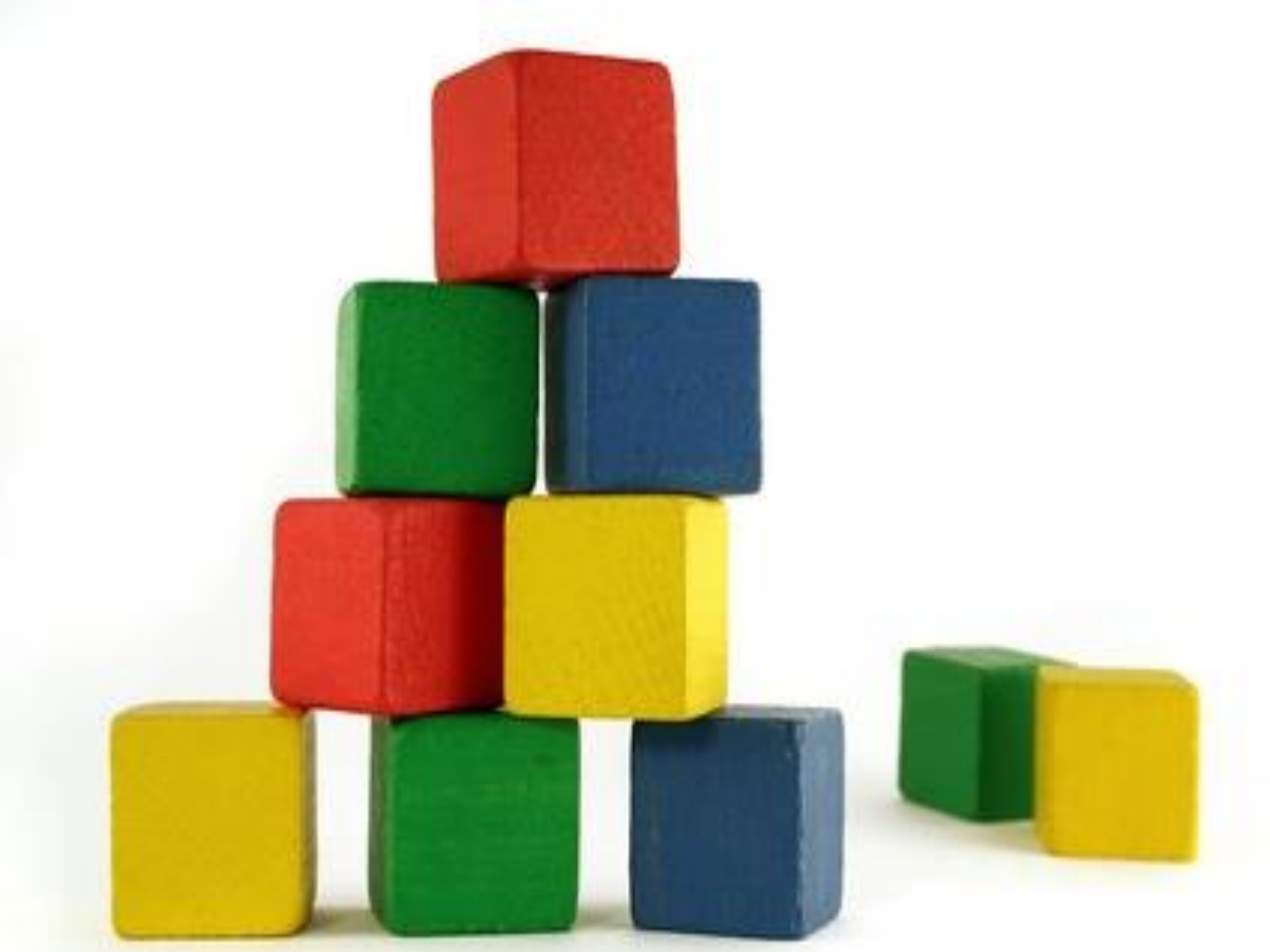
> Big screen

Software

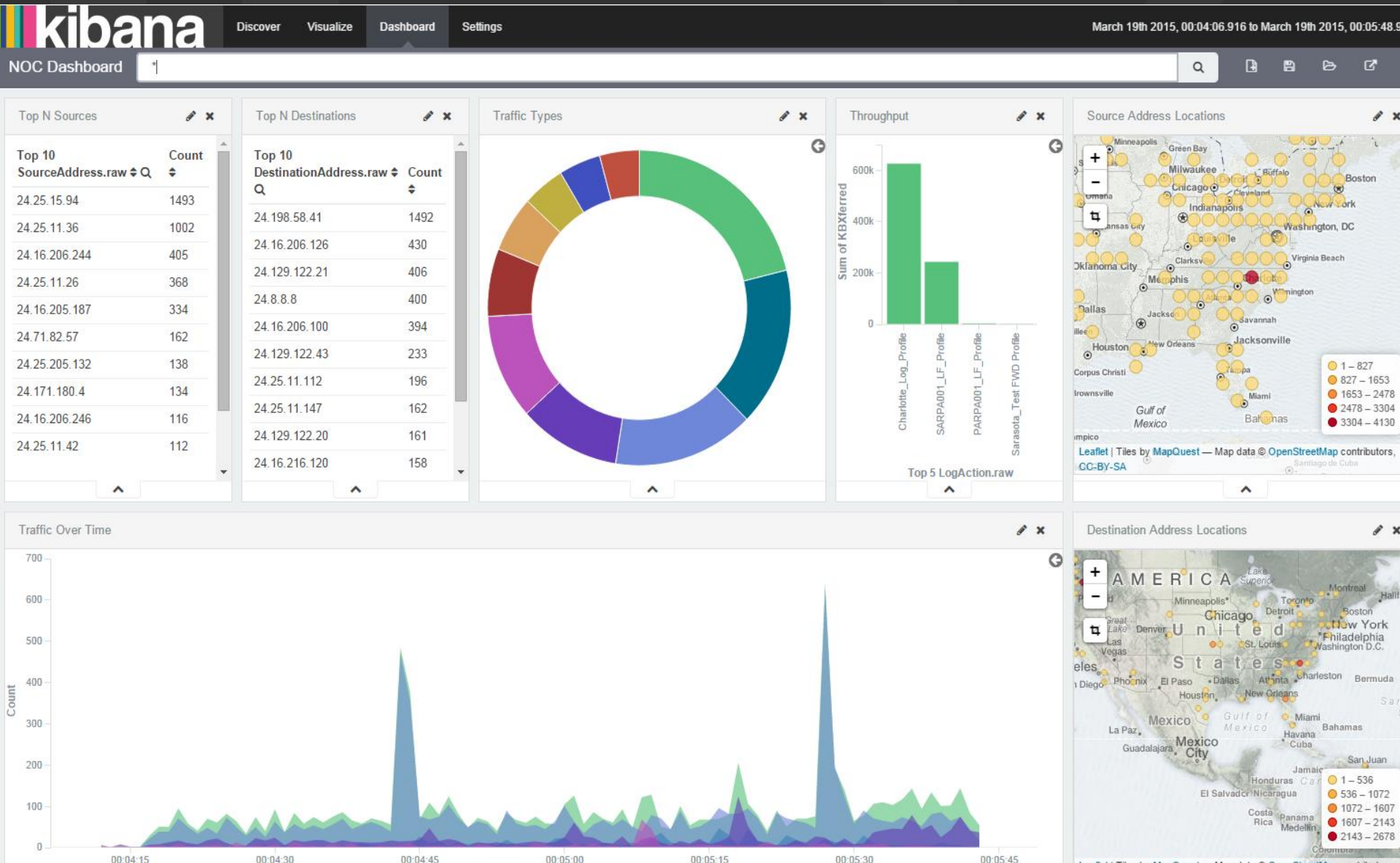
- You favourite OS (Linux, Mac, Win*)
- Keep in mind, that you might get into some challenges with one component, but there are some solutions

environment

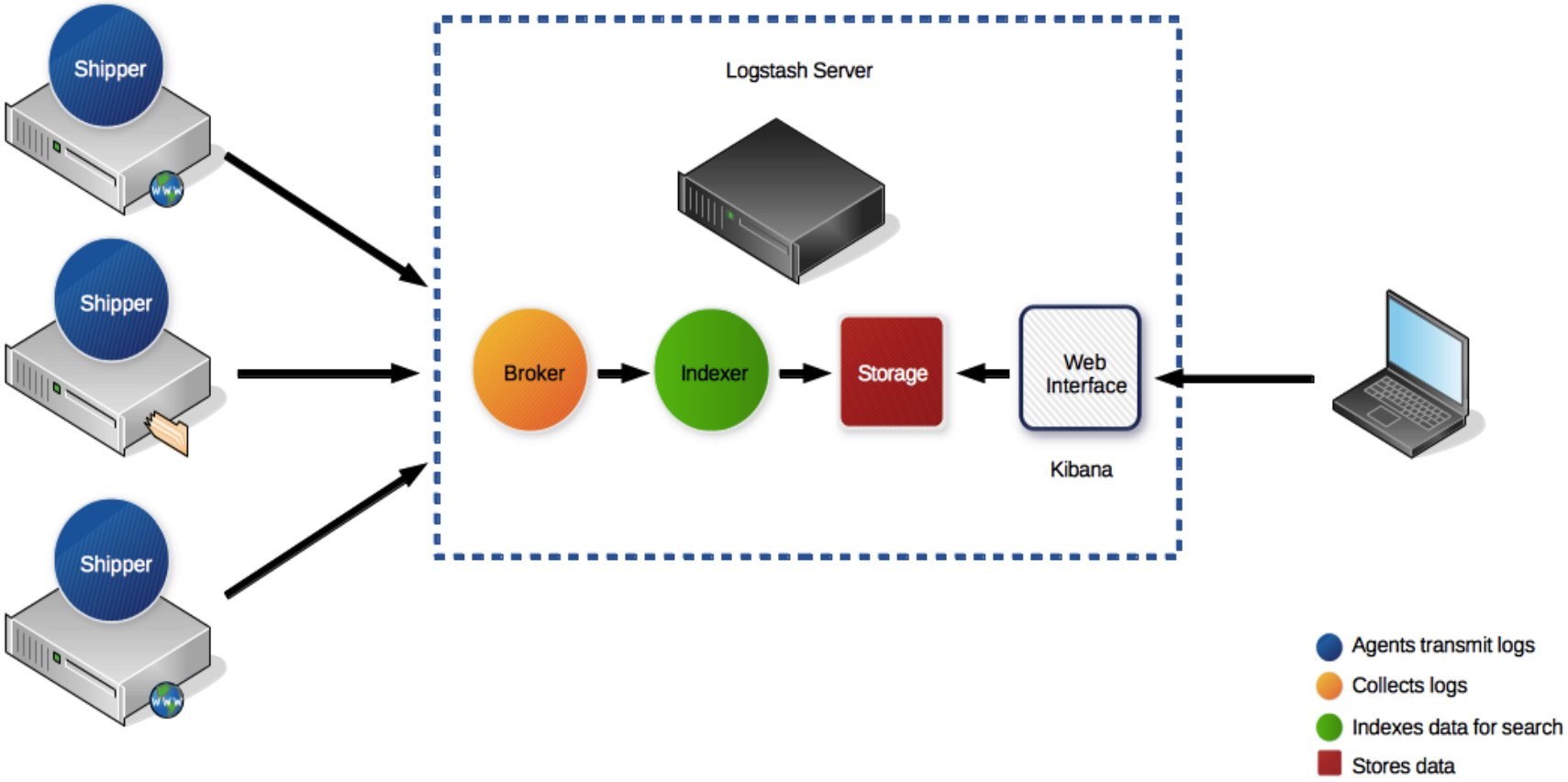
data



ELK stack


kibana
Discover
Visualize
Dashboard
Settings
March 19th 2015, 00:04:06.916 to March 19th 2015, 00:05:48.9
NOC Dashboard
*
Top N Sources
Top 10 SourceAddress.raw
Count
24.25.15.94 1493
24.25.11.36 1002
24.16.206.244 405
24.25.11.26 368
24.16.205.187 334
24.71.82.57 162
24.25.205.132 138
24.171.180.4 134
24.16.206.246 116
24.25.11.42 112
Top N Destinations
Top 10 DestinationAddress.raw
Count
24.198.58.41 1492
24.16.206.126 430
24.129.122.21 406
24.8.8.8 400
24.16.206.100 394
24.129.122.43 233
24.25.11.112 196
24.25.11.147 162
24.129.122.20 161
24.16.216.120 158
Traffic Types
Throughput
Sum of KBXferred
600k
400k
200k
0
Charlotte_Log_Profile
SARPA001_LF_Profile
PARPA001_LF_Profile
Sarasota_Test FWD Profile
Top 5 LogAction.raw
Source Address Locations
Minneapolis
Green Bay
Milwaukee
Chicago
Boston
Indianapolis
Washington, DC
Virginia Beach
Oklahoma City
Memphis
Dallas
Houston
New Orleans
Jacksonville
Savannah
Corpus Christi
Miami
Gulf of Mexico
Bahamas
1 – 827
827 – 1653
1653 – 2478
2478 – 3304
3304 – 4130
Leaflet | Tiles by MapQuest — Map data © OpenStreetMap contributors, CC-BY-SA
Traffic Over Time
Count
700
600
500
400
300
200
100
0
00:04:15
00:04:30
00:04:45
00:05:00
00:05:15
00:05:30
00:05:45
Destination Address Locations
AMERICA
Montreal
Minneapolis
Chicago
Detroit
Boston
New York
Philadelphia
Washington D.C.
Denver
United States
St. Louis
Las Vegas
Phoenix
El Paso
Dallas
Atlanta
Charleston
Bermuda
Houston
New Orleans
Miami
Gulf of Mexico
Bahamas
La Paz
Mexico
Havana
Cuba
Guadalajara
Mexico City
San Juan
Honduras
El Salvador
Nicaragua
Costa Rica
Panama
Medellin
1 – 536
536 – 1072
1072 – 1607
1607 – 2143
2143 – 2678

ELK stack


Shipper
Shipper
Shipper
Logstash Server
Broker
Indexer
Storage
Web Interface
Kibana
Agents transmit logs
Collects logs
Indexes data for search
Stores data

Logstash

- Processing data from various sources
- Parse, Collect, Modify, Transport data
- Running and hungry for new input

```
input{

    file {
        path => "/var/log/wlan/*.json"
          type => "wifi"
    }

}

filter{

    if [type] == "wifi" {
        json {
            source => message
        }

        if [wlan_type] == "CL" {
            mutate {
                rename => ["ProbedESSIDs", "ProbedESSIDsArray"]
                  add_field => ["ProbedESSIDs","%{ProbedESSIDsArray}"]
                  split => ["ProbedESSIDsArray", ","]

            }
        }
    }

}

output {
    elasticsearch {
        template_name => "wifi"
          hosts => ["localhost:9200"]
          index => "wifi-%{+dd.MM.YYYY}"
    }
    stdout { codec => rubydebug }
}
```

Logstash forwarder

- Agent for forwarding logs
- Prebuilt for some platforms
- Lack of support for some
- Can be done with some other solutions (Win – nxlog-ce, Beaver, syslog)

Elasticsearch

- Elasticsearch is a search server based on **Lucene.** It provides a distributed, multitenant-capable **full-text search** engine with a HTTP web interface and schema-free JSON documents ~ Wikipedia
- Elasticsearch is a **distributed,** scalable, real-time search and **analytics engine** ~ elastic.co
- **Document oriented** (stores entire objects or documents)
- **JSON** was picked as serialization format for documents
- Talking to Elasticsearch
  - **RESTful API** with JSON over HTTP
  - Various client APIs.

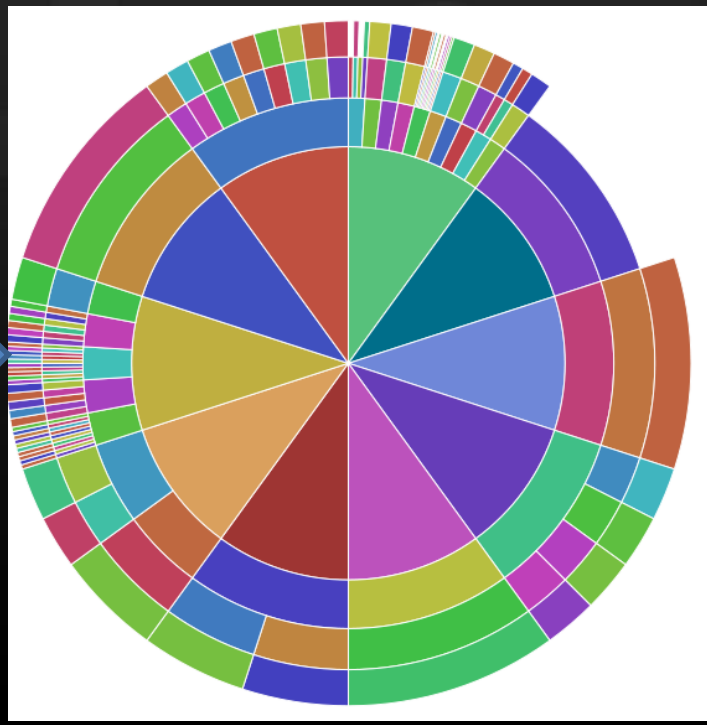
Kibana

> Graphical presentation

> The power of visualization

```
POST /elasticsearch/_msearch?timeout=0&ignore_unavailable=true&preference=1434391152506 HTTP/1.1
Host: 192.168.81.128
User-Agent: Mozilla/5.0 (X11; Linux i686; rv:22.0) Gecko/20100101 Firefox/22.0 Iceweasel/22.0
Accept: application/json, text/plain, */*
Accept-Language: en-US,en;q=0.5
Accept-Encoding: gzip, deflate
Content-Type: application/json;charset=utf-8
Referer: http://192.168.81.128/
Content-Length: 786
Authorization: Basic ZWxrYWRtaW46UzBuY24wR2VzbDA=
Connection: keep-alive
Pragma: no-cache
Cache-Control: no-cache

{"index":"logstash-*","search_type":"count","ignore_unavailable":true}
{"query":{"filtered":{"query":{"query_string":{"query":"wlan_type:\"CL\"","analyze_wildcard":true}},"
filter":{"bool":{"must":[{"range":{"@timestamp":{"gte":1420066800000,"lte":1451602799999}}}],"must_no
t":[]}}}},"size":0,"aggs":{"2":{"terms":{"field":"ESSID.raw","size":10,"order":{"1":"desc"}},"aggs":{
"1":{"cardinality":{"field":"ESSID.raw"}},"3":{"terms":{"field":"BSSID.raw","size":10,"order":{"1":"d
esc"}},"aggs":{"1":{"cardinality":{"field":"ESSID.raw"}},"4":{"terms":{"field":"StationMAC.raw","size
":10,"order":{"1":"desc"}},"aggs":{"1":{"cardinality":{"field":"ESSID.raw"}},"5":{"terms":{"field":"M
anufacturer.raw","size":10,"order":{"1":"desc"}},"aggs":{"1":{"cardinality":{"field":"ESSID.raw"}}}}}
}}}}}}}
```



Google

setup elk

Milan

Web Images Videos Shopping News More Search tools

About 657,000 results (0.72 seconds)

How To Install Elasticsearch, Logstash, and Kibana (ELK ...

https://www.digitalocean.com/.../how-to-install-elasticsearch-logstash-and...

Mar 10, 2015 - The goal of the tutorial is to **set up** Logstash to gather syslogs of multiple ... to use CentOS instead, check out this tutorial: How To Install **ELK** on ...

Adding Logstash Filters To ... - (ELK Stack) on CentOS 7 - Mitchell Anicas

Setting up a single ELK node in 20 minutes | White snow ...

christophe.vandeplas.com/.../setting-up-single-node-**elk**-in-20-minutes.ht...

Jun 1, 2014 - This is a first article of a series to show the power of Elasticsearch, Kibana and Logstash (**ELK**) in the domain of Incident Handling and forensics ...

Elasticsearch - Logstash - Kibana 4 (ELK Stack) Setup Tutorial

https://www.youtube.com/watch?v=ge8uHdmtb1M

Mar 15, 2015 - Uploaded by AWS Tutorial Series

AWS Tutorial Series. ... This tutorial is setting up Elasticsearch in cluster mode with Logstash ...

How to Install the ELK Stack on AWS - Logz.io

logz.io/blog/install-**elk**-stack-amazon-aws/

Oct 13, 2015 - **ELK** is a great open-source stack for log aggregation and analytics. ... You can **set up** your own **ELK** stack using this guide or try out our simple ...

Howto Configure Elasticsearch, Logstash & Kibana on ...

linoxide.com/tools/configure-elasticsearch-logstash-kibana-ubuntu-15-04/

Jun 10, 2015 - We will guide you with the **setup** of **ELK** installations to configure with


SIDE EFFECT

Shodan says

SHODAN | country:at elasticsearch | Explore | Contact Us | Blog | Enterprise Access

Exploits | Maps | Download Results | Create Report

TOP COUNTRIES

Showing results 11 - 16 of 16

151.236.6.238

EDIS GmbH

HTTP/1.1 200 OK

Top 20 treatment.title	Count
min	9
osteopathi	9
triggerpunktbehandlung	7
60	6
elektrotherapi	6
manull	6
therapi	6
massag	5
bewegungstherapi	4
taping	4

„Issues“ with ELK

- No security ($$$ for auth)
- Alerts
- Constant development
- Big changes (3 or 4)
- Lack of some functionalities

Aircrack-ng

> JSON what?

> Tested a lot of things

> Source code change was winner

> Contributing to main branch?

Aircrack-ng facelift

```
#define REFRESH_RATE 100000  /* default delay in us between updates */
#define DEFAULT_HOPFREQ 250  /* default delay in ms between channel hopp
#define DEFAULT_CWIDTH  20 /* 20 MHz channels by default */

#define NB_PWR  5       /* size of signal power ring buffer */
#define NB_PRB 100       /* size of probed ESSID ring buffer */

#define MAX_CARDS 8     /* maximum number of cards to capture from */
```

```
int dump_write_json( void )
{
    int i, n, probes_written;
    struct tm *ltime;
    struct AP_info *ap_cur;
    struct ST_info *st_cur;
    char * temp;
    //printf("DUMP JSON\n");
    if (! G.record_data || !G.output_format_json)
        return 0;

    fseek( G.f_json, 0, SEEK_END );


    ap_cur = G.ap_1st;
```

Result


```
{"BSSID":"2C:5D:93:25:AF:A8", "FirstTimeSeen":"2015-11-19 08:43:38", "LastTimeSeen":"2015-11-19 08:43:38", "channel":11, "max
speed":" 54","Privacy":"OPN","Cipher":"" , "Authentication":"", "Power":-70, "#beacons":       1,"#IV":       0, "LANIP":"  0
  0.  0.  0", "ID-length": 17, "ESSID":"Renaissance_GUEST", "Manufacturer":"Ruckus Wireless", "wlan_type":"AP","timestamp":"1
47919023"}
{"BSSID":"6C:AA:B3:23:6D:78", "FirstTimeSeen":"2015-11-19 08:43:38", "LastTimeSeen":"2015-11-19 08:43:38", "channel":11, "max
speed":" 54","Privacy":"OPN","Cipher":"" , "Authentication":"", "Power":-74, "#beacons":       0,"#IV":       0, "LANIP":"  0
  0.  0.  0", "ID-length": 17, "ESSID":"Renaissance_GUEST", "Manufacturer":"Ruckus Wireless", "wlan_type":"AP","timestamp":"1
47919023"}
{"BSSID":"6C:AA:B3:1F:96:28", "FirstTimeSeen":"2015-11-19 08:43:39", "LastTimeSeen":"2015-11-19 08:43:42", "channel": 1, "max
speed":" 54","Privacy":"OPN","Cipher":"" , "Authentication":"", "Power":-75, "#beacons":       5,"#IV":       0, "LANIP":"  0
  0.  0.  0", "ID-length": 17, "ESSID":"Renaissance_GUEST", "Manufacturer":"Ruckus Wireless", "wlan_type":"AP","timestamp":"1
47919023"}
{"BSSID":"6C:AA:B3:1F:BA:08", "FirstTimeSeen":"2015-11-19 08:43:39", "LastTimeSeen":"2015-11-19 08:43:42", "channel": 1, "max
speed":" 54","Privacy":"OPN","Cipher":"" , "Authentication":"", "Power":-83, "#beacons":       5,"#IV":       0, "LANIP":"  0
  0.  0.  0", "ID-length": 17, "ESSID":"Renaissance_GUEST", "Manufacturer":"Ruckus Wireless", "wlan_type":"AP","timestamp":"1
47919023"}
{"BSSID":"6C:AA:B3:01:8B:08", "FirstTimeSeen":"2015-11-19 08:43:39", "LastTimeSeen":"2015-11-19 08:43:42", "channel": 1, "max
speed":" 54","Privacy":"OPN","Cipher":"" , "Authentication":"", "Power":-81, "#beacons":       4,"#IV":       0, "LANIP":"  0
  0.  0.  0", "ID-length": 17, "ESSID":"Renaissance_GUEST", "Manufacturer":"Ruckus Wireless", "wlan_type":"AP","timestamp":"1
47919023"}
{"BSSID":"6C:AA:B3:01:A1:78", "FirstTimeSeen":"2015-11-19 08:43:39", "LastTimeSeen":"2015-11-19 08:43:42", "channel": 1, "max
speed":" 54","Privacy":"OPN","Cipher":"" , "Authentication":"", "Power":-59, "#beacons":       6,"#IV":       2, "LANIP":"172
 20. 13. 99", "ID-length": 17, "ESSID":"Renaissance_GUEST", "Manufacturer":"Ruckus Wireless", "wlan_type":"AP","timestamp":"1
47919023"}
{"BSSID":"6C:AA:B3:1F:AA:C8", "FirstTimeSeen":"2015-11-19 08:43:40", "LastTimeSeen":"2015-11-19 08:43:40", "channel": 6, "max
speed":" 54","Privacy":"OPN","Cipher":"" , "Authentication":"", "Power":-84, "#beacons":       1,"#IV":       0, "LANIP":"  0
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47919023"}
{"BSSID":"2C:5D:93:26:16:08", "FirstTimeSeen":"2015-11-19 08:43:40", "LastTimeSeen":"2015-11-19 08:43:40", "channel": 6, "max
speed":" 54","Privacy":"OPN","Cipher":"" , "Authentication":"", "Power":-72, "#beacons":       1,"#IV":       0, "LANIP":"  0
  0.  0.  0", "ID-length": 17, "ESSID":"Renaissance_GUEST", "Manufacturer":"Ruckus Wireless", "wlan_type":"AP","timestamp":"1
47919023"}
{"StationMAC":"8C:70:5A:12:E2:20", "FirstTimeSeen":"2015-11-19 08:43:39", "LastTimeSeen":"2015-11-19 08:43:39", "Power":-68,
```
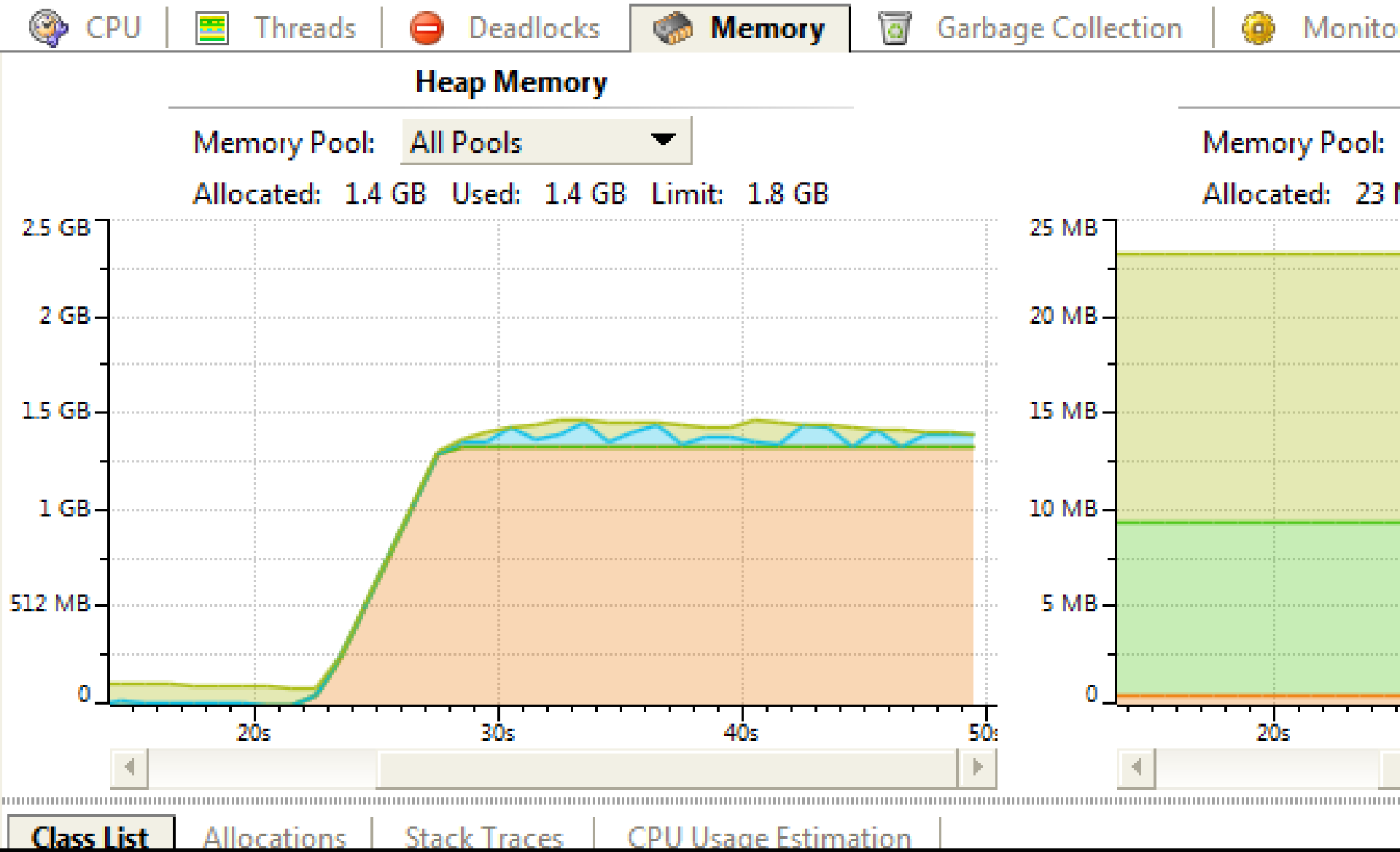


Do not give up, the beginning is
always the hardest.

#/viris[# *]


Problems


CPU
Threads
Deadlocks
Memory
Garbage Collection
Monito
Heap Memory
Memory Pool: All Pools
Allocated: 1.4 GB Used: 1.4 GB Limit: 1.8 GB
2.5 GB
2 GB
1.5 GB
1 GB
512 MB
0
20s
30s
40s
50
Memory Pool:
Allocated: 23
25 MB
20 MB
15 MB
10 MB
5 MB
0
20s
Class List
Allocations
Stack Traces
CPU Usage Estimation

#/viris[# *]

KEEP CALM

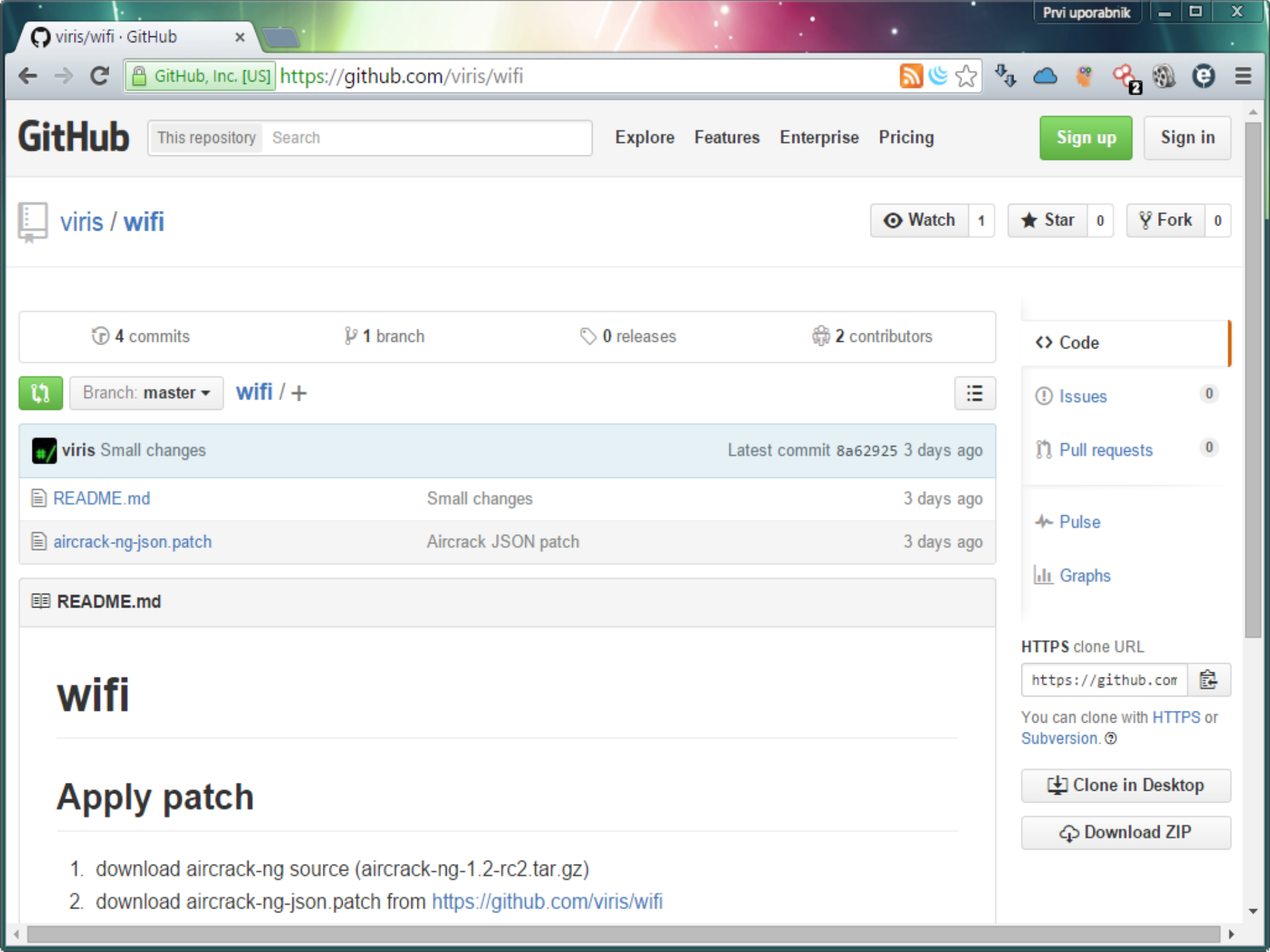
it's

NOT TRUE

Some ideas to play with

- Visualization (Penetration Testing, Security Audits)
- SIEM for Wi-Fi
- EVIL Intelligence Gathering
- Warstalking
- Tracking down stolen phones
- Adding traffic records of open networks


TRUST
YOUR
CRAZY
IDEAS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Sign up Sign in
viris / wifi
Watch 1 Star 0 Fork 0
4 commits 1 branch 0 releases 2 contributors
Branch: master wifi / +
viris Small changes Latest commit 8a62925 3 days ago
README.md Small changes 3 days ago
aircrack-ng-json.patch Aircrack JSON patch 3 days ago
README.md
wifi
Apply patch
1. download aircrack-ng source (aircrack-ng-1.2-rc2.tar.gz)
2. download aircrack-ng-json.patch from https://github.com/viris/wifi
Code
Issues 0
Pull requests 0
Pulse
Graphs
HTTPS clone URL
https://github.com
You can clone with HTTPS or Subversion.
Clone in Desktop
Download ZIP

@MilanGabor

#/viris[# Q *]

Don’t be afraid to bug me! I don’t bite! ;)