bro - what is in my network?

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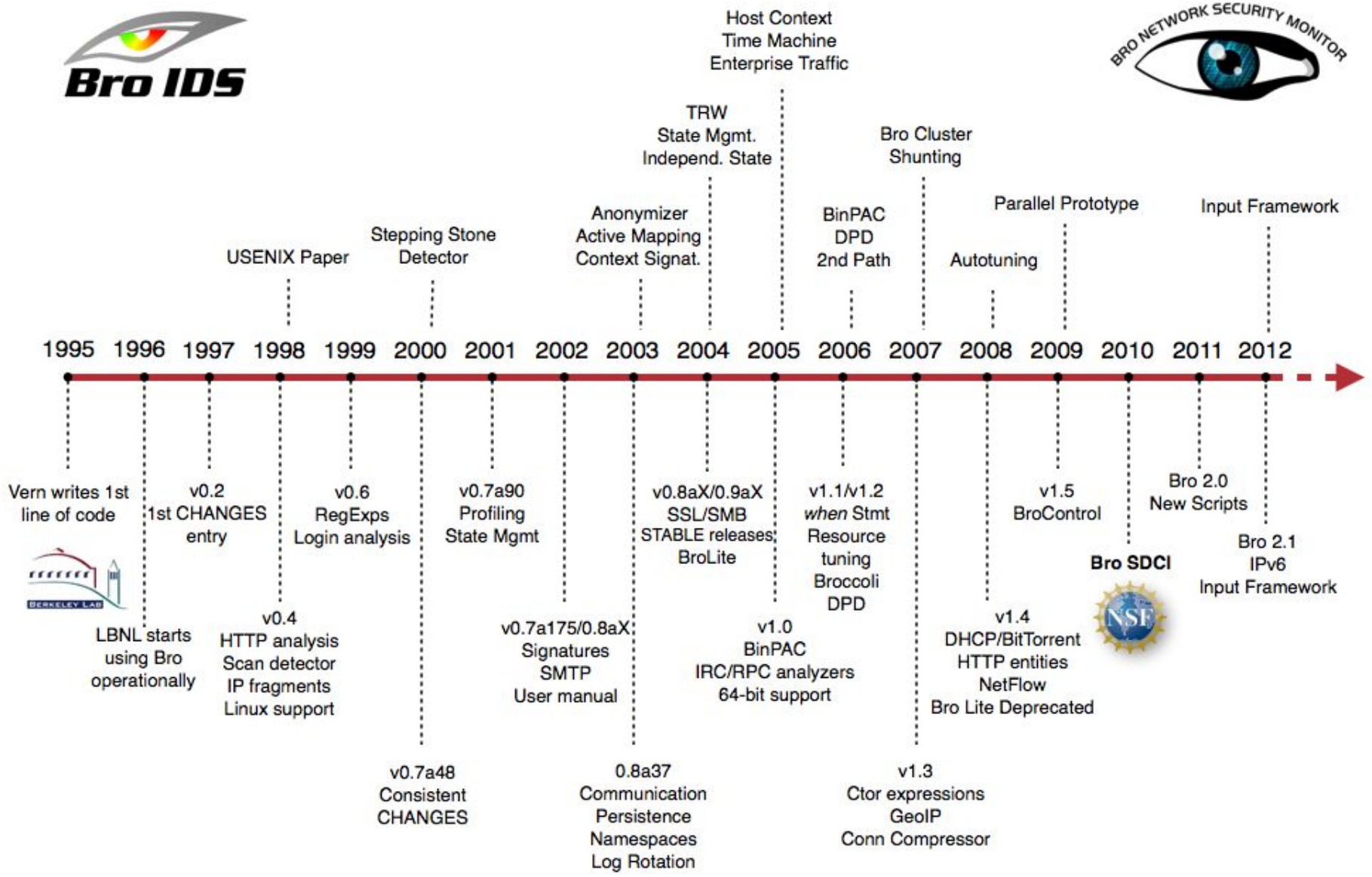
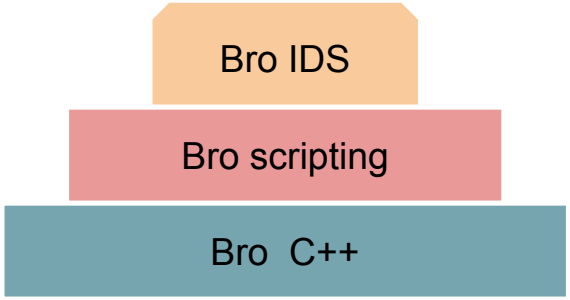
http://bit.ly/dc2017-bro


BRO NETWORK SECURITY MONITOR


Bro IDS
BRO NETWORK SECURITY MONITOR
Host Context
Time Machine
Enterprise Traffic
TRW
State Mgmt.
Independ. State
Bro Cluster
Shunting
Anonymizer
Active Mapping
Context Signat.
BinPAC
DPD
2nd Path
Parallel Prototype
Input Framework
USENIX Paper
Stepping Stone
Detector
Autotuning
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
Vern writes 1st line of code
LBNL starts using Bro operationally
v0.2
1st CHANGES entry
v0.4
HTTP analysis
Scan detector
IP fragments
Linux support
v0.6
RegExps
Login analysis
v0.7a48
Consistent
CHANGES
v0.7a90
Profiling
State Mgmt
v0.7a175/0.8aX
Signatures
SMTP
User manual
0.8a37
Communication
Persistence
Namespaces
Log Rotation
v0.8aX/0.9aX
SSL/SMB
STABLE releases
BroLite
v1.0
BinPAC
IRC/RPC analyzers
64-bit support
v1.1/v1.2
when Stmt
Resource
tuning
Broccoli
DPD
v1.3
Ctor expressions
GeoIP
Conn Compressor
v1.4
DHCP/BitTorrent
HTTP entities
NetFlow
Bro Lite Deprecated
v1.5
BroControl
Bro SDCI
NSF
Bro 2.0
New Scripts
Bro 2.1
IPv6
Input Framework

What is Bro?

- Flexible network security monitor with event correlation
- Traffic inspection
- Attack detection
- Log recording
- Distributed analysis
- Full programmability



- Bro decodes **protocols** on your network
- Generates nice and structured log files based on protocol, with uid for correlation
- Ground-truth about your network (it comes from packets on it, after all)
- **It doesn't depend on signatures or ports of traffic to find out what it is**
- It can be used with content hashing and lists like https://intel.criticalstack.com/ to detect known bad actors.
- it can use pcap files or live traffic
- event based,bind to them from external process (e.g. iptables -j DROP)
- Bro script is DSL for network analysis which IDS in implemented in (using 400+ scripts)

Every powerful tool can be used for good and evil.
If you don't care about state of your network, you might want to know what "metadata" network operators can collect about you as user.

Security onion

-ETOOMUCHWORK (or: "I don't want to do all this manually")

https://securityonion.net/

Security Onion is a Linux distro for intrusion detection, network security monitoring, and log management. It’s based on Ubuntu and contains Snort, Suricata, Bro, OSSEC, Sguil, Squert, ELSA, Xplico, NetworkMiner, and many other security tools. The easy-to-use Setup wizard allows you to build an army of distributed sensors for your enterprise in minutes!

In this talk, we don't care about Snort, Suricata, only about Bro and don't care about Web UI.

Do you know your network?

We are university setting running wired and wifi network for our users.

Multiple buildings (**1Gbps** uplink, **1Gbps** link between buildings, **2-6Gbps** backbone aggregation - we can DoS our uplink from inside!)

~3100 active IP addresses

~53 smart switches

~1900 network ports

~30 vlans

~40 wifi APs

~1300 wifi users per day <10% @5GHz

~11000 user accounts

So, you need machine for bro....

Commodity Dell hardware OptiPlex 7040

i7-6700 CPU 3.40GHz (bro uses 4 cores ~2GHz)

2 port Intel 82575EB Gigabit Network

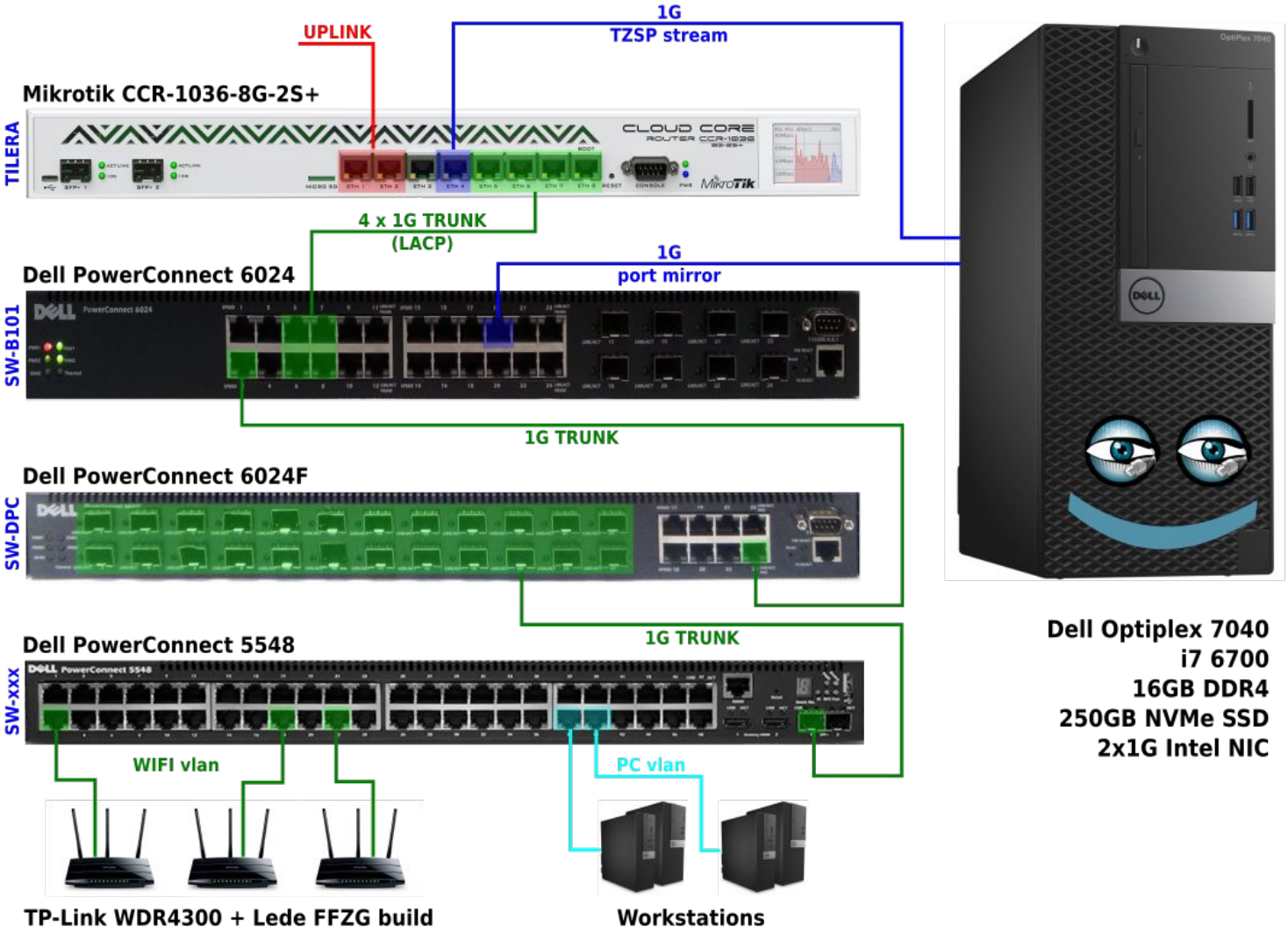
You will need 3GHz to process 1Gbps traffic with pf_ring to calculate content hashing

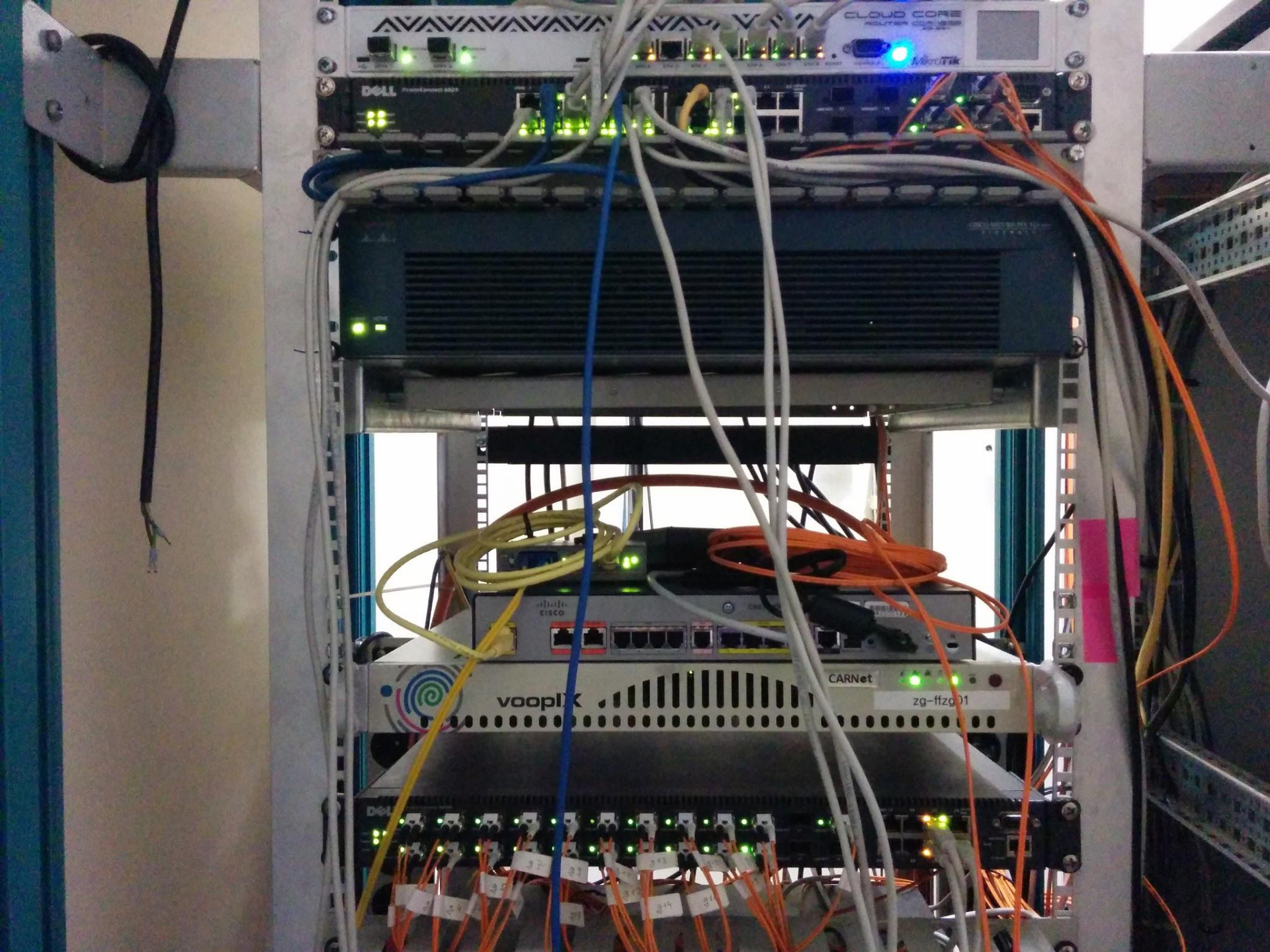
Same machine is used as master and logger.

Our bro config is not optimal, but does work for us and shows how useful bro is.

You should have separate bro master node and multiple workers, but we don't have that.

Network infrastructure




CLOUD CORE
MikroTik
DELL
CISCO
vooplix
CARNet
zg-ffzg01

Dell PowerConnect 6024 port mirror

```
interface ethernet g2
description sw-dpc-ffzg-local

interface ethernet g22
description sw-lib

interface ethernet g19
port monitor g2
port monitor g3
port monitor g21
port monitor g22
port monitor g23
port monitor g24
port monitor vlan-tagging
```

simple and limiting - only one port can be destination

Mikrotik tilera, tzsp, TaZmen Sniffer Protocol, WTF?!

Mikrotik "router" == doesn't have switch chip == no port mirroring

tzsp streaming in udp packets

```
/tool sniffer
set filter-interface=all memory-limit=10000KiB
streaming-enabled=yes streaming-server=10.9.10.2
```

https://github.com/thefloweringash/tzsp2pcap

```
modprobe dummy
ip link set dummy0 up
/home/dpavlin/tzsp2pcap -f | /usr/bin/tcpreplay --topspeed -i
dummy0 - &
```

terrible, terrible way to waste kernel/user-space copy just to keep bro happy and think that it's listening to simple interface

bro on Debian

package is suitable for pcap file analysis and evaluation but lacks pf_ring and broker support (due to missing pf_ring and actor-framework dependencies)

```
dpavlin@enesej:~$ git clone --recursive git://git.bro.org/bro

dpavlin@enesej:~/bro$ ./configure --enable-broker && make install
```

deploy with broctl deploy, carefully symlink all config dirs back to debian locations

start customizing bro configuration files in /etc/bro or /usr/local/bro/etc/

install broctl cron

bro

```
root@enesej:~# broctl status
Name         Type    Host             Status    Pid    Started
logger       logger  enesej           running   21215  29 May 19:42:39
manager      manager enesej           running   21286  29 May 19:42:40
proxy        proxy   enesej           running   21355  29 May 19:42:42
tilera       worker  enesej           running   21586  29 May 19:42:43
b101-1       worker  enesej           running   21593  29 May 19:42:43
b101-2       worker  enesej           running   21606  29 May 19:42:43
b101-3       worker  enesej           running   21605  29 May 19:42:43
b101-4       worker  enesej           running   21604  29 May 19:42:43
tzsp         worker  enesej           running   21599  29 May 19:42:43

root@enesej:/var/log/bro/current# ls
communication.log conn.log dhcp.log dns.log dpd.log files.log http.log intel.log
kerberos.log known_certs.log known_hosts.log known_services.log loaded_scripts.log
netcontrol.log notice.log packet_filter.log radius.log rdp.log reporter.log sip.log
smb_mapping.log smtp.log snmp.log software.log ssh.log ssl.log stats.log stderr.log
stdout.log syslog.log traceroute.log tunnel.log weird.log x509.log
```

simple shell tools for useful counts

```
dpavlin@enesej:/var/log/bro/2017-06-01$ cat /srv/bro-tools/notice-count.sh
zcat notice.* | bro-cut -d note | sort | uniq -c
dpavlin@enesej:/var/log/bro/2017-06-01$ /srv/bro-tools/notice-count.sh
    291 CaptureLoss::Too_Much_Loss
     13 HTTP::SQL_Injection_Attacker
      9 HTTP::SQL_Injection_Victim
      3 PacketFilter::Dropped_Packets
    232 Scan::Address_Scan
      6 Scan::Port_Scan
      2 SSH::Interesting_Hostname_Login
    103 SSH::Password_Guessing
   4107 SSL::Invalid_Server_Cert
     76 Traceroute::Detected
     67 Weird::Activity
```

root@bro:~#

```
less -S # chop long lines

bro-cut -d username # log files have header used by bro-cut

awk -F '\t' '{ print $12 }'

sort | uniq -c | column -t | less -S

zless, zcat # broctl rotate and compress logs every hour
```

https://github.com/ffzg/bro-tools

Work in progress