High-Performance Packet Sniffing and Traffic Mining

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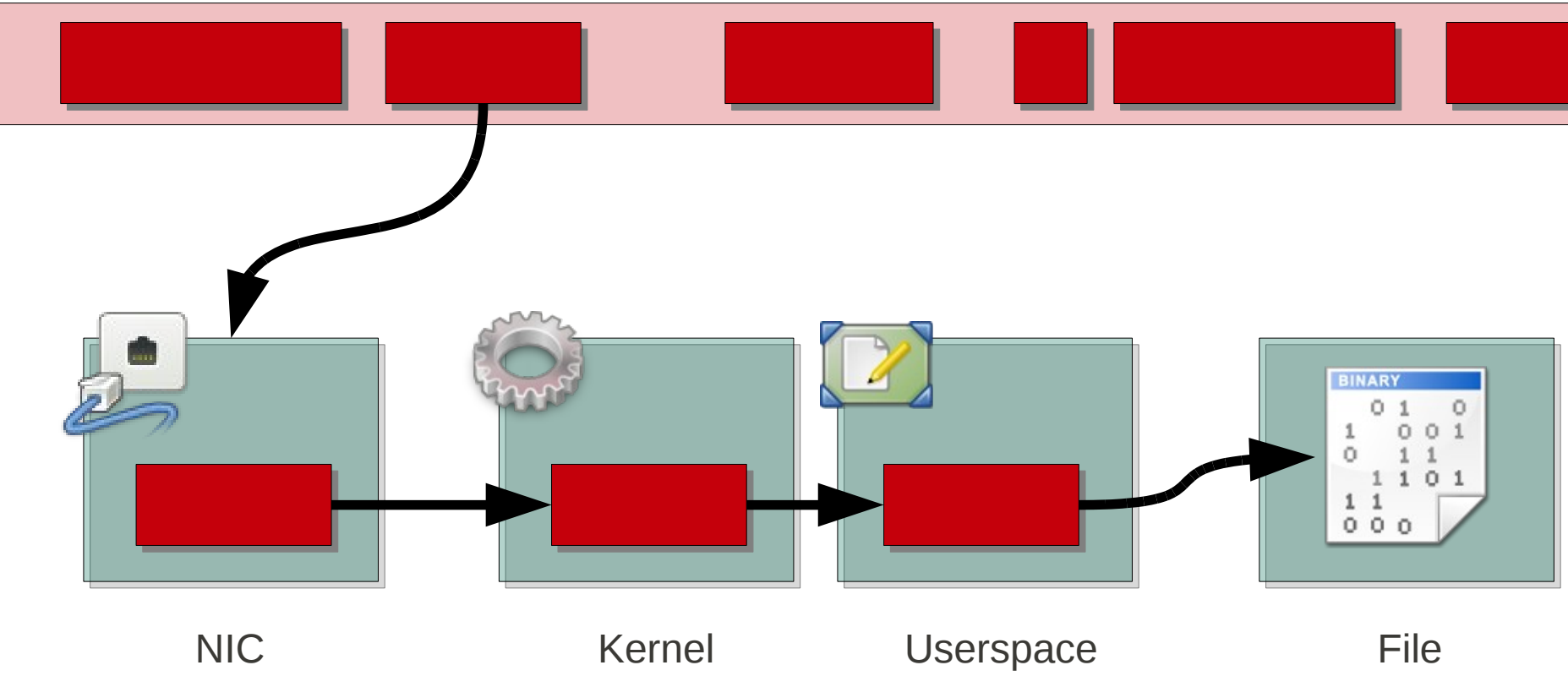
Honeynet Workshop 2011, Public Day
Paris, 21 March, 2011

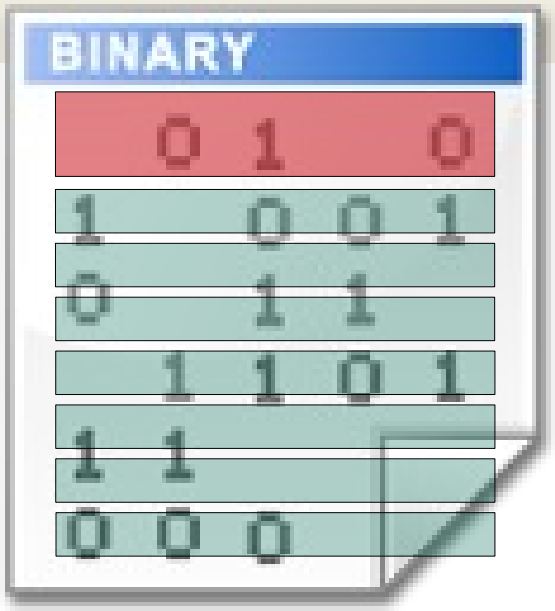
High Performance Packet Sniffing

multicap

Packet Sniffing



The Pcap File Format



Straight-Forward File Format

- Portable library for packet sniffing
- Convenient API for programmers
  - Live capturing
  - Writing and reading dump files
- Open source, GPLv2
- Used by tools like tcpdump, wireshark, snort, …
- Time resolution in microseconds

```
struct pcap_file_header {
        bpf_u_int32 magic;
        u_short version_major;
        u_short version_minor;
        bpf_int32 thiszone;
        bpf_u_int32 sigfigs;
        bpf_u_int32 snaplen;
        bpf_u_int32 linktype;
};
```

```
struct pcap_pkthdr {
        struct timeval ts;
        bpf_u_int32 caplen;
        bpf_u_int32 len;
};
```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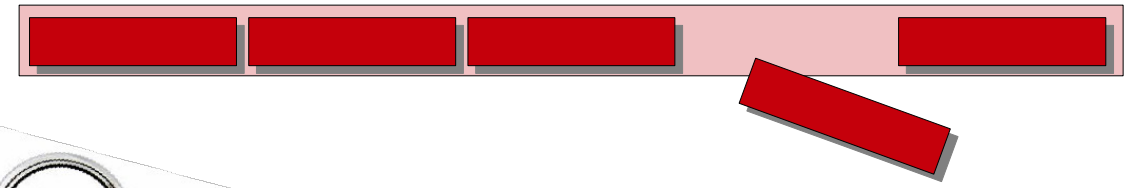
Do Not Drop The Packets

Packet Drops

- Sniffer too slow: packet drops
- Lost information cannot be recovered
- Missing packets can render TCP streams unusable



Sniffing Performance

- Allocating, copying and freeing memory takes time
- Getting the system time costs CPU cycles
- Reduce such calls as much as possible

Designing *multicap*

Minimize Memory Allocations

- Use a `PF_PACKET` socket
- Attach a user-space ring buffer with `setsockopt(PACKET_RX_RING)`
- This is Linux only

No System Calls To Get Packet Times

- `PF_PACKET` already stores the time stamp in the packet struct
  - nano-second time resolution without further system calls
- No need to call `localtime()` etc.

Memory-mapped Dump Files

- `mmap()` for increased dumping
- Pre-allocate multiples of page size

Configuration Example

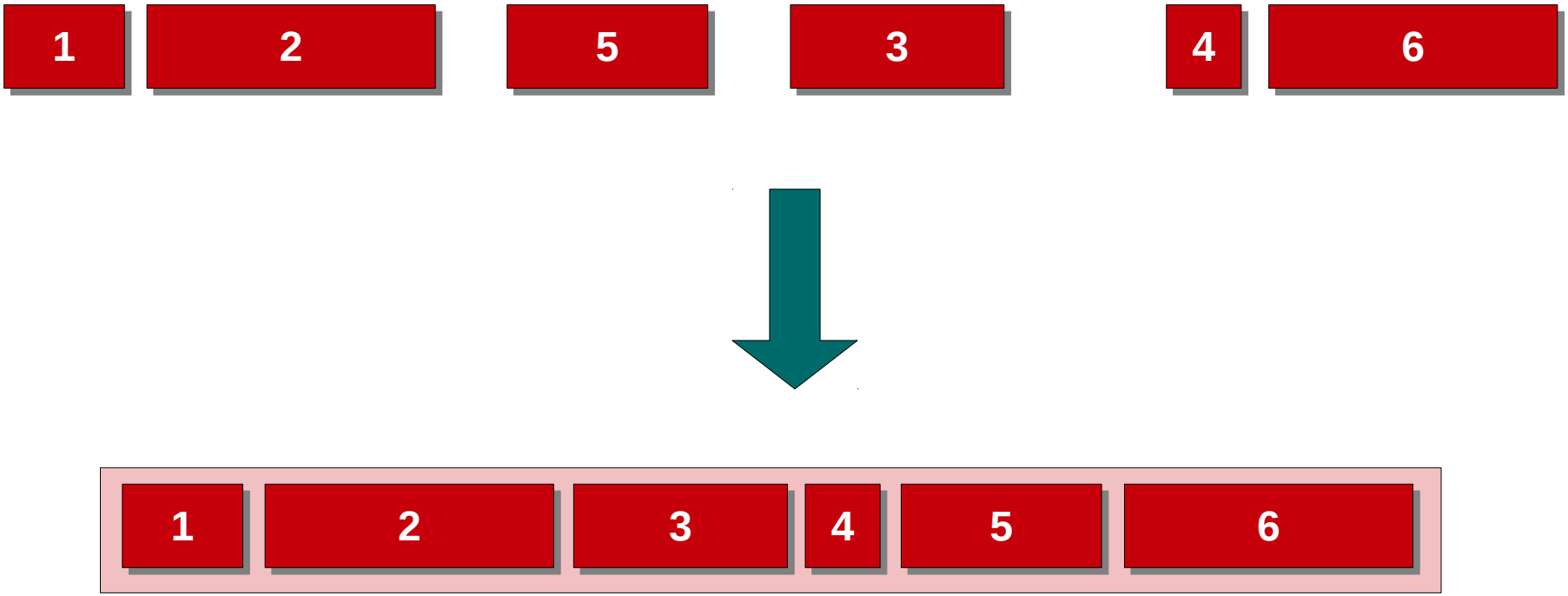
```
rotate = "1d" // "h|d|G|M"
path = ""
file = "$tracker-%Y%m%d.pcap"

trackers = {
        tcponly =
        {
                enabled = "true"
                interface = "eth0"
                bpf = "tcp"
                snaplen = "0"
                rotate = "10M"
                path = "var/log/multicap/$tracker/%Y-%m-%d"
                file = "%H:%M:%S.pcap"
                promisc = "0"
        }
}
```

multicap Demo

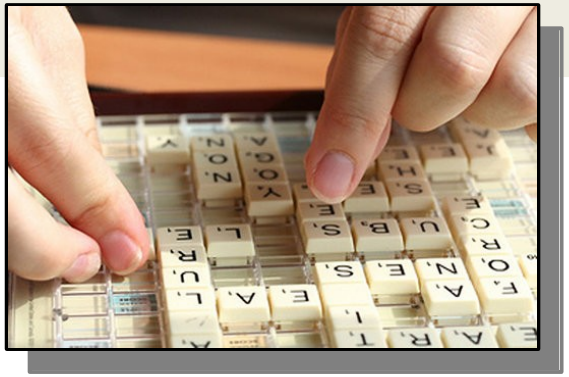
Packet Trace File Processing

streams

Stream Reassembly



TCP Stream Reassembly

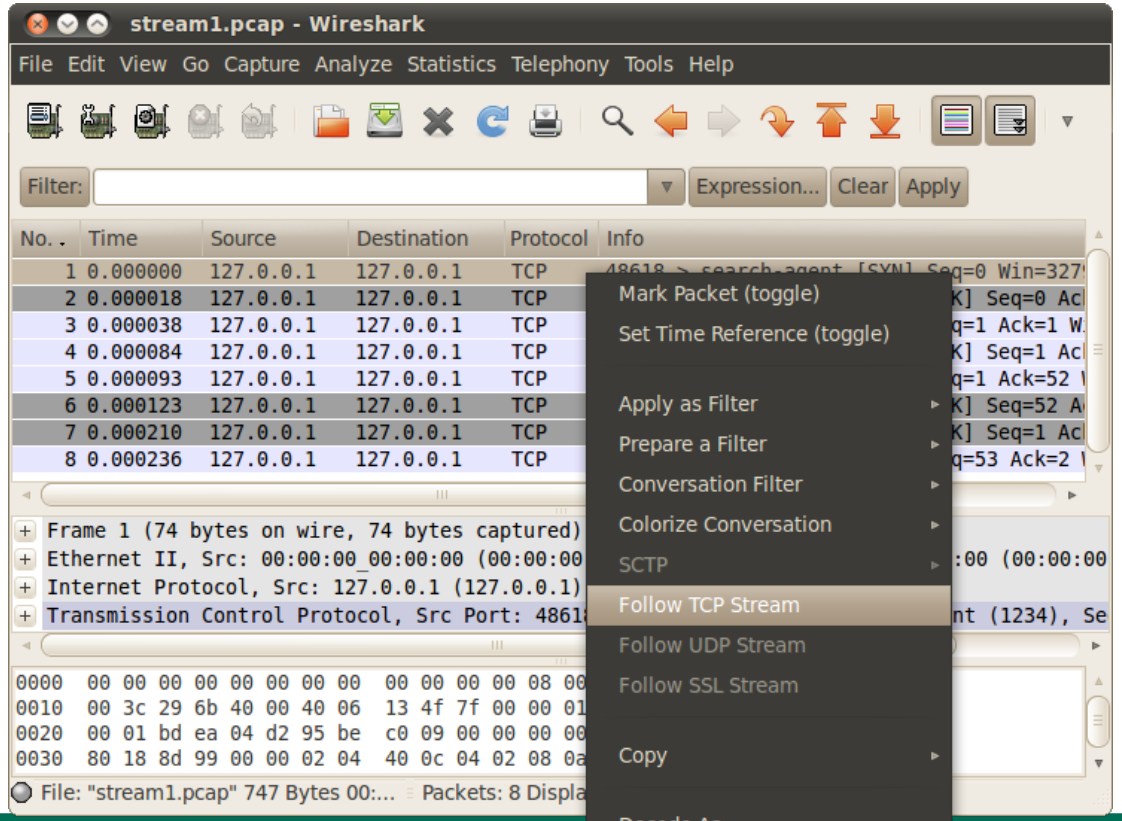


TCP Streams

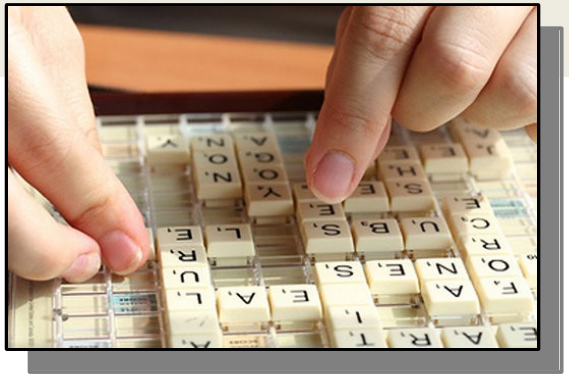
- Stream: reliable, ordered stream of data
- OS assembles segments in the right order

Stream Reassembly Tools

- Wireshark
- tcpick
- tcpflow



TCP Stream Reassembly



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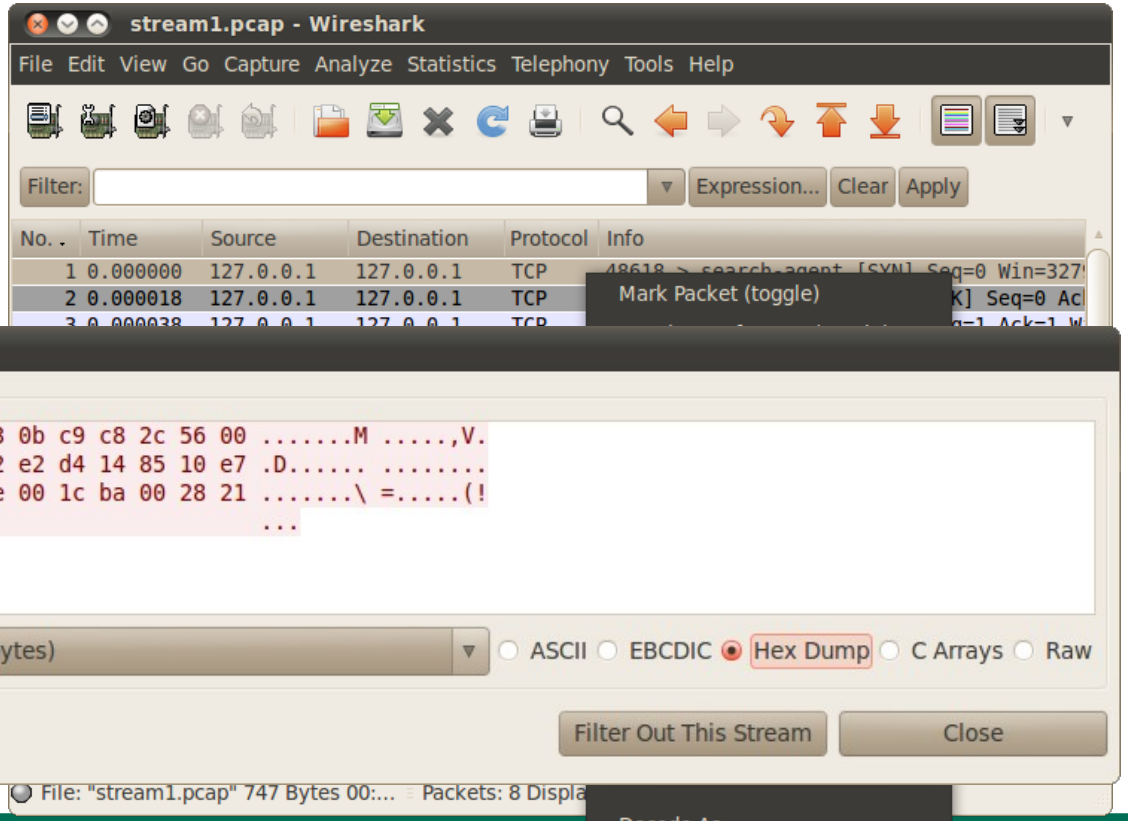

Designing *streams*

Stream

- IP addresses, port numbers, initial sequence number

Stream Reassembly Strategy

- A SYN segment starts a new stream
- A RST or FIN segment terminates a stream
- Any segment gets copied at the right offset according to its sequence number

Interactive Command Line Tool

- Listing, counting, filtering, selecting, … streams
- Easy integration of external tools

Insertion, Evasion, and Denial of Service: Eluding Network Intrusion Detection

<**http://insecure.org/stf/secnet_ids/secnet_ids.html**>

streams Demo

Code

Where To Get Them

```
lftp anonymous@ftp.carnivore.it:/> cd projects/streams/
lftp anonymous@ftp.carnivore.it:/projects/streams> ls
-rw-r--r--    1 33       33         125549 Mar 16 16:19 streams-0.1.0.tar.bz2
-rw-r--r--    1 33       33         235740 Mar 16 16:19 streams-0.1.0.tar.gz
lftp anonymous@ftp.carnivore.it:/projects/streams>
```

git carnivore.it code browser

source web interface to carnivore.it projects

index

Name	Description
projects	
carniwwwhore	webif for dionaeas xmpp fed postgres database
dionaea	low interaction honeypot - our nepenthes sucessor
honeytrap	low interaction honeypot - the attacker implements the protocol
libemu	x86 emulation library to detect and emulate shellcode
liblcfg	lightweight configuration parsing library
libxmatch	library for matching patterns in xor-encoded data.
multicap	multi interface networkstream dump daemon
nebula	attack signtures via clustering
nepenthes	low interaction honeypot - use dionaea instead
pehunter	snort plugin to carve PE files from network streams
regoogle	google assisted reverse engeneering
streams	Play with pcap files
users	
users/common/aguri	aguri fork for the ladies
users/common/prosody	prosody fork with sensor network patches
users/gento/dionaea	dionaea branch for new things
users/phibo/dionaea	dionaea branch for reason

http://src.carnivore.it

ftp.carnivore.it

Thank You

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