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Back to the future with eBPF



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Supporting the Cloud Native World

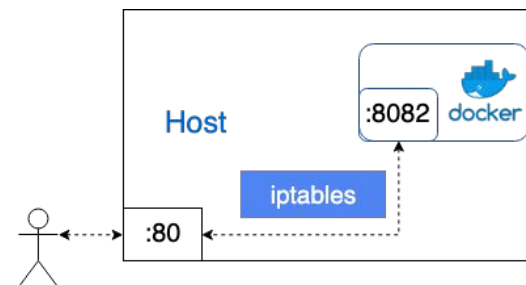
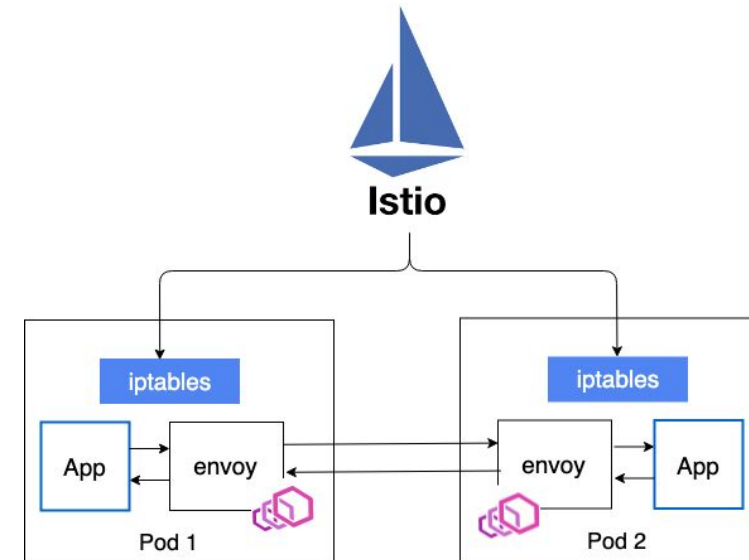
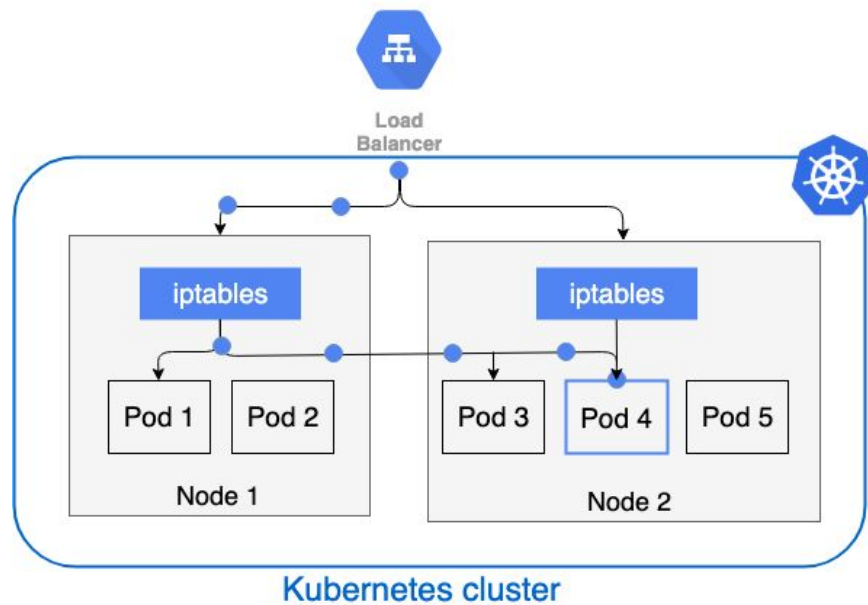


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BPF (1992)

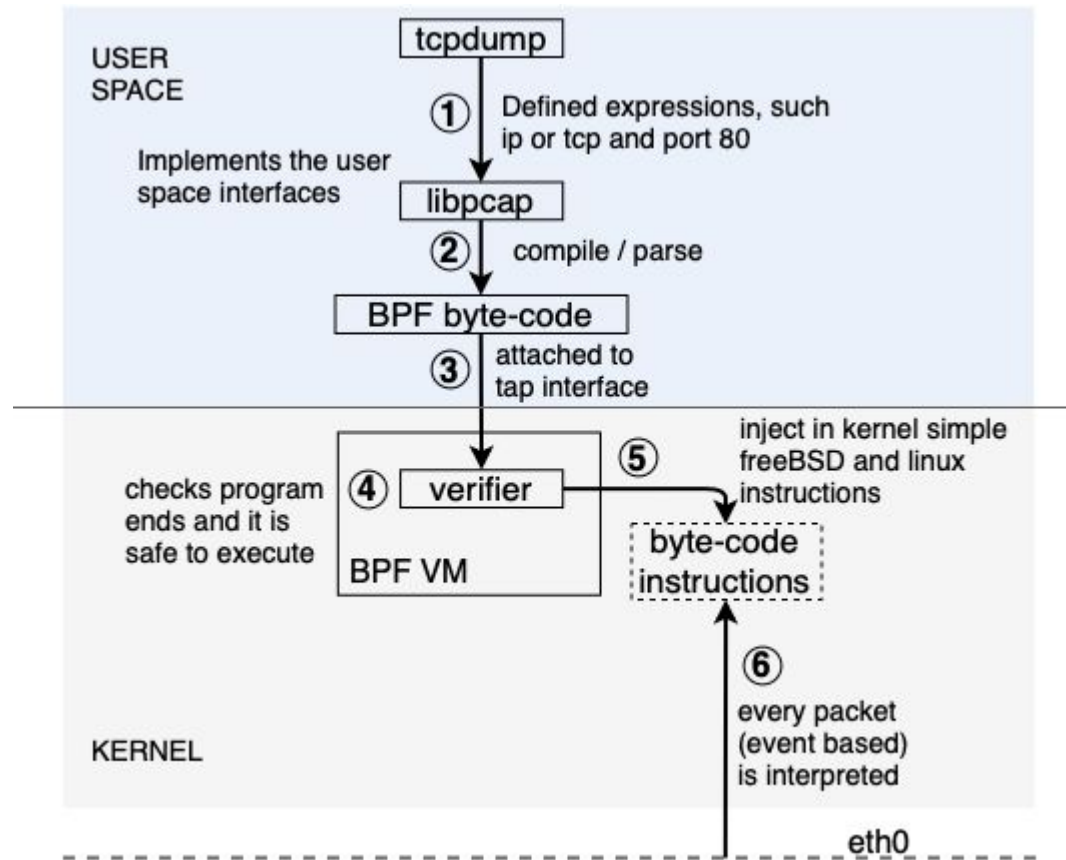


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```
$ tcpdump -p -ni en0 -d "ip or tcp and port 80"
(000) ldh      [12]
(001) jeq      #0x800          jt 2    jf 12
(002) ldb      [23]
(003) jeq      #0x6           jt 4    jf 12
(004) ldh      [20]
(005) jset     #0x1fff         jt 12   jf 6
(006) ldx      4*([14]&0xf)
(007) ldh      [x + 14]
(008) jeq      #0x50          jt 11   jf 9
(009) ldh      [x + 16]
(010) jeq      #0x50          jt 11   jf 12
(011) ret      #262144
(012) ret      #0
```

eBPF: dynamic Linux kernel

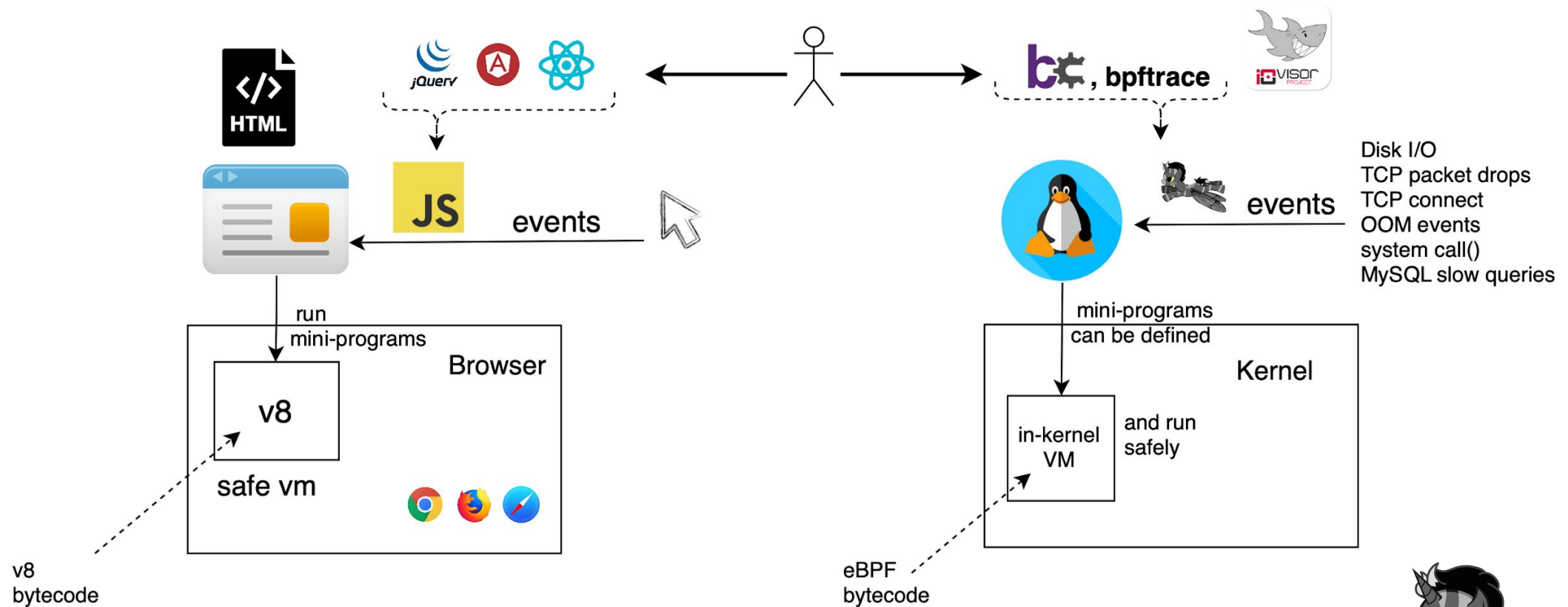


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Inspired on Brendan Gregg's Blog example



Writing eBPF programs



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```
#define ETH_LEN 14

struct dns_hdr_t
{
    uint16_t id;
    uint16_t flags;
    uint16_t qdcount;
    uint16_t ancount;
    uint16_t nscount;
    uint16_t arcount;
} BPF_PACKET_HEADER;

struct dns_query_flags_t
{
    uint16_t qtype;
    uint16_t qclass;
} BPF_PACKET_HEADER;
```

Used in prod:
Netflix, Facebook



BPF bytecode	Brutal
C	Hard
perf	Hard
bcc	Moderate
bpftrace	Easy
ply	Easy

```
(000) ldh    [12]
(001) jeq    #0x800
jt 2      jf 5
(002) ldb    [23]
(003) jeq    #0x11
jt 4      jf 5
(004) ret    #65535
(005) ret    #0
```

one-liners

Syscall counts by process

```
bpftrace -e 'tracepoint:raw_syscalls:sys_enter { @[comm] = count(); }'
```

Testing eBPF



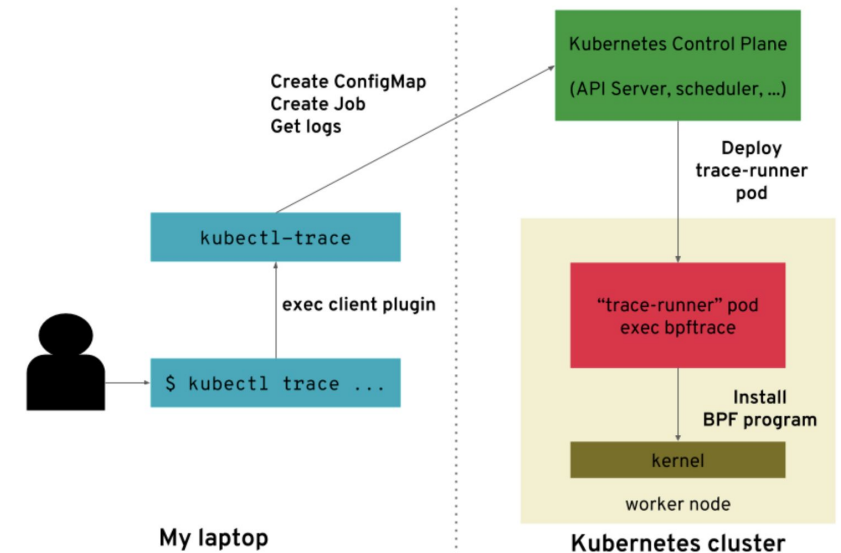
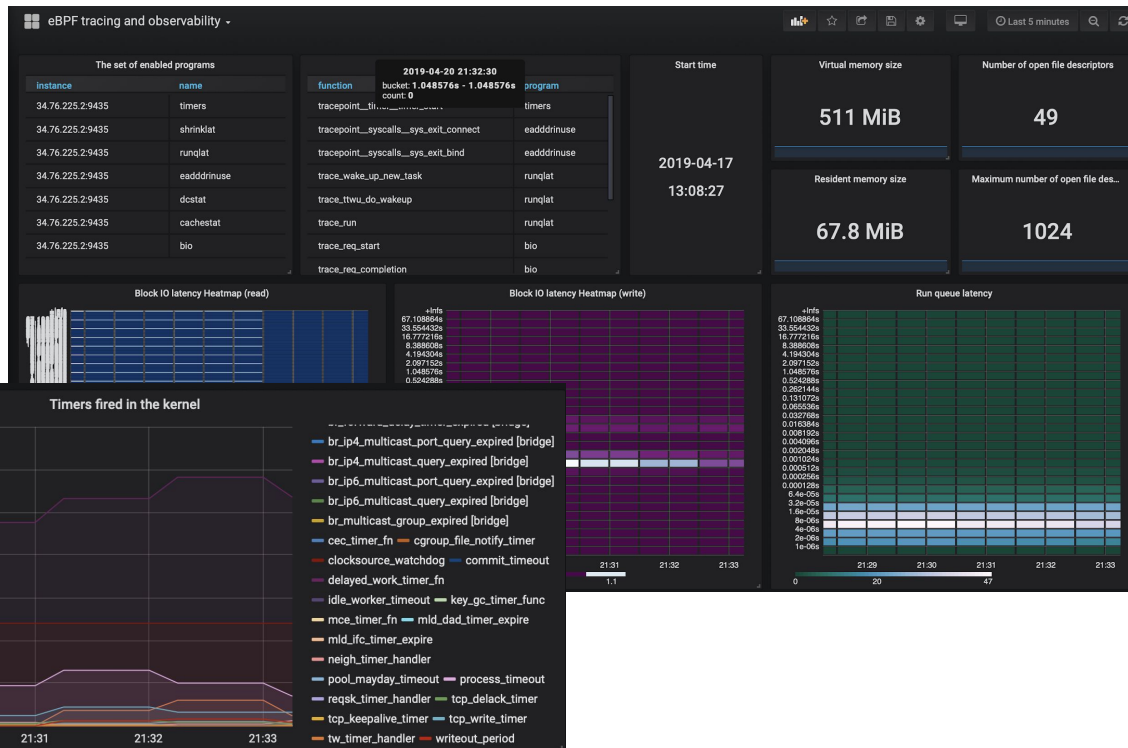
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ebpf-exporter (bcc)



Real world examples



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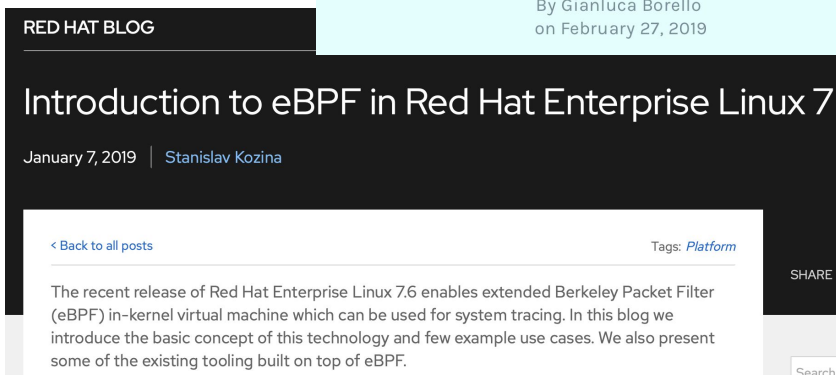


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Use cases:

- Networking
- Firewalls
- Security
- Tracing
- Device Drivers



Netflix

Performance profiling and tracing



Sysdig

eBPF instrumentation for high performance system calls tracing



Weaveworks

Trace TCP events



AWS Firecracker

Using Seccomp BPF to restrict system calls.



Facebook

eBPF-based load balancer with DDoS



Cloudflare

DDoS and Observability



Cilium

Powerful and efficient networking, security and load-balancing at L3-L7.



Redhat

RHEL 7.6 enables extended eBPF in-kernel VM



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