

**“Unifying *Event Tracing*
and *Statistical Sampling*”**

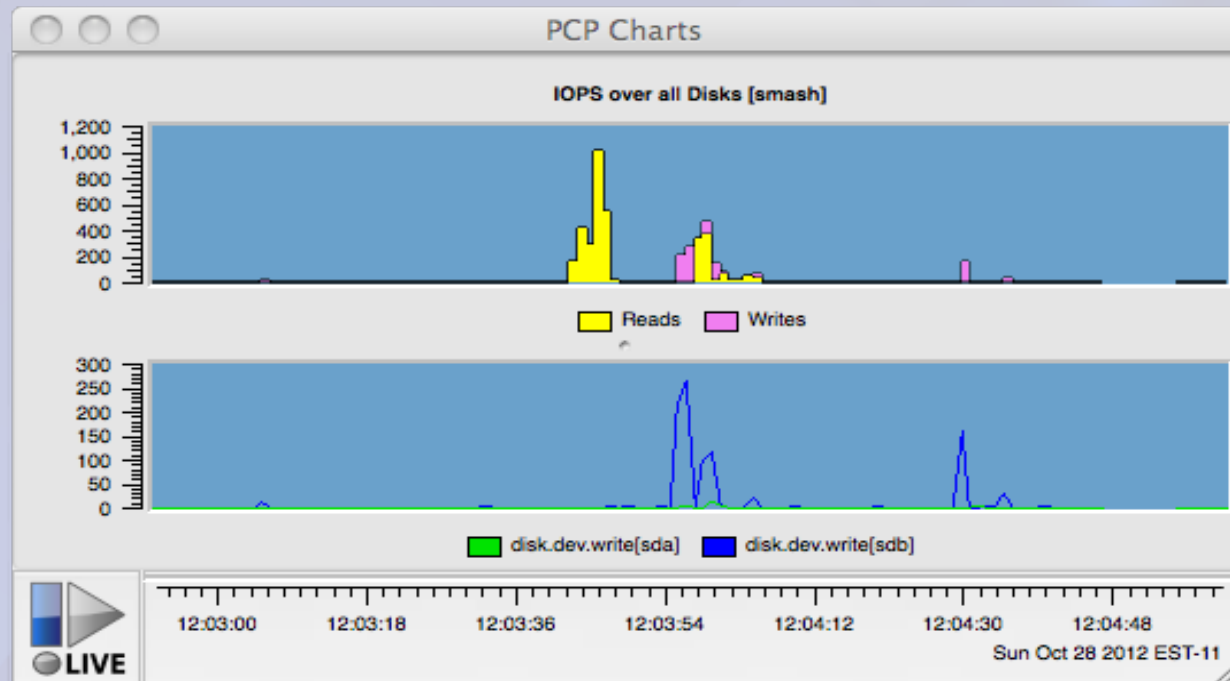
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Overview

- **Terminology**
- **Problem space**
- **Review**
- **Approach**
- **Case studies**
- **Conclusions**
- **Crash & Burn – Demo!**

Some Terminology...

“Sampled Values”

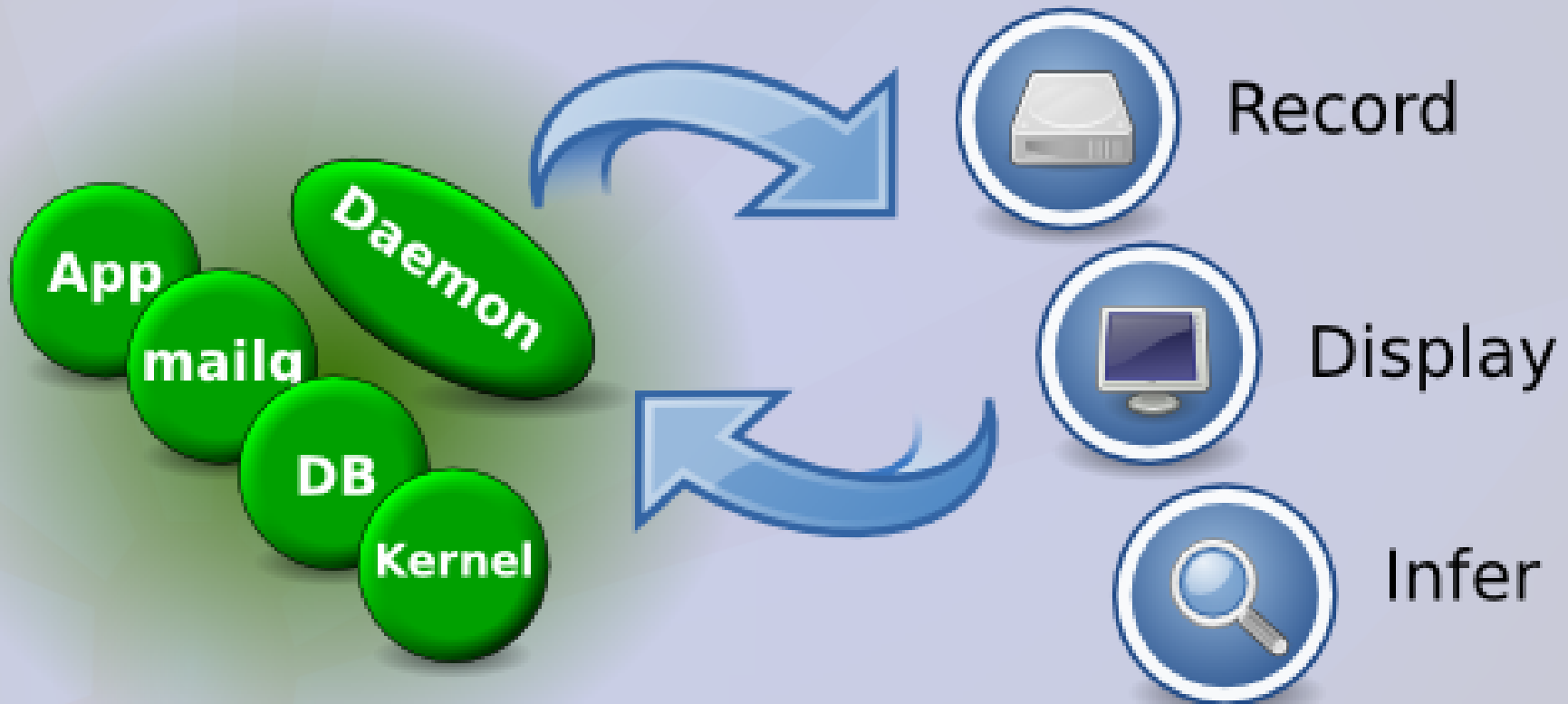


“Event Traces”

```
nathans@smash:~ — ssh — 85x16
nathans@smash:~$ sudo btrace /dev/sdb
8,16 4 1 0.000000000 25141 U N [blktrace] 0
8,17 6 1 0.284749006 533 A WS 38792240 + 8 <- (253,0) 38790192
8,16 6 2 0.284750249 533 A WS 38794288 + 8 <- (8,17) 38792240
8,16 6 3 0.284751128 533 Q WS 38794288 + 8 [jbd2/dm-0-8]
8,16 6 4 0.284756210 533 G WS 38794288 + 8 [jbd2/dm-0-8]
8,16 6 5 0.284758455 533 P N [jbd2/dm-0-8]
8,16 6 6 0.284760059 533 I WS 38794288 + 8 [jbd2/dm-0-8]
8,16 6 0 0.284764841 0 m N cfq533S / insert_request
8,16 6 0 0.284766120 0 m N cfq533S / add_to_rr
8,17 6 7 0.284776976 533 A WS 55091080 + 8 <- (253,0) 55089032
8,16 6 8 0.284777371 533 A WS 55093128 + 8 <- (8,17) 55091080
8,16 6 9 0.284777645 533 Q WS 55093128 + 8 [jbd2/dm-0-8]
8,16 6 10 0.284780151 533 G WS 55093128 + 8 [jbd2/dm-0-8]
8,16 6 11 0.284780852 533 I WS 55093128 + 8 [jbd2/dm-0-8]
8,16 6 0 0.284781942 0 m N cfq533S / insert_request
```

More Terminology...

“Independent Domains”



“Collector” (server)

“Monitor” (client)

What's The Problem?

- System-level performance analysis
- Predominantly sampling based today
 - Flexible (retrospective, modelling, generic)
 - Granularity becomes an issue
- Tracing gaining popularity
 - Active research area (relatively)
- Discontinuity
 - Disjointed tools, analysis “flow” broken

Review

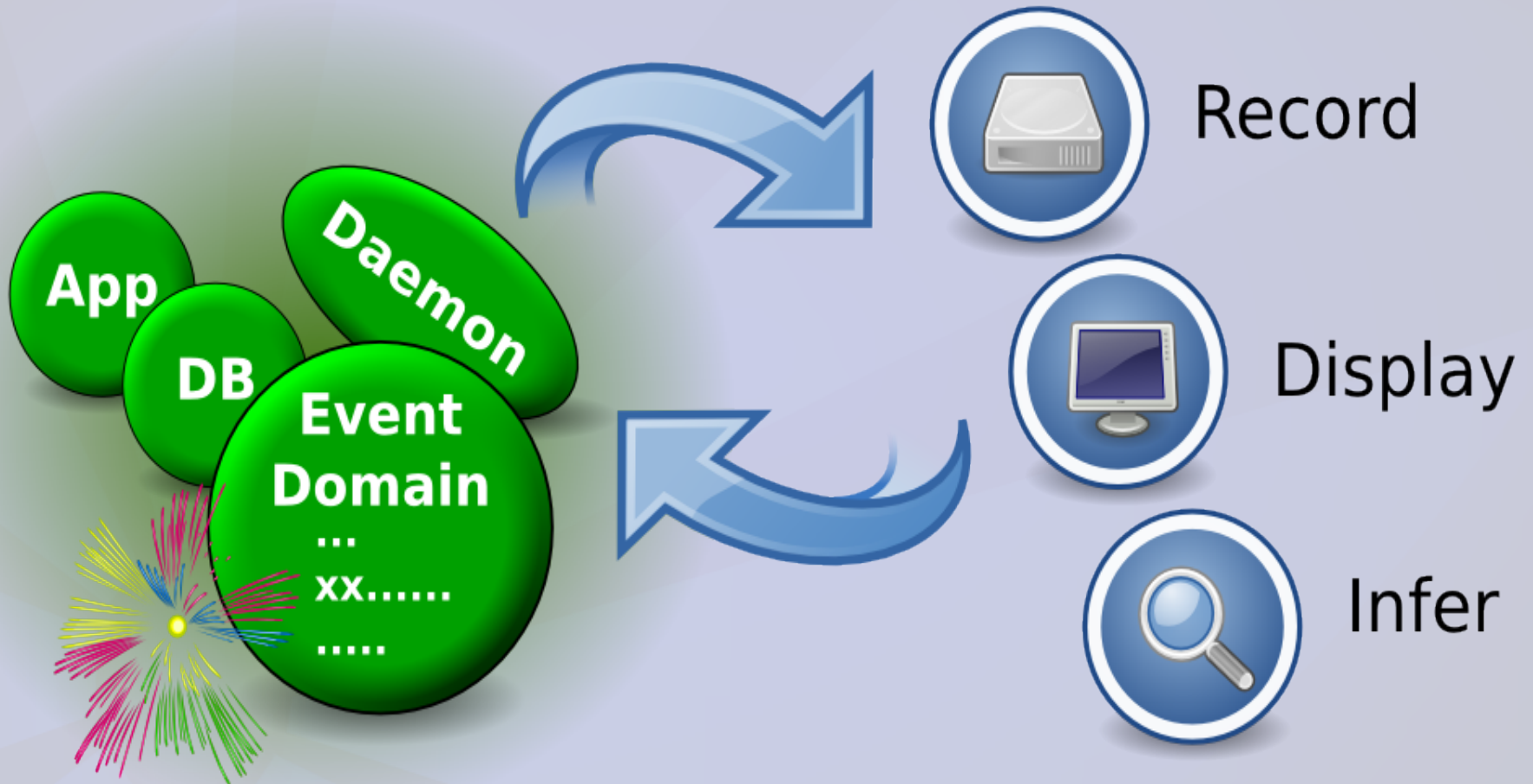
- Magpie and ETW
 - DTrace and SystemTap
 - X-Trace
 - Dapper
 - Performance Co-Pilot
-
- Production environments
 - Visualisation techniques

Approach

- Building on PCP:
 - Existing sampling-based toolkit
 - With recent tracing extensions
- Case-study based research
 - Multiple instrumentation points for each case
 - Extend/refine monitor tools based on findings



Event Queues



Case Studies

- Distributed Log Streaming
 - Sampling and tracing agent
 - Importance of server-side event filtering
- Data Warehouse Import
 - Shell script instrumentation
 - Visualisation
 - Charts with event trees and spans
 - Event selection

Conclusions

- Event Parameters
 - Security model impact
 - Identifier significance
- Event filtering
 - Server side explored
 - Client side needed (and for archives)
- Visualisation
 - Trace structure explored (identifiers)
 - Selection model differences

Quick example – parent shell

```
#!/bin/bash
. /etc/pcp.sh

wired()
{
    ./test-wired.sh $@
    sleep $1
}

pcp_trace on
for (( count=0 ; count < 10 ; count++ ))
do
    wired 2 $count
    [ $count -eq 5 ] && ./test-flood.sh $count
done
```

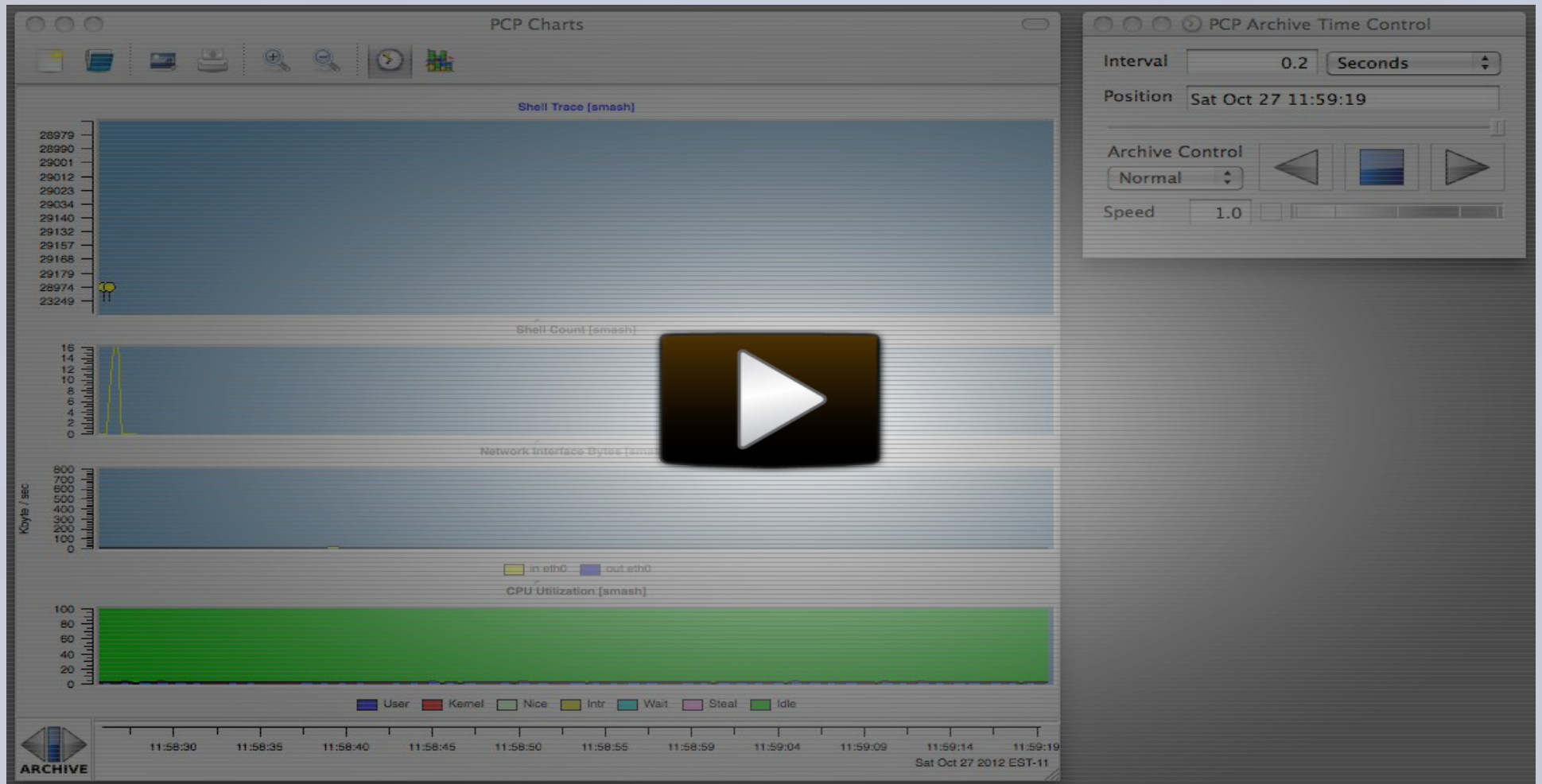
Quick example – children

- **test-flood.sh:**

```
#!/bin/bash
. /etc/pcp.sh
pcp_trace on
sudo ping -q -f -i 0.00002 -c 30000 verge
```
- **test-wired.sh:**

```
#!/bin/bash
. /etc/pcp.sh
pcp_trace on
for i in {0..4} ; do
    ./cpuburn &
done
wait
```

Quick example - visually



<http://screencast.com/t/Xa5wmEq7>