ATS Post-Mortem Debugging

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https://backtrace.io; @0xCD03

Backtrace

Debugging

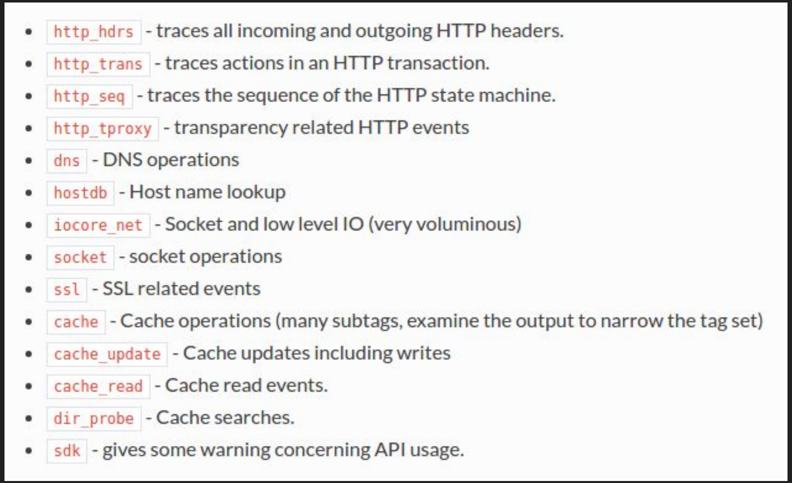
- *In-situ*
- Logging
- Tracing / Profiling
- **Post-Mortem**

- Flexibility
- Verbosity
- Overhead (run-time, space, post-processing)
- Type of failure
  - **Explicit** / Implicit
  - **Fatal / Non-Fatal**

OUR GOAL IS TO WRITE BUG-FREE SOFTWARE. I'LL PAY A TEN-DOLLAR BONUS FOR EVERY BUG YOU FIND AND FIX.
S. Adams E-mail: SCOTTADAMS@AOL.COM
YAHOO!
WE'RE RICH
YES!!! YES!!! YES!!!
© 1995 United Feature Syndicate, Inc.(NYC)
I HOPE THIS DRIVES THE RIGHT BEHAVIOR.
I'M GONNA WRITE ME A NEW MINIVAN THIS AFTER-NOON!

Instrumentation

- Dump mem info periodically
  - CONFIG proxy.config.dump_mem_info_frequency INT <value>
    - dump mem info to *traffic.out* every <value> seconds
- Debug Tags output to *traffic.out*
  - CONFIG proxy.config.diags.debug.enabled INT 1
  - CONFIG proxy.config.diags.debug.tags STRING <tag-name>
  - -T<tag-name>



- `http_hdrs` - traces all incoming and outgoing HTTP headers.
- `http_trans` - traces actions in an HTTP transaction.
- `http_seq` - traces the sequence of the HTTP state machine.
- `http_tproxy` - transparency related HTTP events
- `dns` - DNS operations
- `hostdb` - Host name lookup
- `iocore_net` - Socket and low level IO (very voluminous)
- `socket` - socket operations
- `ssl` - SSL related events
- `cache` - Cache operations (many subtags, examine the output to narrow the tag set)
- `cache_update` - Cache updates including writes
- `cache_read` - Cache read events.
- `dir_probe` - Cache searches.
- `sdk` - gives some warning concerning API usage.

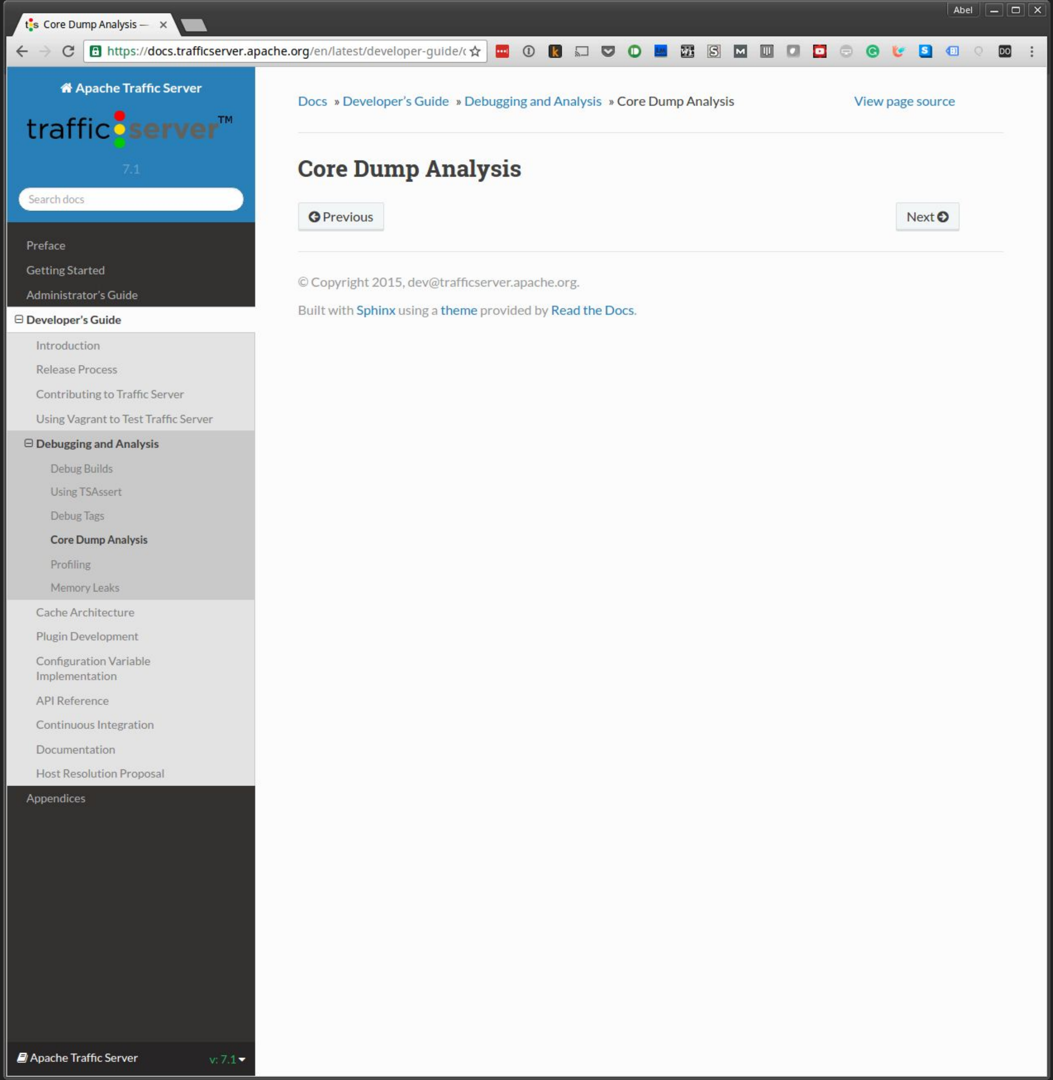
Post-Mortem Debugging

Pros:

- Rich data set
- Robust data capture
- Overhead only at the time of error
- Allows for powerful tooling

Cons:

- State at a single point in time
- Large data artifacts
- Lack of useful tooling, documentation



Docs » Developer's Guide » Debugging and Analysis » Core Dump Analysis   View page source

Core Dump Analysis

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Built with Sphinx using a theme provided by Read the Docs.

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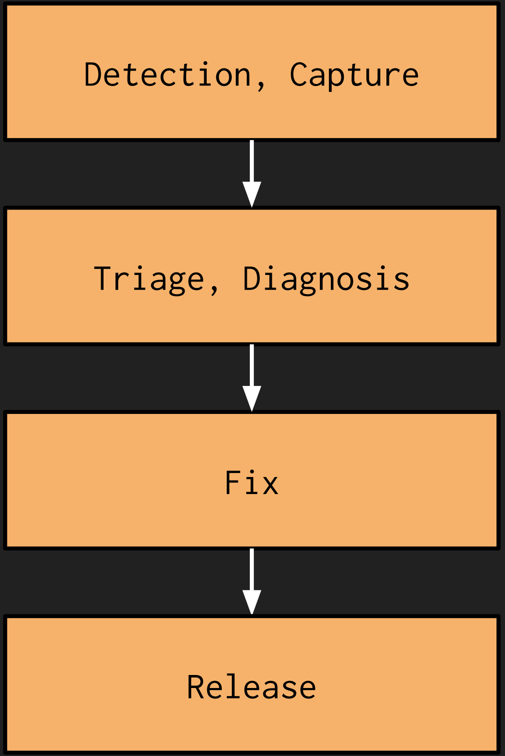
Post-Mortem Debugging for ATS

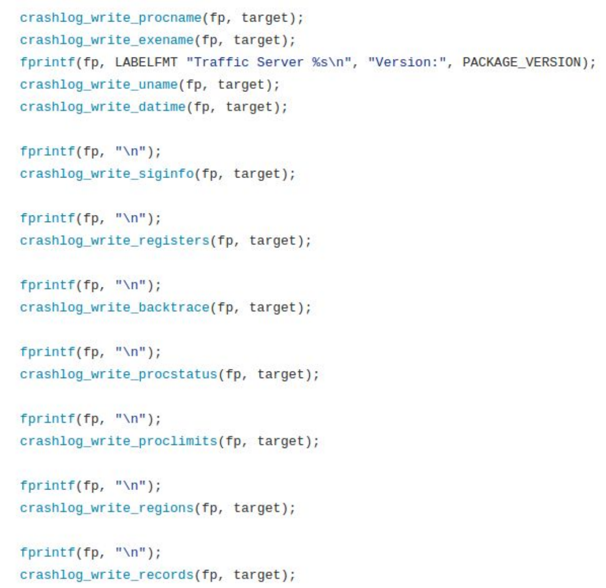


Backtrace

Detection, Capture

CONFIG proxy.config.crash_log_helper

Default: traffic_crashlog, if remote_unwinding enabled



```
crashlog_write_procname(fp, target);
crashlog_write_exename(fp, target);
fprintf(fp, LABELFMT "Traffic Server %s\n", "Version:", PACKAGE_VERSION);
crashlog_write_uname(fp, target);
crashlog_write_datime(fp, target);

fprintf(fp, "\n");
crashlog_write_siginfo(fp, target);

fprintf(fp, "\n");
crashlog_write_registers(fp, target);

fprintf(fp, "\n");
crashlog_write_backtrace(fp, target);

fprintf(fp, "\n");
crashlog_write_procstatus(fp, target);

fprintf(fp, "\n");
crashlog_write_proclimits(fp, target);

fprintf(fp, "\n");
crashlog_write_regions(fp, target);

fprintf(fp, "\n");
crashlog_write_records(fp, target);
```

Forks child process configured application at startup.

Child waits and wakes up (SIGCONT) when parent receives SIGBUS, SIGSEGV, SIGILL, SIGTRAP, SIGFPE, SIGABRT. traffic_server then pauses

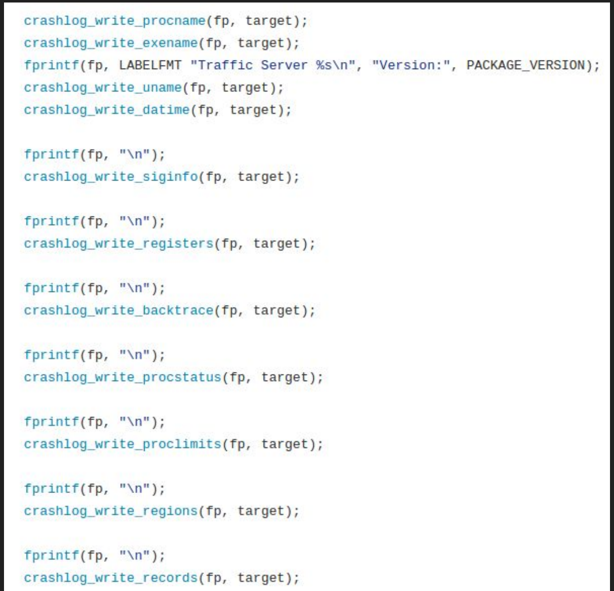
By default logs to *crash-%Y-%m-%d-%H%M%S.log*

Enable coredumps: CONFIG proxy.config.core_limit INT -1

Detection, Capture

CONFIG proxy.config.crash_log_helper

Default: traffic_crashlog, if remote_unwinding enabled



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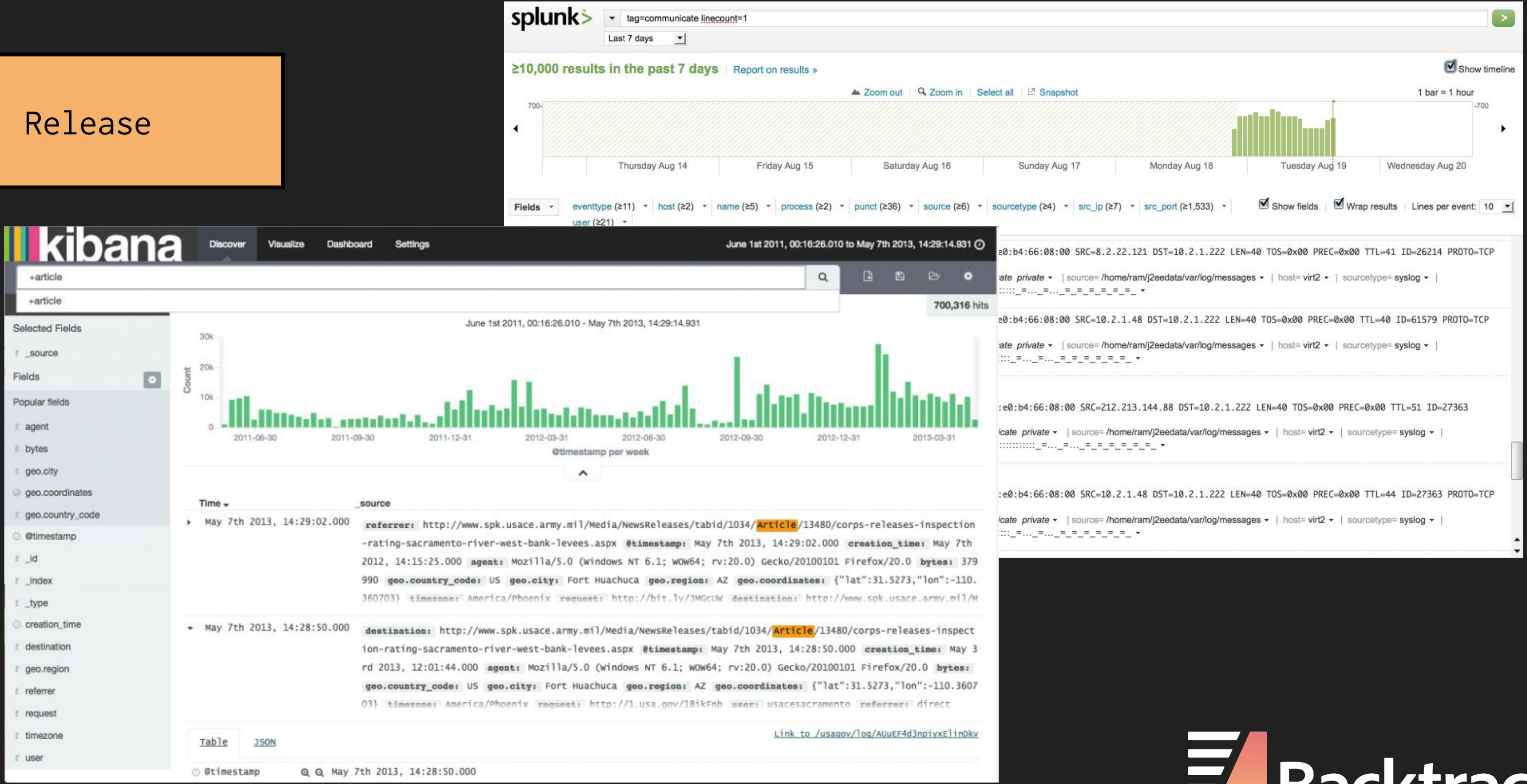
fprintf(fp, "\n");
crashlog_write_records(fp, target);
```

1. Startup Death Spiral? Zombie children
    a. prctl(PR_SET_PDEATHSIG, signum, 0, 0, 0)
2. libunwind, remote unwinding, waitpid()
3. Unwinding, capture in ATS
4. Variables? Deeper Analysis?

Triage, Diagnosis

Fix, Release



```
e0:b4:66:08:00 SRC=8.2.22.121 DST=10.2.1.222 LEN=40 TOS=0x00 PREC=0x00 TTL=41 ID=26214 PROTO=TCP
ate private ▾ | source= /home/ram/j2eedata/var/log/messages ▾ | host= virt2 ▾ | sourcetype= syslog ▾ |
:::::_=..._=..._=_=_=_=_=_=_ ▾

e0:b4:66:08:00 SRC=10.2.1.48 DST=10.2.1.222 LEN=40 TOS=0x00 PREC=0x00 TTL=40 ID=61579 PROTO=TCP
ate private ▾ | source= /home/ram/j2eedata/var/log/messages ▾ | host= virt2 ▾ | sourcetype= syslog ▾ |
::::_=..._=..._=_=_=_=_=_=_ ▾

:e0:b4:66:08:00 SRC=212.213.144.88 DST=10.2.1.222 LEN=40 TOS=0x00 PREC=0x00 TTL=51 ID=27363
icate private ▾ | source= /home/ram/j2eedata/var/log/messages ▾ | host= virt2 ▾ | sourcetype= syslog ▾ |
:::::::::::_=..._=..._=_=_=_=_=_=_ ▾

:e0:b4:66:08:00 SRC=10.2.1.48 DST=10.2.1.222 LEN=40 TOS=0x00 PREC=0x00 TTL=44 ID=27363 PROTO=TCP
icate private ▾ | source= /home/ram/j2eedata/var/log/messages ▾ | host= virt2 ▾ | sourcetype= syslog ▾ |
::::_=..._=..._=_=_=_=_=_=_ ▾
```

```
▸ May 7th 2013, 14:29:02.000   referrer: http://www.spk.usace.army.mil/Media/NewsReleases/tabid/1034/Article/13480/corps-releases-inspection
                               -rating-sacramento-river-west-bank-levees.aspx @timestamp: May 7th 2013, 14:29:02.000 creation_time: May 7th
                               2012, 14:15:25.000 agent: Mozilla/5.0 (Windows NT 6.1; WOW64; rv:20.0) Gecko/20100101 Firefox/20.0 bytes: 379
                               990 geo.country_code: US geo.city: Fort Huachuca geo.region: AZ geo.coordinates: {"lat":31.5273,"lon":-110.
                               360703} timezone: America/Phoenix request: http://bit.ly/JMGcUW destination: http://www.spk.usace.army.mil/M

▾ May 7th 2013, 14:28:50.000   destination: http://www.spk.usace.army.mil/Media/NewsReleases/tabid/1034/Article/13480/corps-releases-inspect
                               ion-rating-sacramento-river-west-bank-levees.aspx @timestamp: May 7th 2013, 14:28:50.000 creation_time: May 3
                               rd 2013, 12:01:44.000 agent: Mozilla/5.0 (Windows NT 6.1; WOW64; rv:20.0) Gecko/20100101 Firefox/20.0 bytes:
                               geo.country_code: US geo.city: Fort Huachuca geo.region: AZ geo.coordinates: {"lat":31.5273,"lon":-110.3607
                               03} timezone: America/Phoenix request: http://1.usa.gov/18ikFnb user: usacesacramento referrer: direct

@timestamp        May 7th 2013, 14:28:50.000
```

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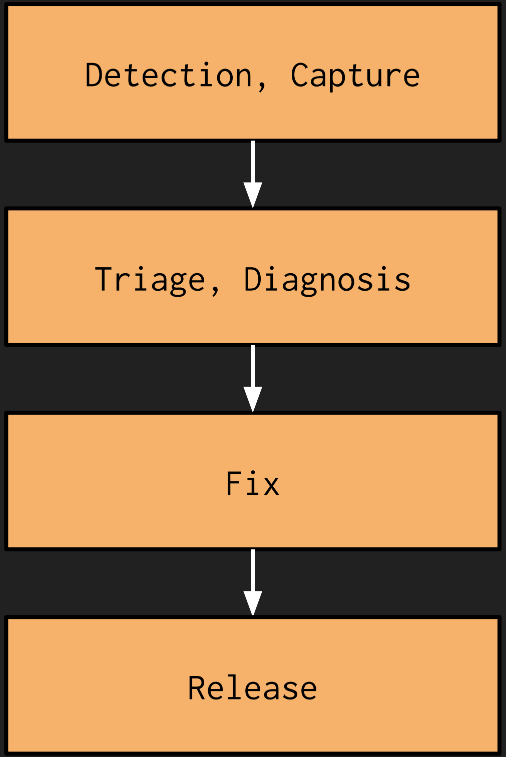
Post-Mortem Debugging for ATS?



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Error Management:

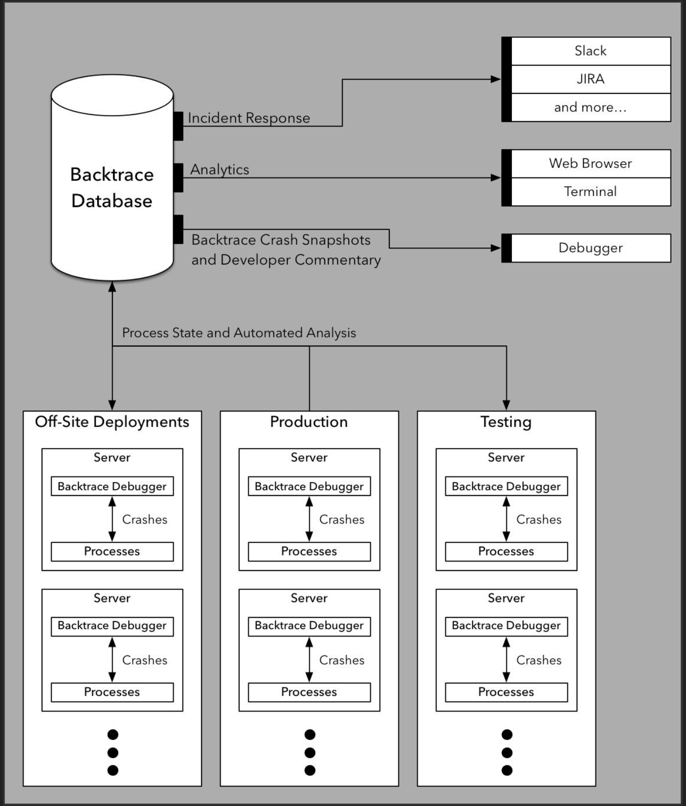
Capture

Notification

Aggregation

Analysis

(in-depth & at-large)



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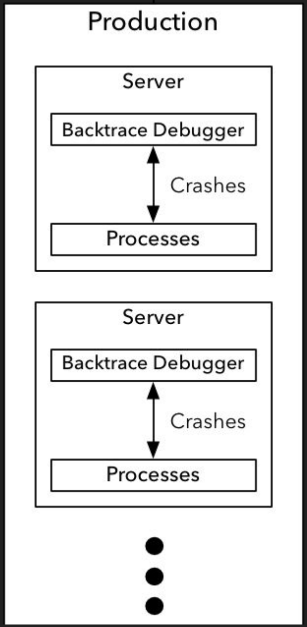
Detection, Capture

CONFIG proxy.config.crash_log_helper

New: backtrace-invoker



https://github.com/backtrace-labs/invoker

Drop-in replacement for traffic_crashlog

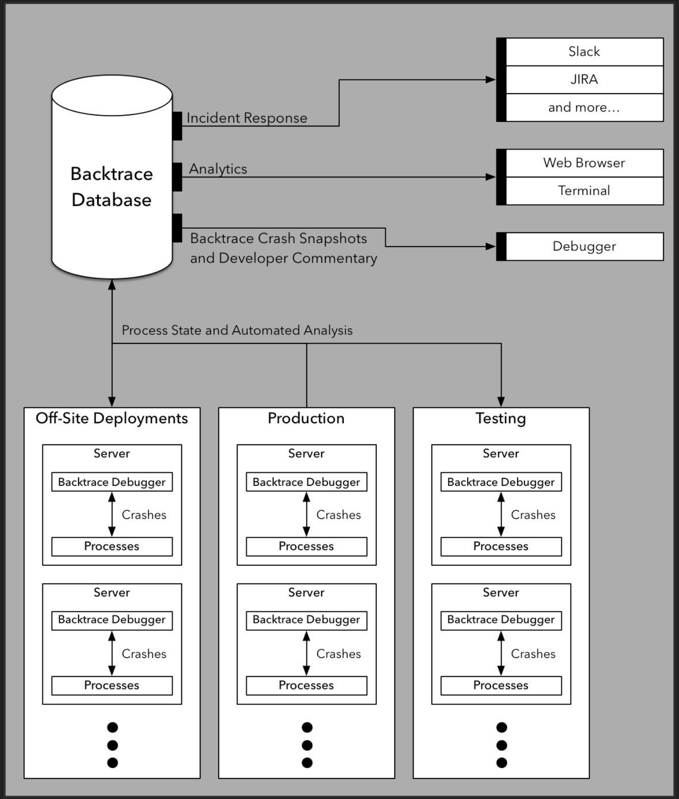
Generic invoker, allows to configure multiple *tracers* , customer args

Used to invoke Backrace’s *snapshot generator*

- Everything traffic_crashlog does
  - sans records
- Local + Automatic Variables
- System Stats
- Extensible

Backtrace

Triage, Diagnosis



- Deduplication
- Aggregation
- Tracking, regressions
- Integrate data into third party systems
- Convenient investigation, collaboration

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Backtrace

Future Work: ATS

- Write an extension for Backtrace snapshot generator to capture ATS “state machine” at the time of fault/error.

Resources

https://github.com/backtrace-labs/invoker

https://docs.trafficserver.apache.org/en/latest/developer-guide/debugging/index.en.html

https://backtrace.io/blog

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