A Prototype for Fast Type-Aware Memory Profiling

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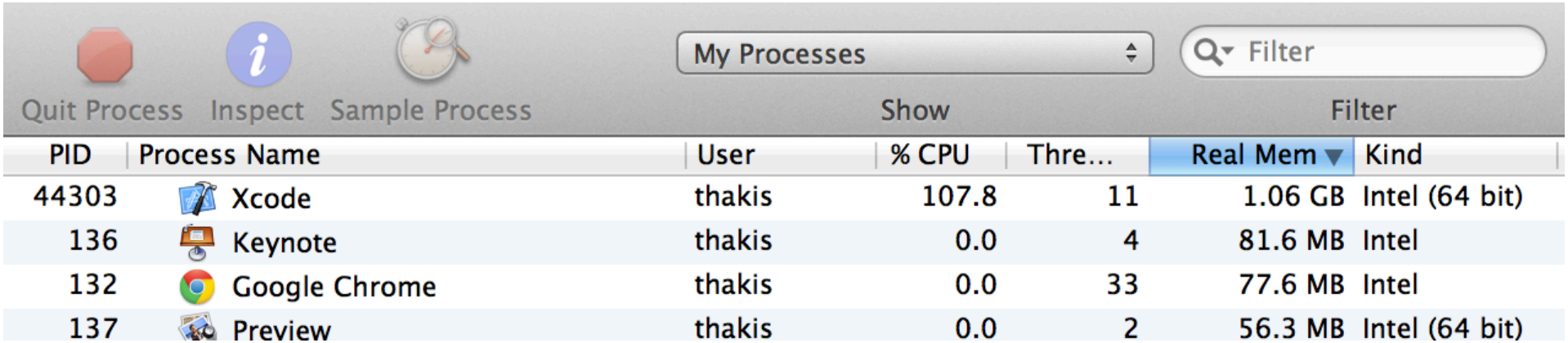
Quit Process
Inspect
Sample Process
My Processes
Show
Filter
Filter
PID
Process Name
User
% CPU
Thre...
Real Mem
Kind
44303
Xcode
thakis
107.8
11
1.06 GB
Intel (64 bit)
136
Keynote
thakis
0.0
4
81.6 MB
Intel
132
Google Chrome
thakis
0.0
33
77.6 MB
Intel
137
Preview
thakis
0.0
2
56.3 MB
Intel (64 bit)

State of the art

- Most profilers* hook malloc()
  - and collect stacks
- But type information would be nice

What's "Type-Aware" mean?

- LookupType(address) -> type info
- available at runtime
- can aggregate memory use by type

State of the art 2

- Some languages (Java…) have rich enough type metadata to get this for free
- C++: memtrack uses `#define new MAGIC`
  - but that uses a define
    - for `new`
      - ugh

Our stuff

- compiler-based instrumentation
- operator new(...) ⇒

  __op_new_intercept__(

  operator new(...), size_t, type_info)
- User code implements __op_new_intercept__!

Example: logger

```
void* ::__op_new_intercept__(
  void* address, size_t size,
  const std::type_info& type) {
 fprintf("Allocated %lu bytes "
         "for %s at %016p.\n",
         size,type.name(),address);
 return address;
}
```

Results

- Early days
- Looks like 30-40% of browser memory are from string-related types
- Hope to use this to provide data on Clang/LLVM's memory usage soon

Next steps

- Prove usefulness in chromium, clang
- Ideally, make it possible to do type-aware profiling with regular clang
- Dai will reach out to the list

Thanks!

Links

- http://dev.chromium.org/developers/deep-memory-profiler
- http://src.chromium.org/viewvc/chrome/trunk/deps/third_party/llvm-allocated-type
- http://crrev.com/158752

Links 2

- http://www.almostinfinite.com/memtrack.html
- http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?reload=true&&arnumber=6080813

Other approaches

- Don’t do this in client code but in compiler-rt (locking etc)
- Intercept at LLVM level instead of clang level
- Change signature of operator new()
- Have type info available in magic variable in operator new()