OS X Security at Scale

mike arpaia / facebook
ted reed / facebook

OS X security at Facebook

production hardening

client engineering

intrusion detection

catch attackers

“detection” and “response”

- insider threats
  - espionage
- external threats
  - APT
  - hacktivists
  - mass malware
  - the list is endless

single intrusion detection team

defend enterprise and production infra

- extract as much signal as possible
  - make high confidence decisions
  - harder for the more variable OS X client fleet

- avoid duplication in production
  - ease burden for humans
  - apply the same intelligence feeds
  - reuse storage

focus on client machines

mac and linux laptops

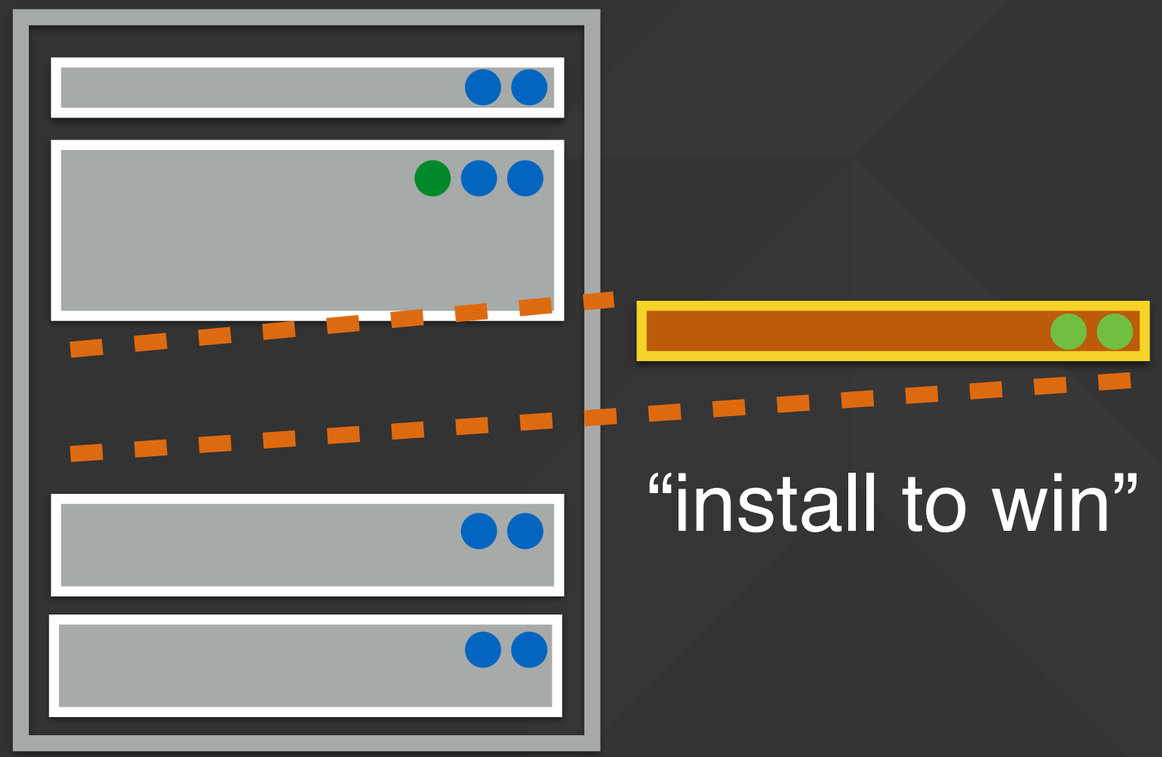
Most variable

‘*Highest’* risk

Largest attack surface

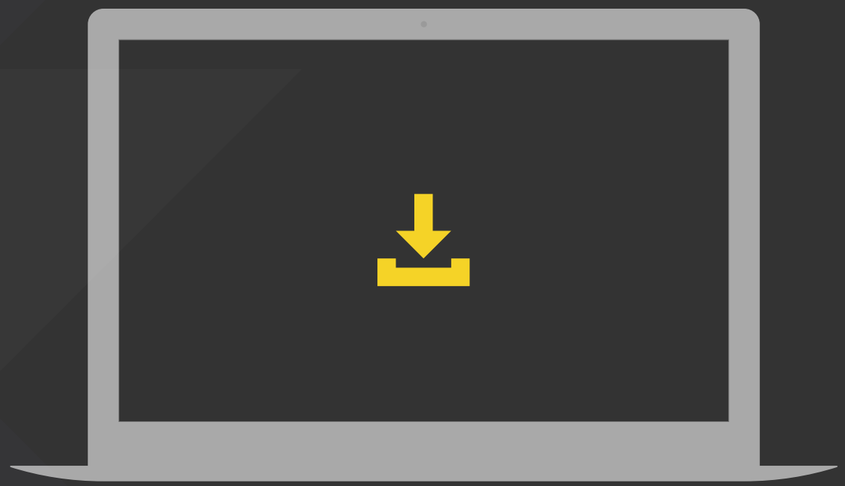
but it’s a hard problem

network-based IDS



“install to win”

host-based IDS



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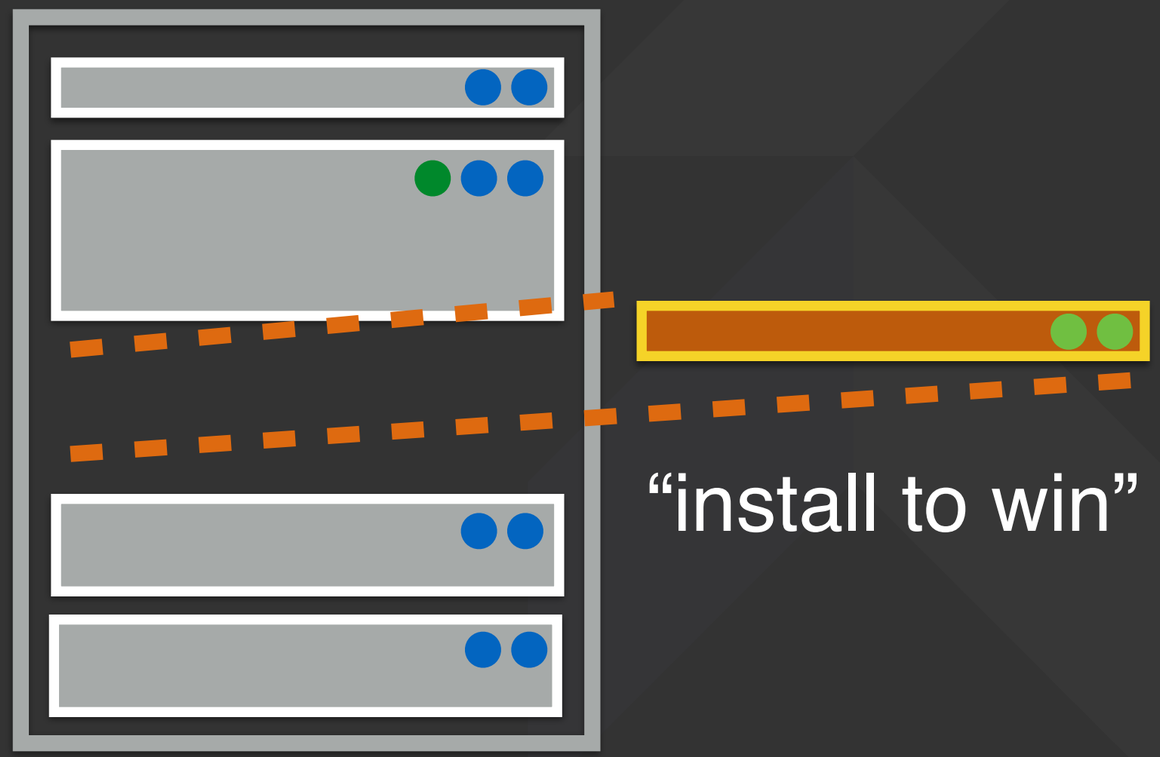
network-based IDS



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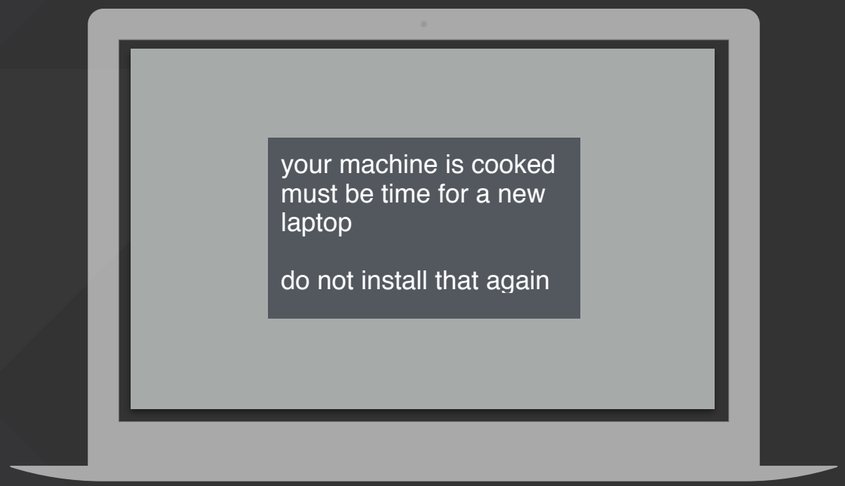


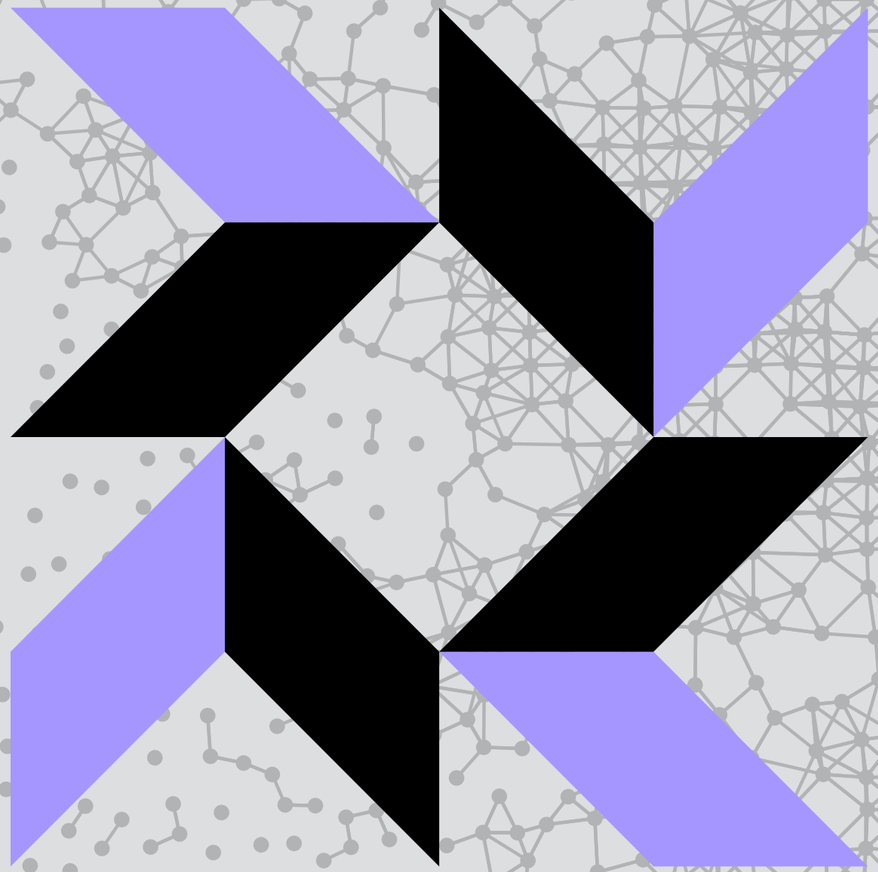
“install and pray”

we live in a windows centric world

but, times are changing

- more OS X laptops
- most production infrastructure runs on Linux

- few are instrumenting their OS X and Linux hosts
  - affordably
  - tailored to medium enterprises or large infrastructures
  - how would we solve that problem?



desired properties

upgrades

simple

development

deployable

low maintenance

configurable

easy

integrations

long uptime

performant

user impact

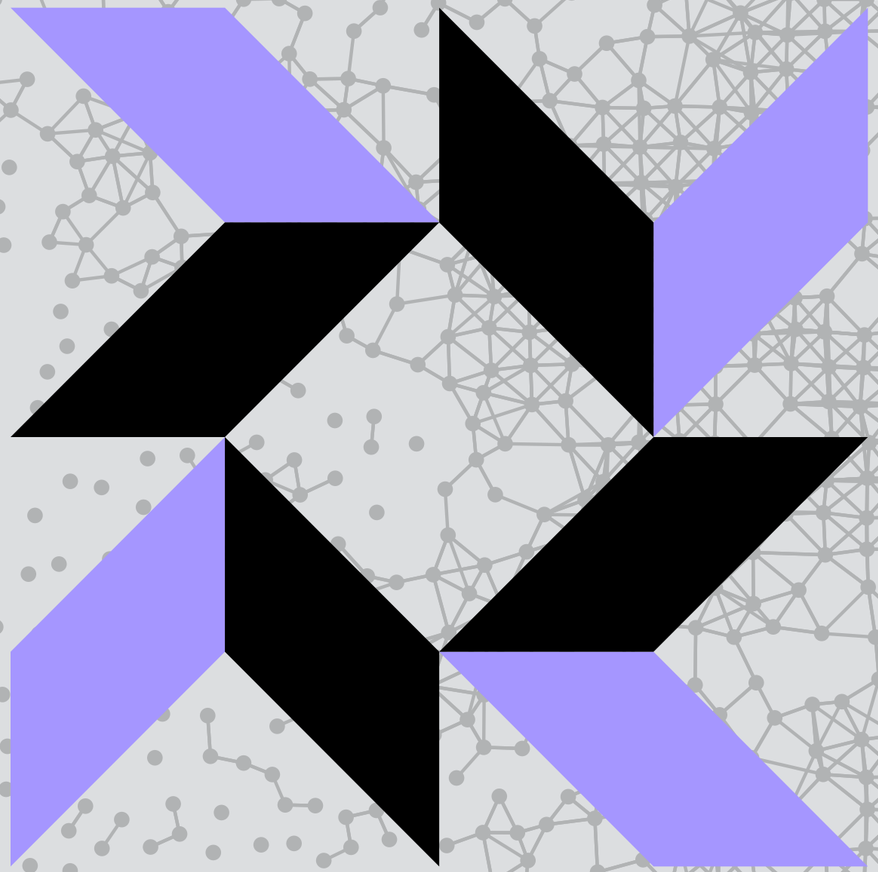
metrics

automation

flexible

vulnerability management

compliance



osquery

osquery

SQL for your infrastructure

use SQL queries to explore OS state

- running processes
- loaded kernel modules
- active network connections
- route table
- firewall settings
- installed software
- file modifications

why SQL?

```
SELECT pid, name, uid FROM processes
```

OS concepts are shared on Mac, Linux, and Windows

the “concepts” have attributes:
user ids, process ids, descriptors, ports, paths

most developers and administrators know SQL

why SQL?

[concept]

```
SELECT pid, name, uid FROM processes
```

why SQL?

[attributes] [concept]

```
SELECT pid, name, uid FROM processes
```

why SQL?

```
SELECT pid, name, uid FROM processes
```

```
WHERE uid != 0
```

[constraints]

why SQL?

[attribute]

```
SELECT pid, name, username FROM processes
JOIN users ON processes.uid=users.uid
WHERE uid != 0
```

[join]

many tables are available

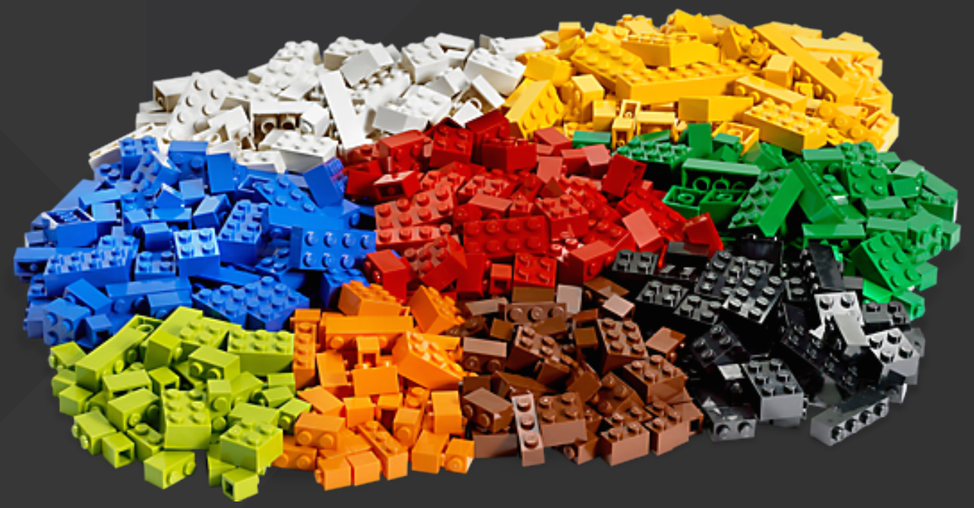
more tables are being written every day

- acpi_tables
- arp_cache
- crontab
- file_events
- kernel_info
- listening_ports
- logged_in_users
- mounts
- pci_devices
- processes
- routes
- shell_history
- smbios_tables
- suid_bin
- system_controls
- usb_devices
- users
- groups
- rpm_packages
- apt_sources
- deb_packages
- homebrew_packages
- kernel_modules
- memory_map
- shared_memory
- browser_plugins
- startup_items

use simple tables, together

osquery enables complex analysis by allowing users to join and aggregate across several simple tables

- simple tables have many advantages
  - easier to write
  - easier to maintain
  - can be used in many contexts

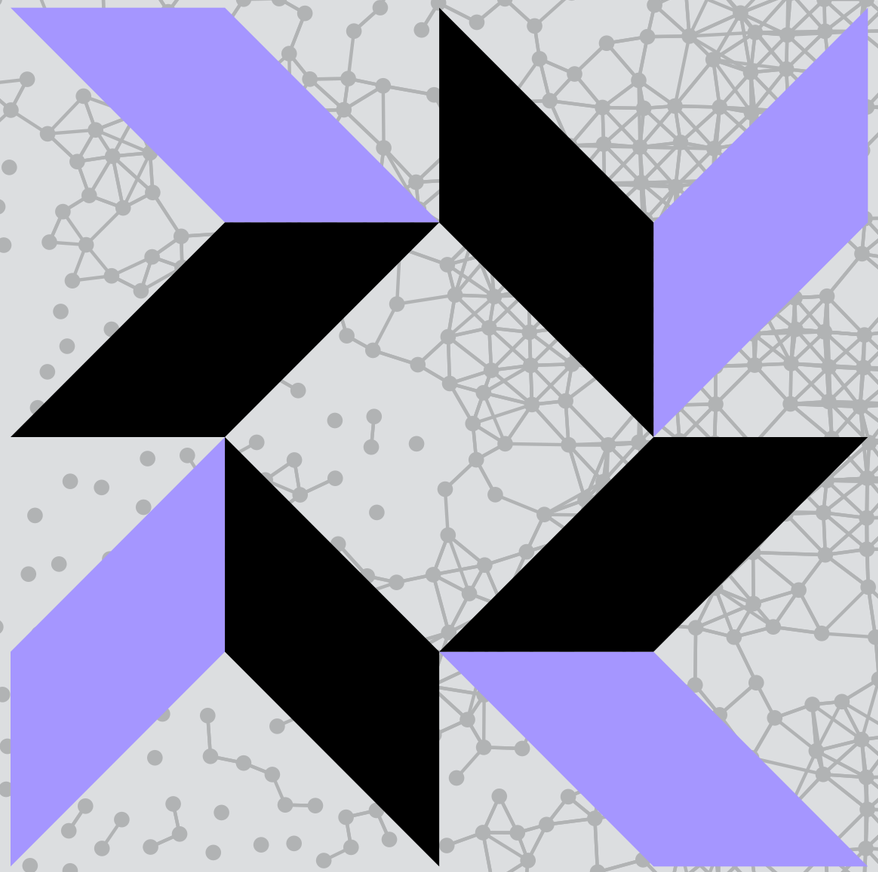


osquery is much more
than a security tool

osquery is much more
than a security tool

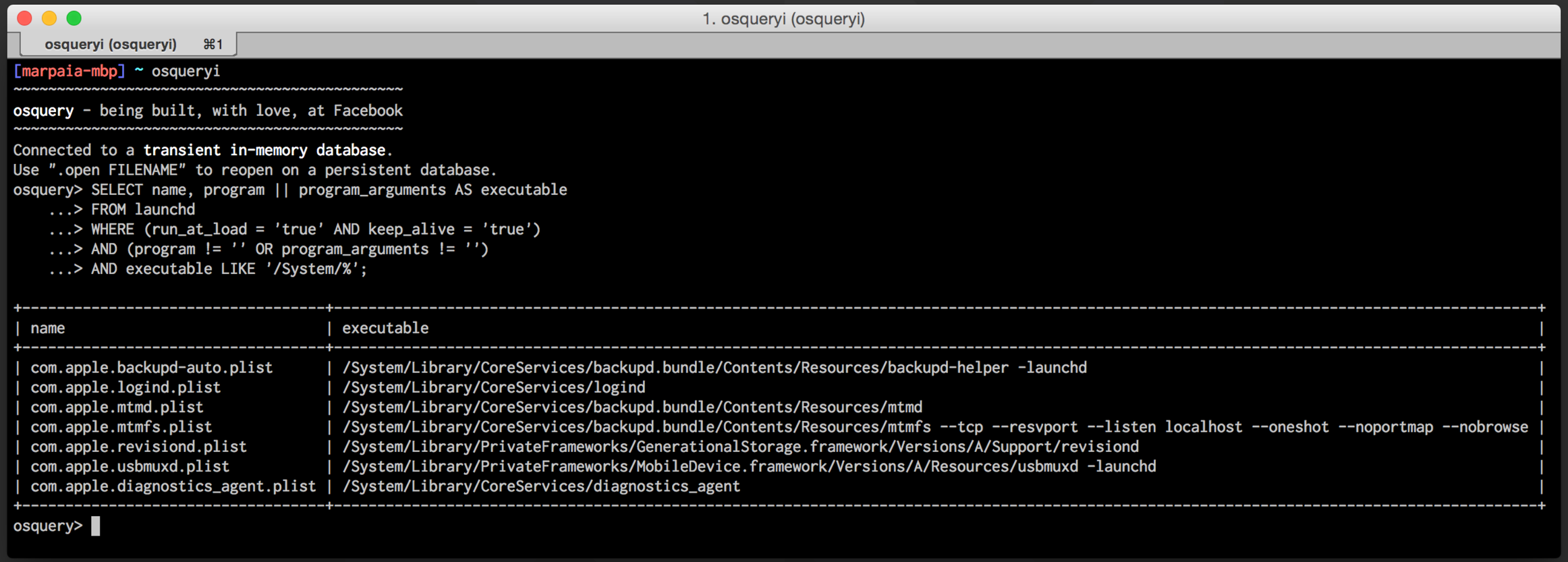
actually, literally…

it is a family of tools

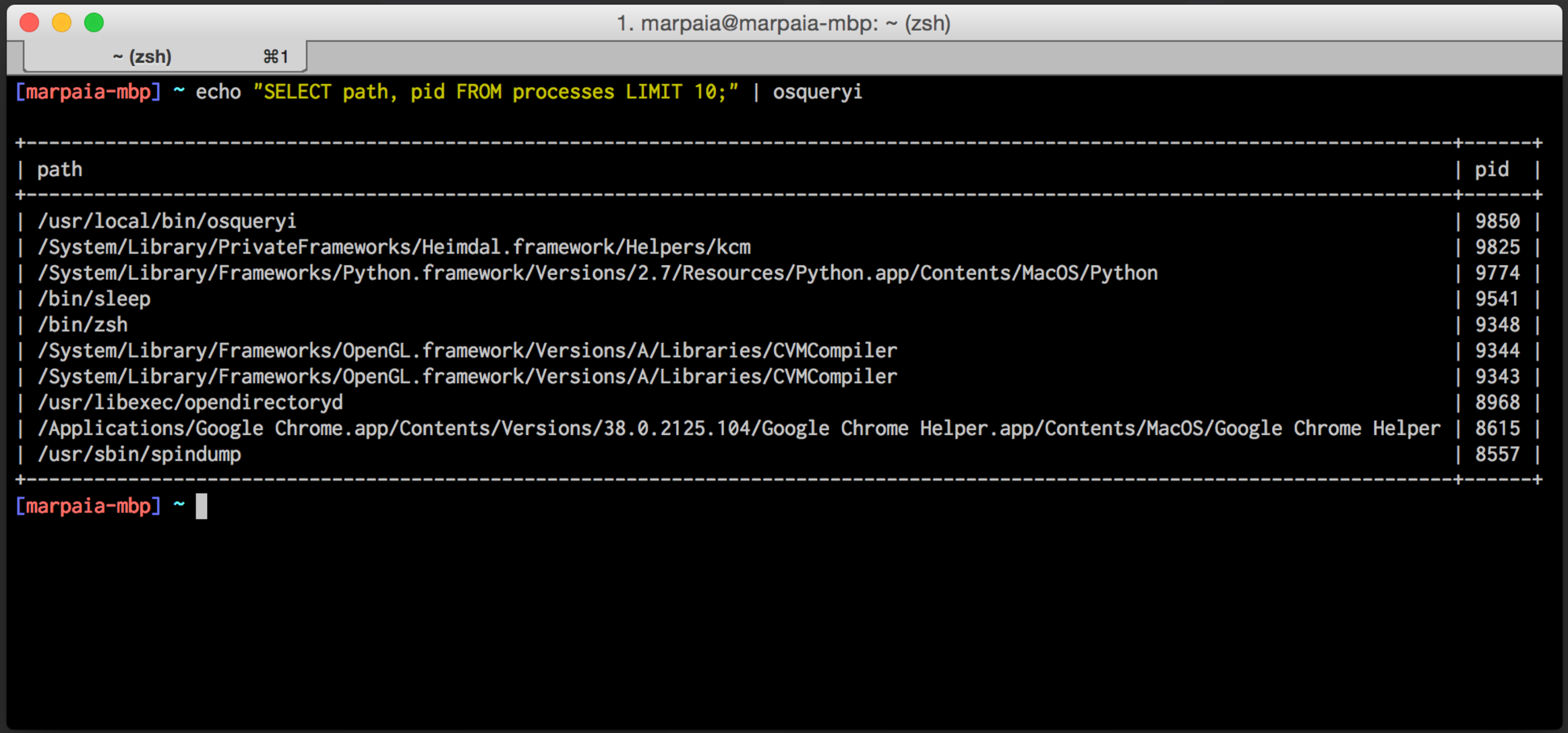


osqueryi

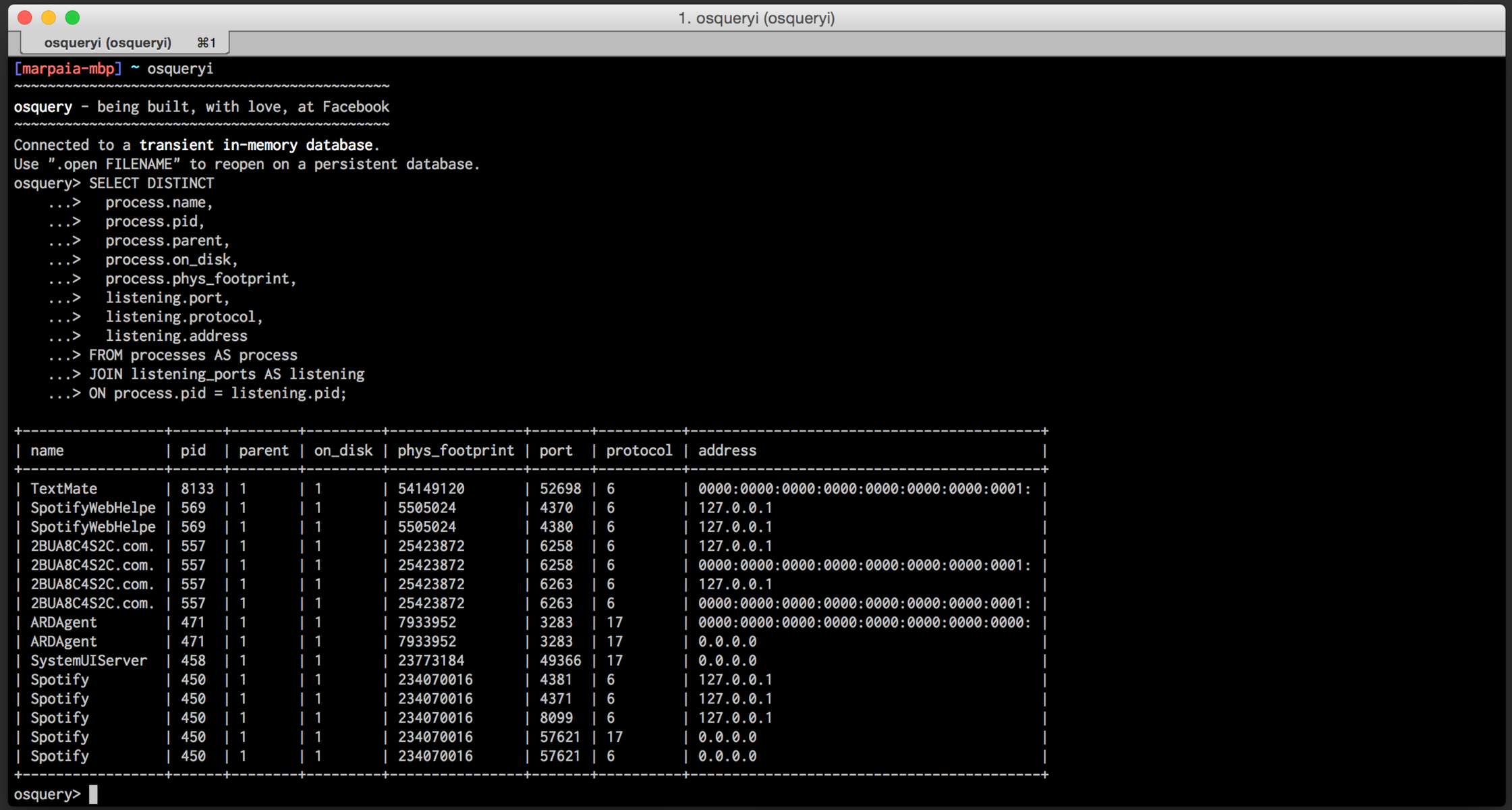

2. marpaia@marpaia-mbp: ~ (zsh)
~ (zsh) ⌘1
[marpaia-mbp] ~ echo "SELECT * FROM time;" | osqueryi
+------+---------+---------+
| hour | minutes | seconds |
+------+---------+---------+
| 0 | 58 | 30 |
+------+---------+---------+
[marpaia-mbp] ~



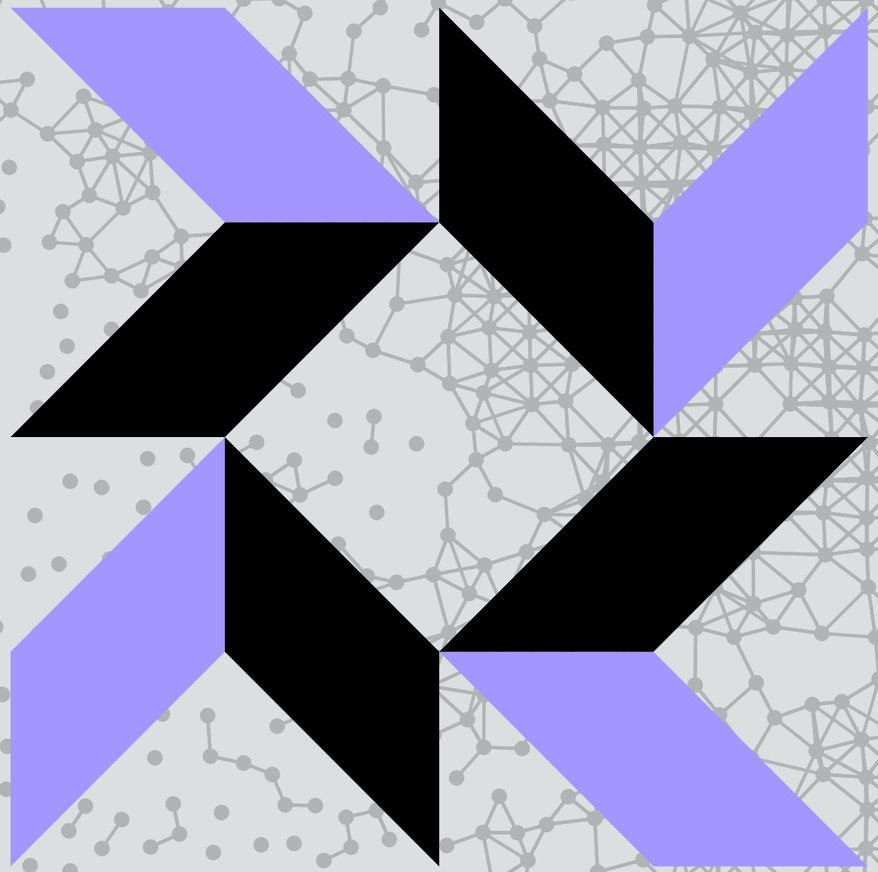
LaunchDaemons which run a binary at boot



running processes



processes listening on ports



osqueryd

osqueryd

daemon for low-level host monitoring

know how the results of a query change over time

- schedule a query on your hosts via a config

- the daemon takes care of periodically executing your queries
  - buffers results to disk and generates a log of state changes
  - logs results for aggregation and analytics

RocksDB

host eventing stream

event-based operating system introspection

subscribe to key OS events to create dynamically growing tables

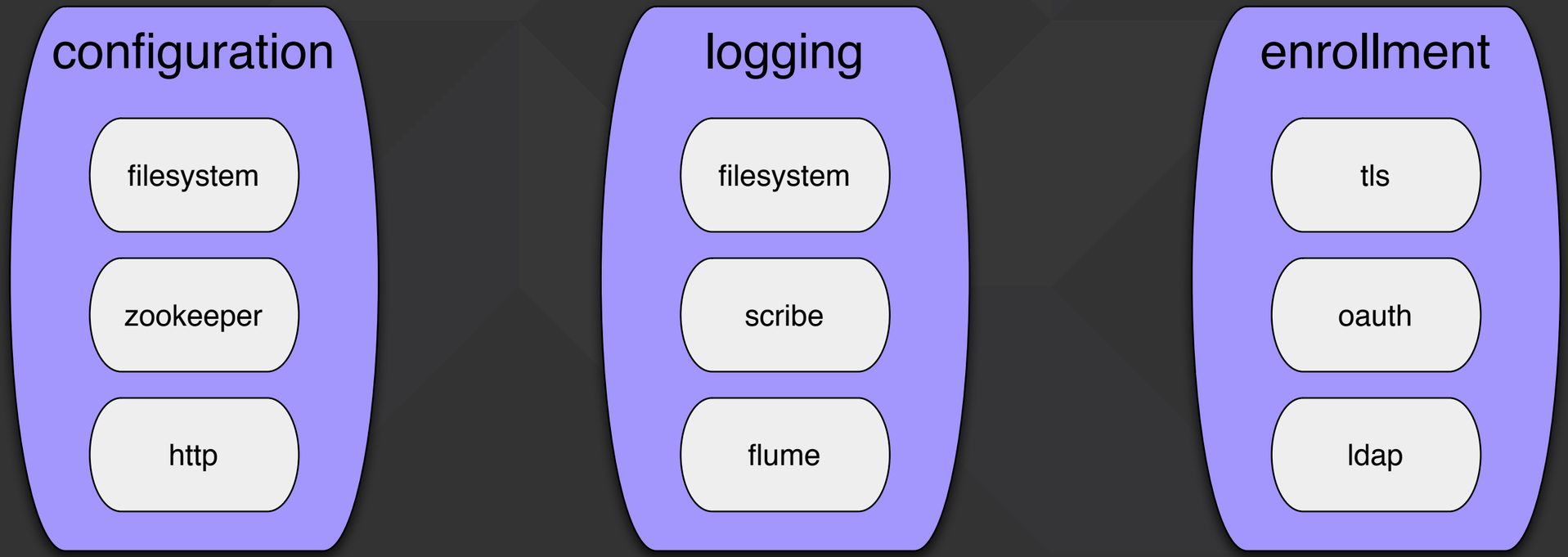
- subscribe to “publishers”
  - filesystem changes (inotify, FSEvents)
  - network setting changes (SCNetwork)
  - application usages (NSNotificationCenter)

- query the history of your host, as it evolves

plugin system

for config distribution, data infrastructure and more

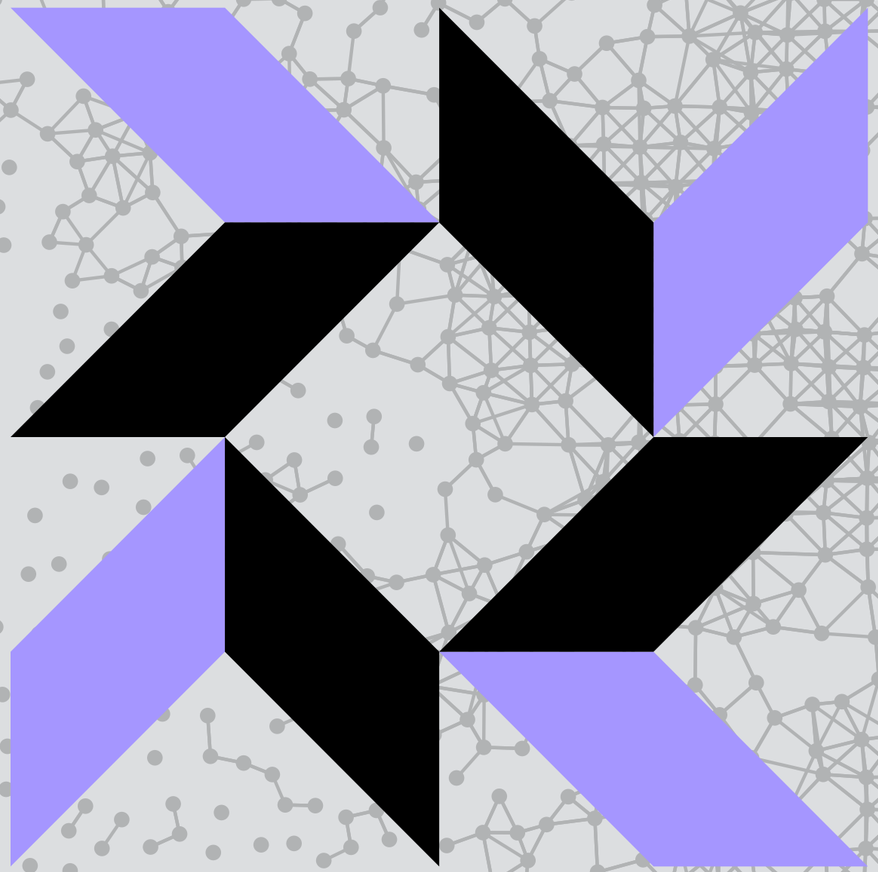
- simple plugin API
- specify your plugins at runtime with a command-line flag



facebook workflow

how we config and log results

1. osquery.pkg published automatically to https://osquery.io
2. download weekly and update chef cookbook
3. chef writes configuration and installs pkg
    1. newsyslog.d rotation file
    2. list of scheduled queries
4. results written to `/var/log/osqueryd.results.log`
5. splunk lightweight forwarder
6. backend analytics



tables

creating tables is easy

easily define what your tables “look like” in Python and use C++ to implement what a full-table scan would return

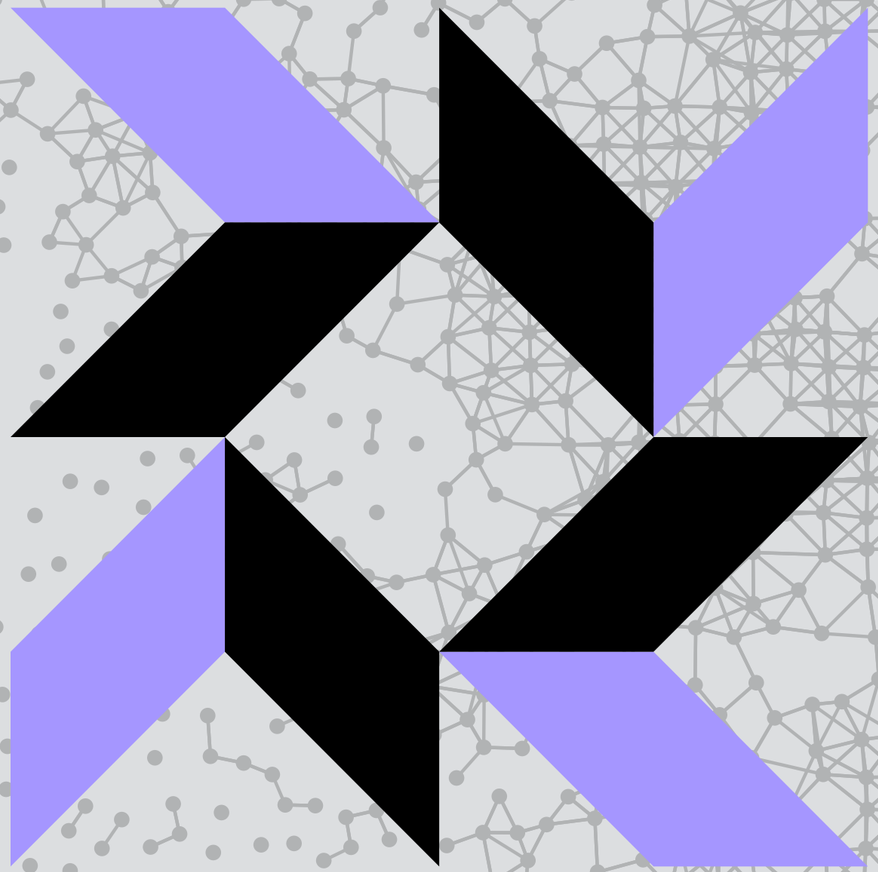
- the Python is used to generate faster C++ code transparently
- you write a single C++ function which implements a full-table scan

```
table_name("time")
schema([
    Column("hour", INTEGER),
    Column("minutes", INTEGER),
    Column("seconds",INTEGER),
])
implementation("time@genTime")
```

```
namespace osquery {
namespace tables {

QueryData genTime(QueryContext& ctx) {
  QueryData results;
  struct tm* now = localtime(time(0));

  Row r;
  r["hour"] = INTEGER(now->tm_hour);
  r["minutes"] = INTEGER(now->tm_min);
  r["seconds"] = INTEGER(now->tm_sec);
  results.push_back(r);

  return results;
}
}
}
```

https://osquery.io/tables

browse all tables, columns, descriptions, and example queries



open source

work on osquery with us

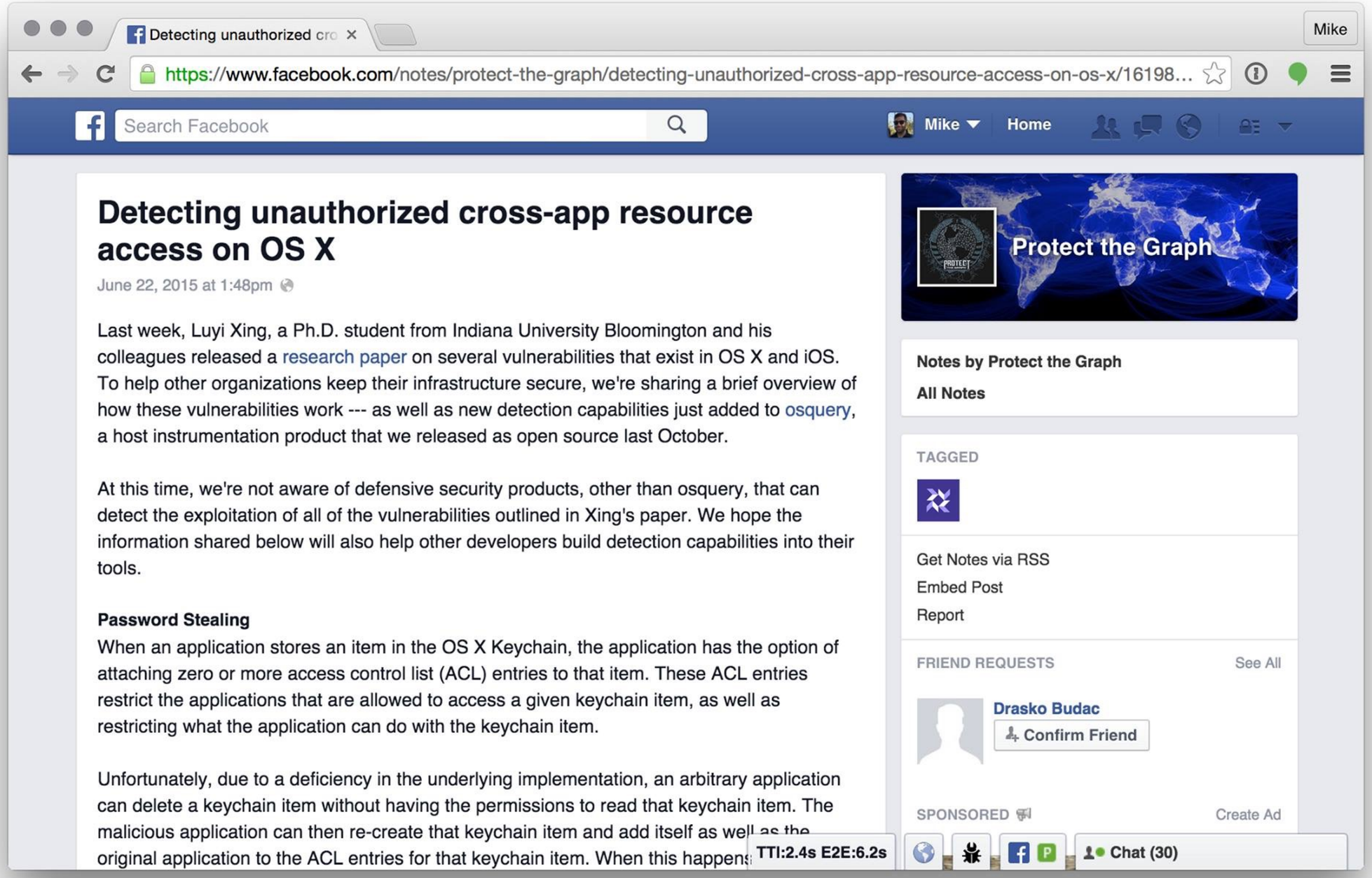
all development happens in the open, on GitHub

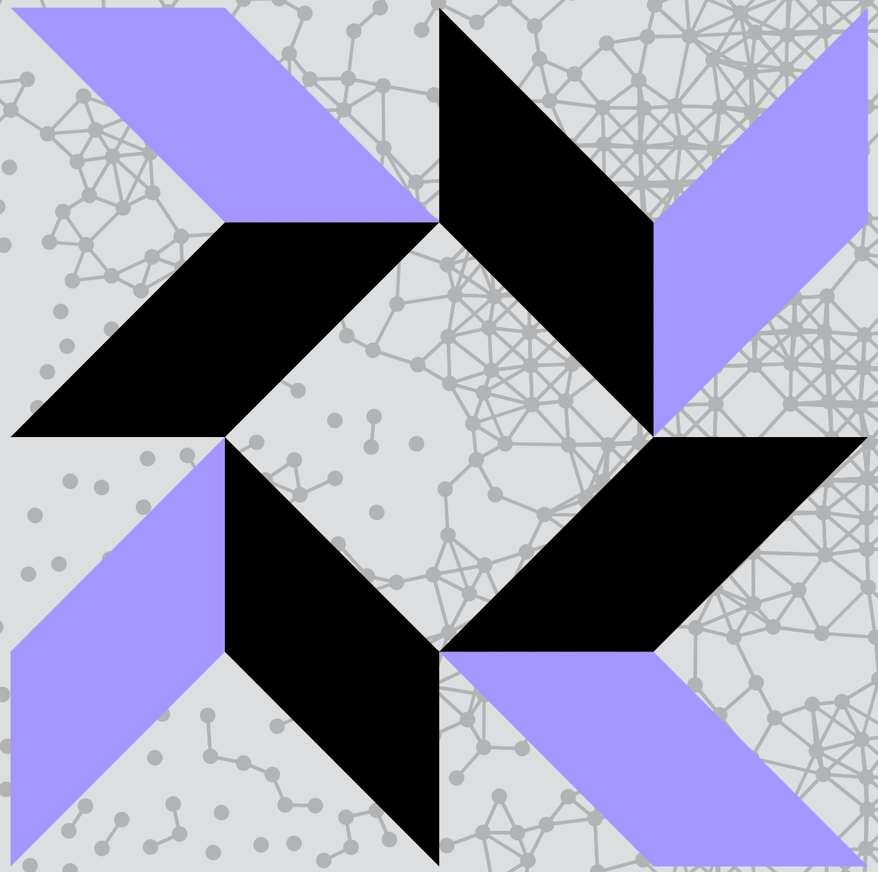
the problem that osquery solves isn't unique to facebook

- https://github.com/facebook/osquery
- https://osquery.io
- https://osquery.readthedocs.org

this journey is 1% finished: get involved

- we’re excited to take on future challenges in the open
- let’s build together


Detecting unauthorized cro
Mike
https://www.facebook.com/notes/protect-the-graph/detecting-unauthorized-cross-app-resource-access-on-os-x/16198...
Search Facebook
Mike
Home
Detecting unauthorized cross-app resource access on OS X
June 22, 2015 at 1:48pm
Last week, Luyi Xing, a Ph.D. student from Indiana University Bloomington and his colleagues released a research paper on several vulnerabilities that exist in OS X and iOS. To help other organizations keep their infrastructure secure, we're sharing a brief overview of how these vulnerabilities work --- as well as new detection capabilities just added to osquery, a host instrumentation product that we released as open source last October.
At this time, we're not aware of defensive security products, other than osquery, that can detect the exploitation of all of the vulnerabilities outlined in Xing's paper. We hope the information shared below will also help other developers build detection capabilities into their tools.
Password Stealing
When an application stores an item in the OS X Keychain, the application has the option of attaching zero or more access control list (ACL) entries to that item. These ACL entries restrict the applications that are allowed to access a given keychain item, as well as restricting what the application can do with the keychain item.
Unfortunately, due to a deficiency in the underlying implementation, an arbitrary application can delete a keychain item without having the permissions to read that keychain item. The malicious application can then re-create that keychain item and add itself as well as the original application to the ACL entries for that keychain item. When this happens
Protect the Graph
Notes by Protect the Graph
All Notes
TAGGED
Get Notes via RSS
Embed Post
Report
FRIEND REQUESTS
See All
Drasko Budac
Confirm Friend
SPONSORED
Create Ad
TTI:2.4s E2E:6.2s
Chat (30)



questions

https://osquery.io