

3 Mini Talks of 10 minutes each



OS/application inversion
Anil Madhavapeddy



Living Databases
Pavlo Baron



**Why do we still not give a
@#%! about testing?!**
Trisha Gee

The OS/App Inversion:
escaping POSIX to bring Git to the datacentre
QCon New York Mini talk

Anil Madhavapeddy (speaker)
with Thomas Gazagnaire and Benjamin Farinier
University of Cambridge Computer Laboratory

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Common features every distributed system needs

- **Persistence** for fault tolerance and scaling
- **Scheduling** of communication between nodes
- **Tracing** across nodes for debugging and profiling

Most distributed systems run over an operating system, and so are stuck with the OS kernel exerting control. We use *unikernels*, which are application VMs that have complete control over their resources.

What if we just used Git?

- **Persistence**

- `git clone` of a shared repository across nodes
- `git commit` of local operations in the node

- **Scheduling**

- `git pull` to receive events from other nodes
- `git push` to publish events to other nodes

- **Tracing and Debugging**

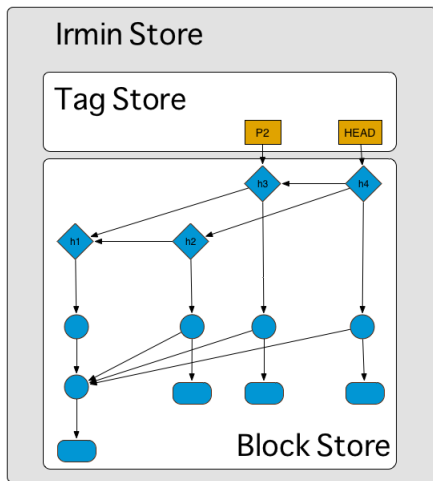
- `git log` to see global operations
- `git checkout` to roll back time to a snapshot
- `git bisect` to locate problem messages

- **New Problems**

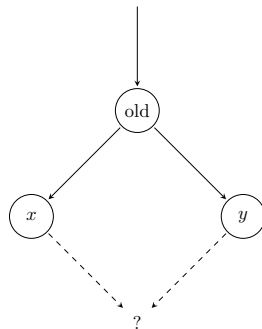
- `git rebase` needed for distributed garbage collection
- Shelling out to `git` is slow and lacks control

Irmin, large-scale, immutable, branch-consistent storage

- Irmin is a library to **persist** and **synchronise distributed data structures** both on-disk and in-memory
- It enables a style of programming very similar to the **Git workflow**, where distributed **nodes fork, fetch, merge and push** data between each other
- The general idea is that you want every active node to get a **local (partial) copy of a global database** and always be very explicit about how and when data is shared and migrated



```
type t = ...  
(** User-defined contents. *)  
type result = [ `Ok of t |  
               `Conflict of string ]  
  
val merge: old:t → t → t →  
          result  
(** 3-way merge functions. *)
```



Irmin Features

- Still pre 1.0, but several useful datastructures such as distributed queues and efficient ropes.
- HTTP REST for remote clients, or library via OCaml.
- JavaScript compilation for pure browser operation.
- Bidirectional operation, so `git` commits map to Irmin commits from any direction.
- Open source at <https://irmin.io>
- **Want to know more?** I'm giving a full talk on this on Friday at 1015 titled "Functional Distributed Programming with Irmin"!

Teaser: Xen Toolstack using Irmin

<https://www.youtube.com/watch?v=DSzvFwIVm5s>

“living” database

@pavlobaron

speaking of
streaming, reactive,
realtime, near time,
near realtime etc.

here is how all things are
supposed to look in the
reactive context



here is how current
database access methods
look in the reactive context



here is how current
databases look in the
reactive context



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it's time to
rethink databases

“living” database

some of the ideas are
partially implemented
in CEP, NoSQL, classic
DBMS, Rx etc.,
but not as a whole

storage is an aspect

storage is raw

everything is
ordered by time

everything is on channels

queries are continuous

views are materialised
and continuous

results are published

results are limited,
timed-out or ignored
by consumer

database quantifies harvest

changes are published
both ways

everybody fires and forgets,
but gets reminded
when things go wrong

consumers react

it needs far more than
just support in
the database driver

it needs the database
to be an active part
of the overall data flow

“living” database

Questions