Beating the No Win Scenario

Joe DeVivo
@joedevivo

Beating the No Win Scenario

Joe DeVivo
@joedevivo
Maybe you've heard of me

Things to know about Joe

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- I've never done this before

Things to know about Joe

- I've never done this before
- Riak User since 2010

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Things to know about Joe

- I've never done this before
- Riak User since 2010
- Started in Basho Professional Services
- Moved to Basho Engineering
- OTP Express Alumni (last year!)


Why are you here?

VALVE®

HANDBOOK FOR NEW EMPLOYEES

A fearless adventure
in knowing what to do
when no one's there
telling you what to do

FIRST EDITION
2012

VALVE
PRESS

VALVE®

HANDBOOK FOR NEW EMPLOYEES

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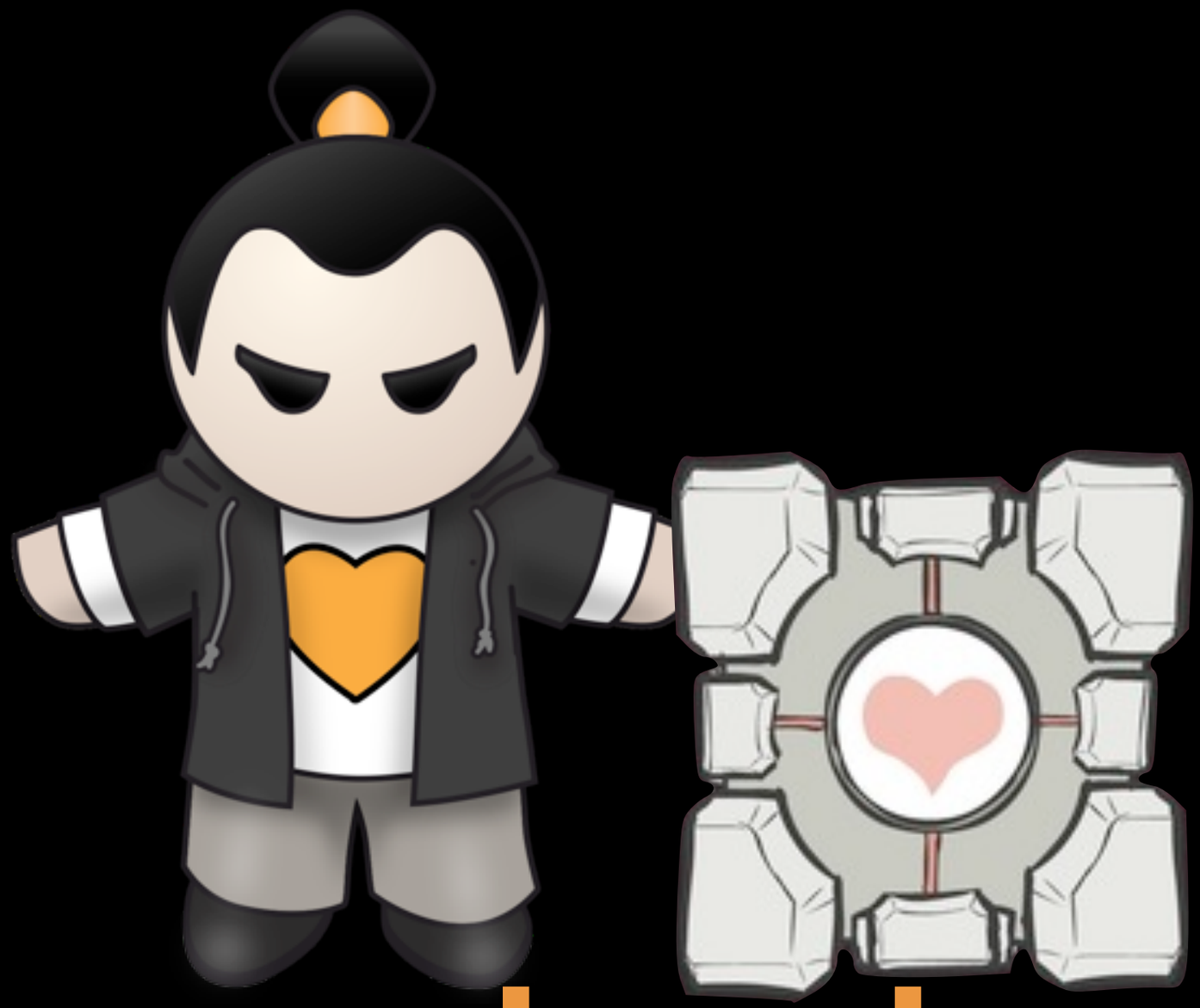
FIRST EDITION
2012

VALVE PRESS



I can do what I want


A Call to Adventure!


The needs of the many,
bro

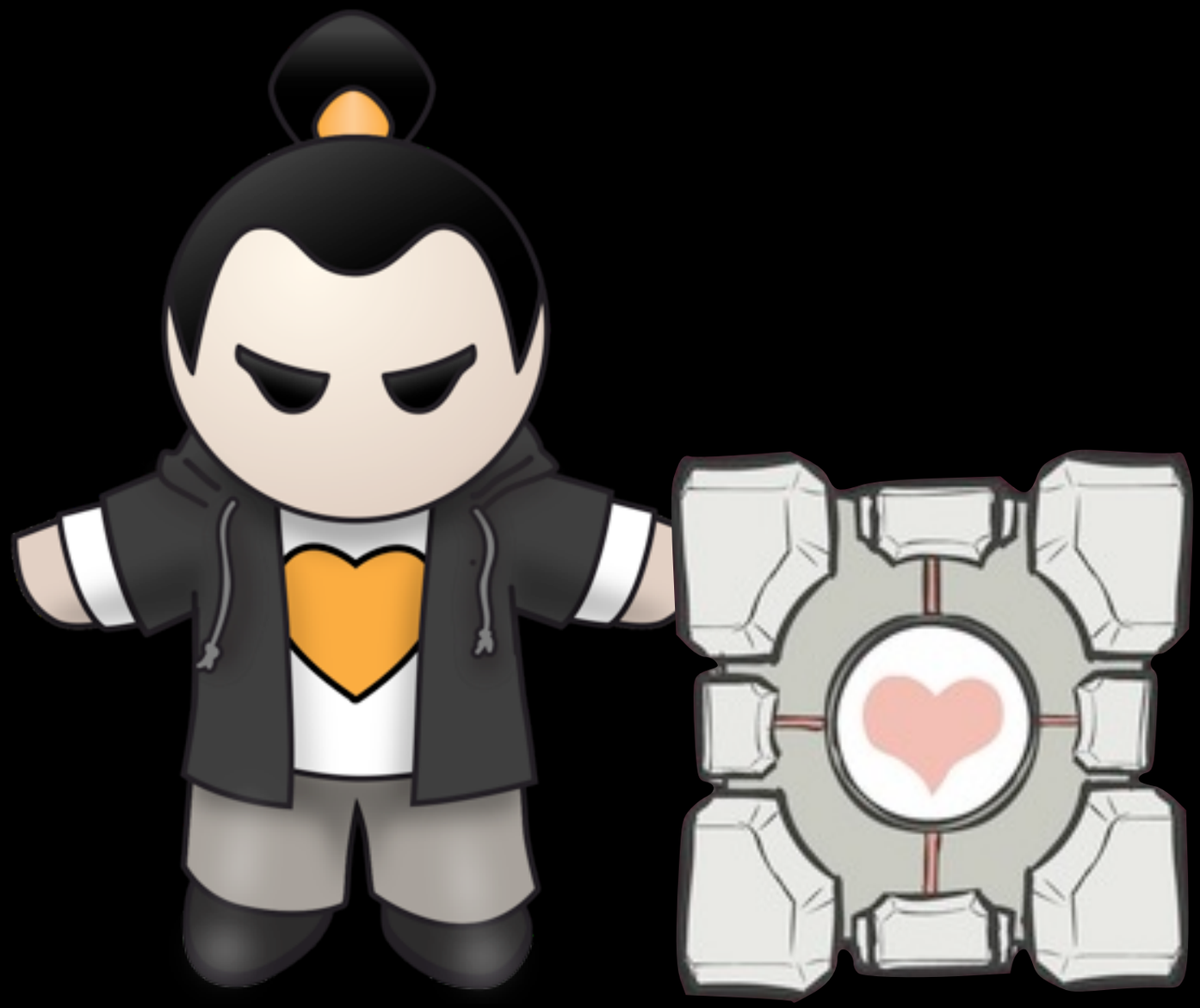
It was a painful process

Python, Virtual Machines, and Bears


Ooooh My

I needed this pain

there are no hi-res ST:V images



Choose your own adventure


The needs of the few,
bro

I felt like I couldn't win


I don’t like to lose

OMG That's Complicated!

Testing A Distributed System is Hard

Jared
@_jared

Follow

lmao if you think testing distributed systems is any easier than writing distributed systems.

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10 FAVORITES

9:15 AM - Feb 19, 2013

Testing A Distributed System is hard but not impossible


Were you in the shit?

Is it really a no-win scenario?

Y So Hard?

Y So Hard?

- Multiple Machines!

Y So Hard?

- Multiple Machines!
- Networks!

Y So Hard?

- Multiple Machines!
- Networks!
- Nodes!

Y So Hard?

- Multiple Machines!
- Networks!
- Nodes!
- Timing!

Y So Hard?

- Multiple Machines!
- Networks!
- Nodes!
- Timing!
- Load!

What would Cap'n Kirk Do?

Change the Conditions of the Test

Change the Conditions of the Test

- We can run a ‘devrel’ to simulate a distributed system locally

Change the Conditions of the Test

- We can run a ‘devrel’ to simulate a distributed system locally
- Don’t focus on what’s right, focus on what works


I see you favor
riak_test


tonight I do

riak_test

riak_test

- A simple abstraction of riak cluster functions

riak_test

- A simple abstraction of riak cluster functions
- Based on a QuickCheck test

riak_test

- A simple abstraction of riak cluster functions
- Based on a QuickCheck test
- Erlang!

riak_test

- A simple abstraction of riak cluster functions
- Based on a QuickCheck test
- Erlang!
- A Machine! Your Machine!

Embracing the Most Important Feature

A User Base

riak_test is a ghetto

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- Not a traditional OTP Application

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- Not a traditional OTP Application
- uses rebar and app.src (I'm not an animal!)

riak_test is a ghetto

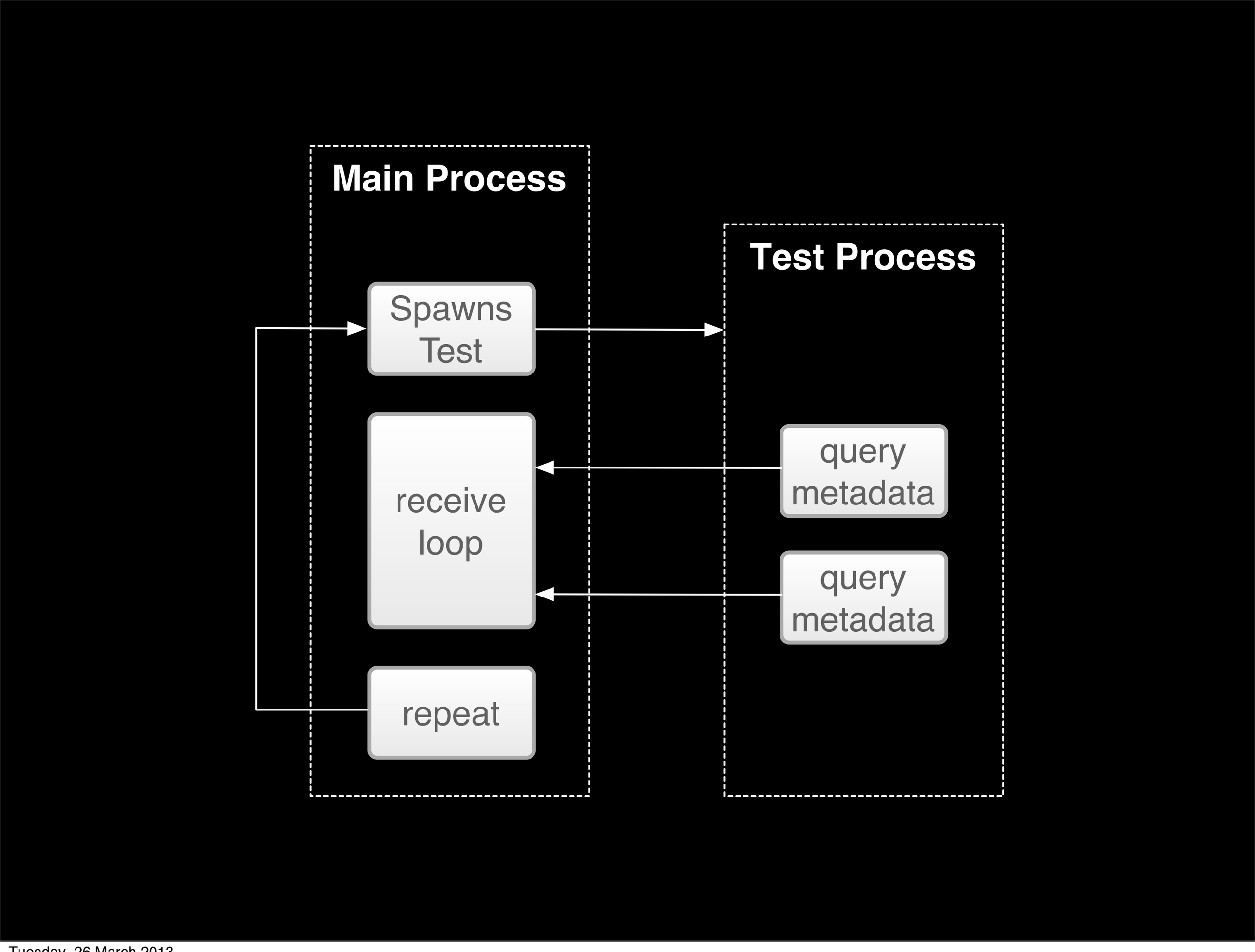
- Not a traditional OTP Application
- uses rebar and app.src (I'm not an animal!)
- Procedural

State and the Main Process

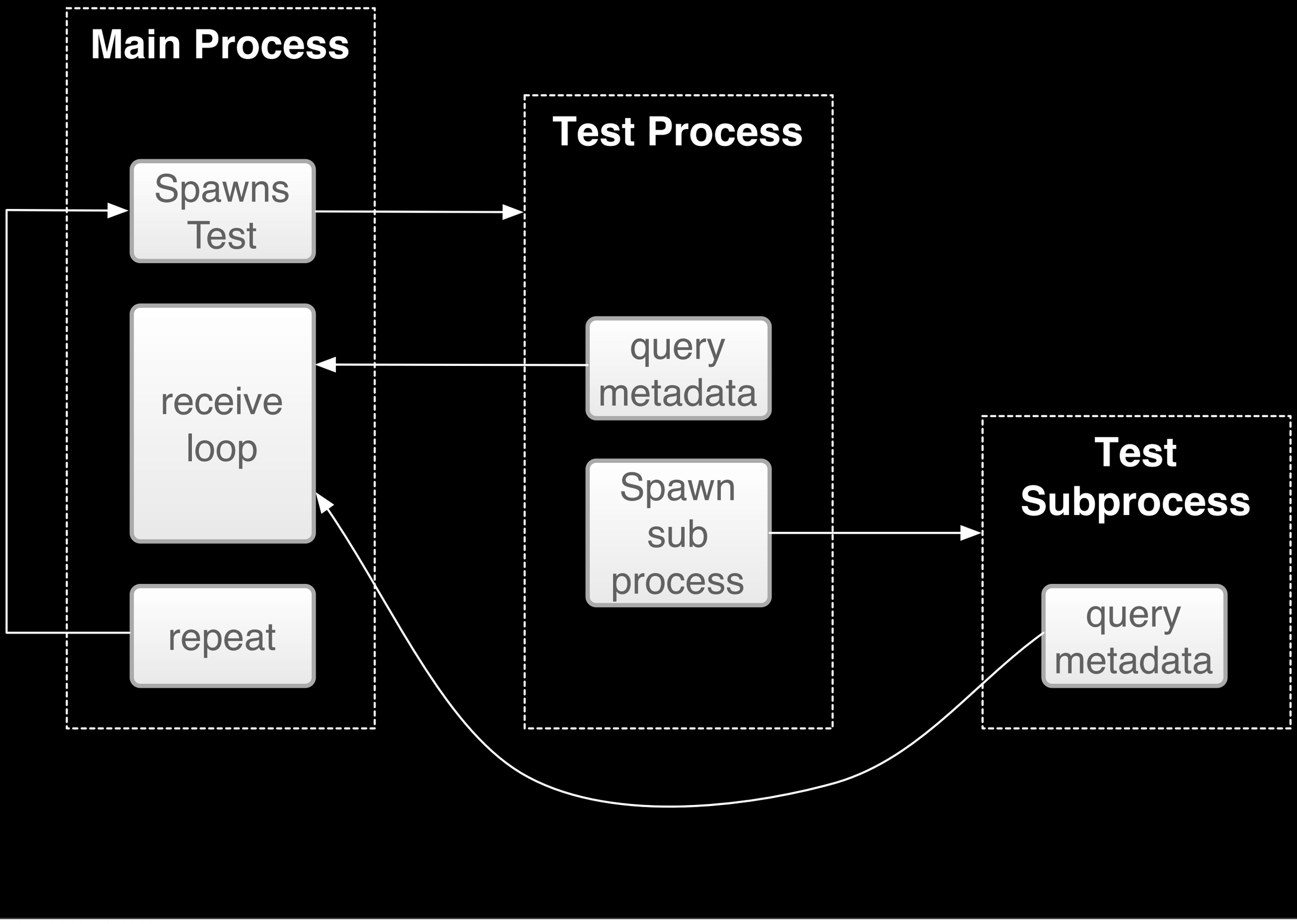

WHOSE DATA IS THIS?

Test Metadata

- Each test is spawned into its own process
- riak_test enters a receive loop
- riak_test answers metadata questions

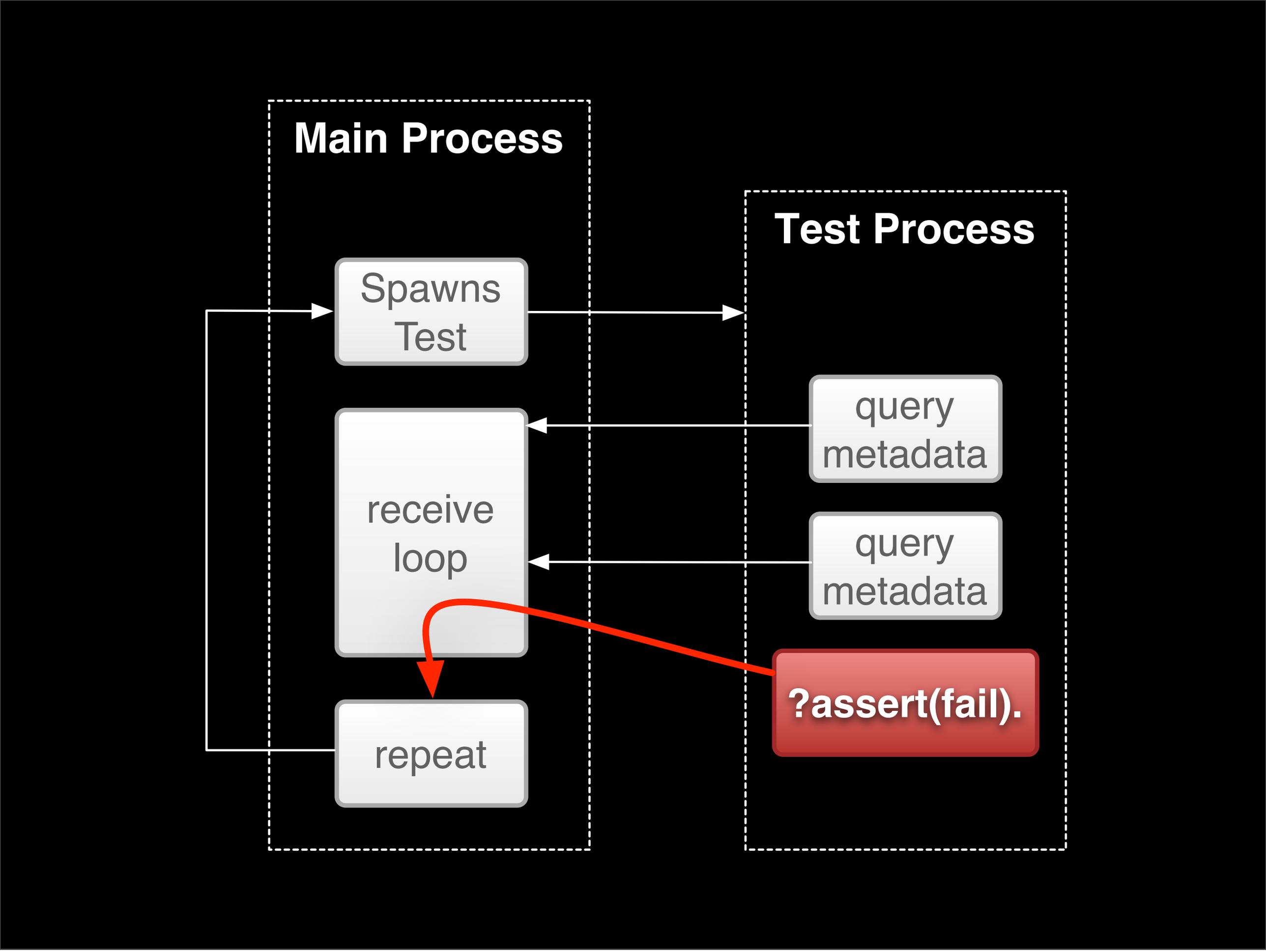

Main Process
Test Process
Spawns Test
receive loop
query metadata
query metadata
repeat

```
rec_loop(Pid, TestModule, TestMetaData) ->
  receive
    metadata ->
      Pid ! {metadata, TestMetaData},
      rec_loop(Pid, TestModule, TestMetaData)
  end.
```


Main Process
Spawns Test
receive loop
repeat
Test Process
query metadata
Spawn sub process
Test Subprocess
query metadata

```
rec_loop(Pid, TestModule, TestMetaData) ->
  receive
    metadata ->
      Pid ! {metadata, TestMetaData},
        rec_loop(Pid, TestModule, TestMetaData);
      {metadata, P} ->
        P ! {metadata, TestMetaData},
        rec_loop(Pid, TestModule, TestMetaData)
  end.
```

?assert


Main Process
Test Process
Spawns Test
receive loop
repeat
query metadata
query metadata
?assert(fail).

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rec_loop(Pid, TestModule, TestMetaData) ->
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    metadata ->
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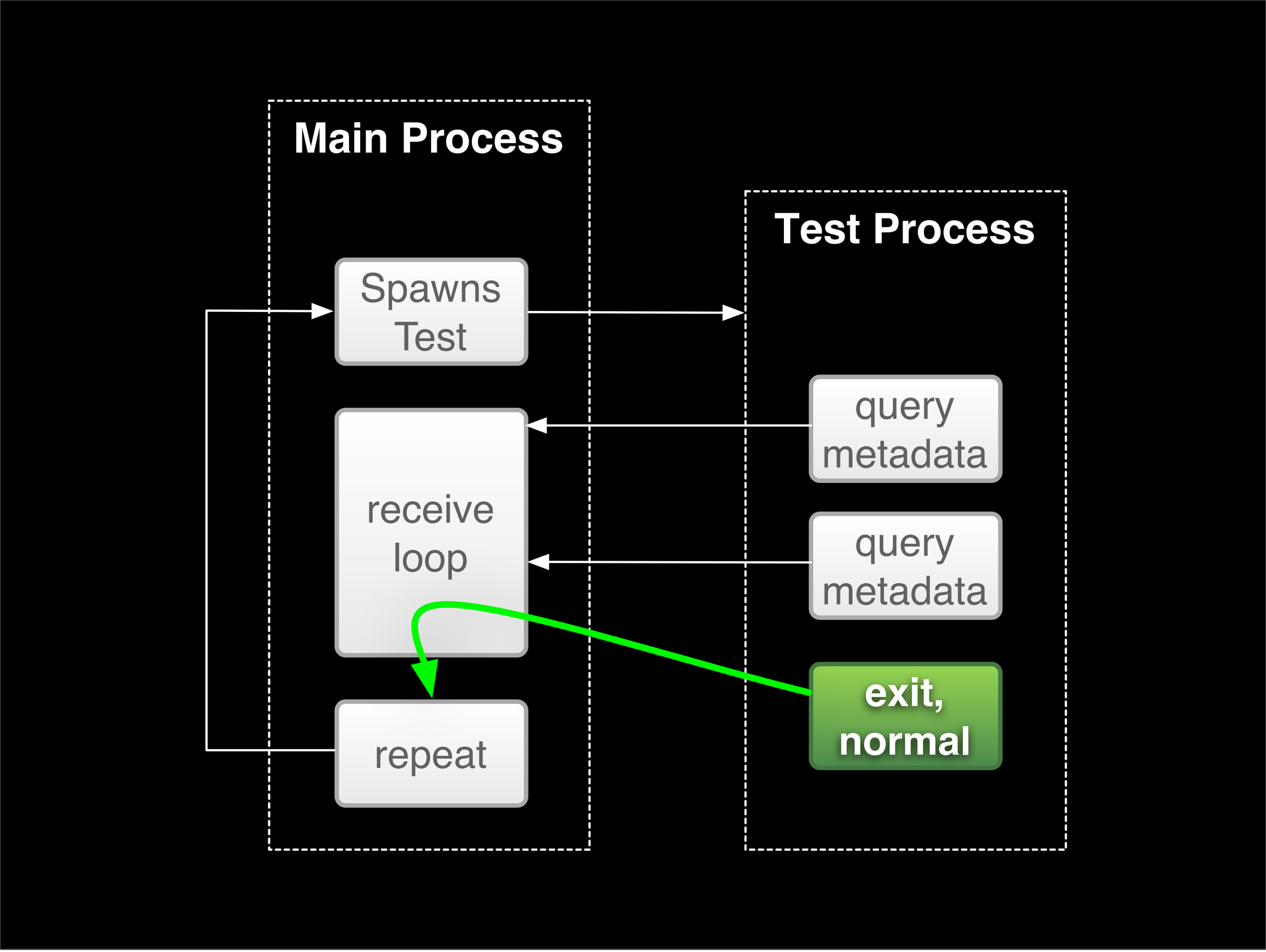
      rec_loop(Pid, TestModule, TestMetaData);
    {metadata, P} ->
      P ! {metadata, TestMetaData},
      rec_loop(Pid, TestModule, TestMetaData);
    {'EXIT', Pid, normal} ->
      {pass, undefined};
    {'EXIT', Pid, Error} ->
      lager:warning("~s failed: ~p",
      [TestModule, Error]),
      {fail, Error}
  end.
```


even if I fail, I don't fail


Main Process
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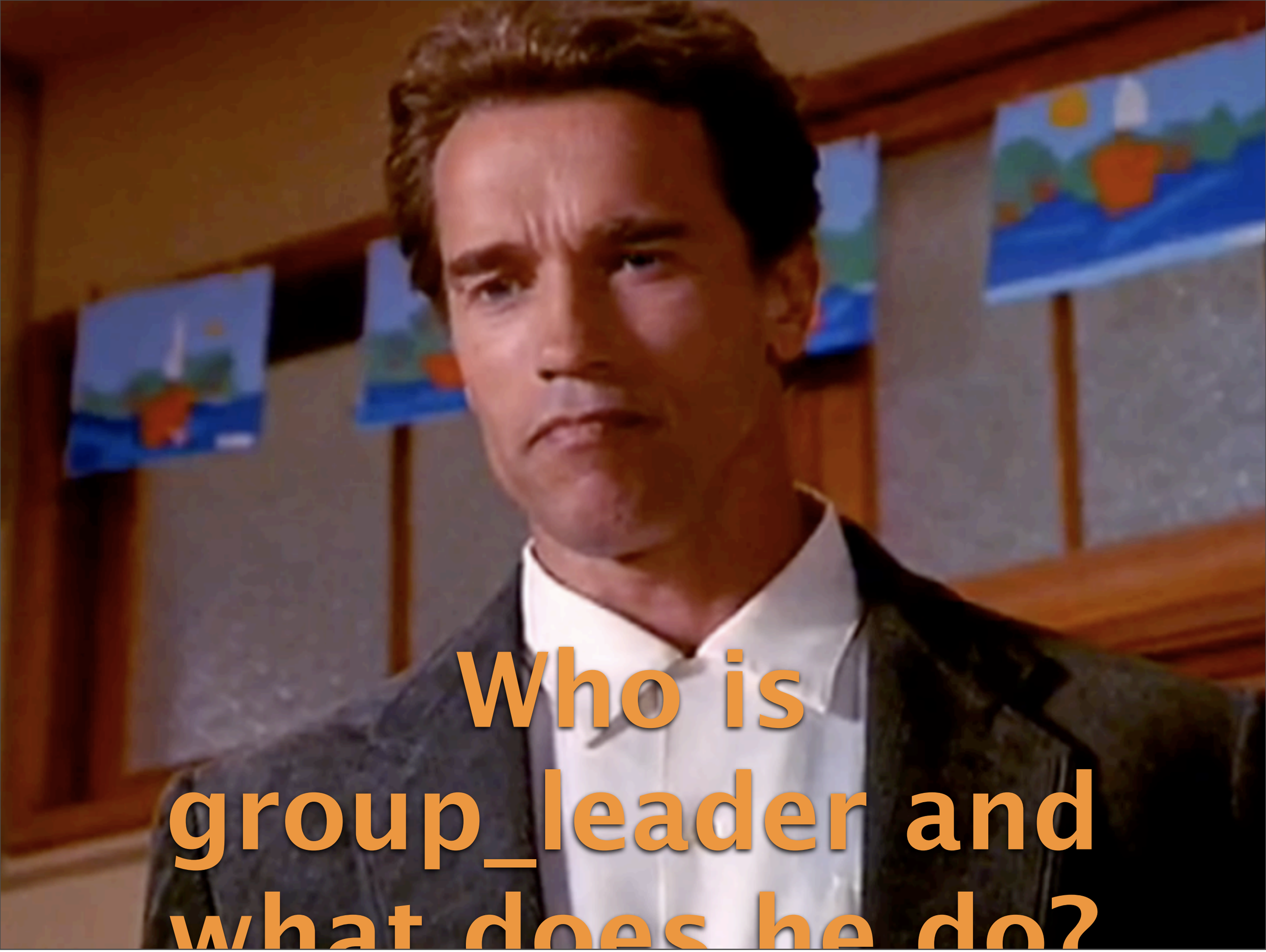
Spawns Test
query metadata
receive loop
query metadata
exit, normal
repeat

Collecting Output


Who is
group_leader and
what does he do?

```
OldGroupLeader = group_leader(),
NewGroupLeader =
  riak_test_group_leader:new_group_leader(self()),
group_leader(NewGroupLeader, self()),

Pid = spawn_link(TestModule, confirm, []),

{Status, Reason} =
    rec_loop(Pid, TestModule, TestMetaData),
group_leader(OldGroupLeader, self()),
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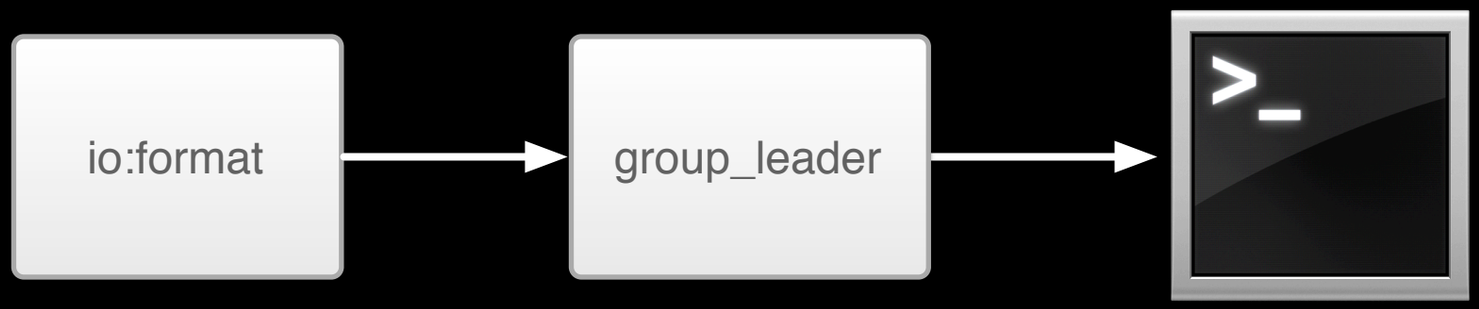
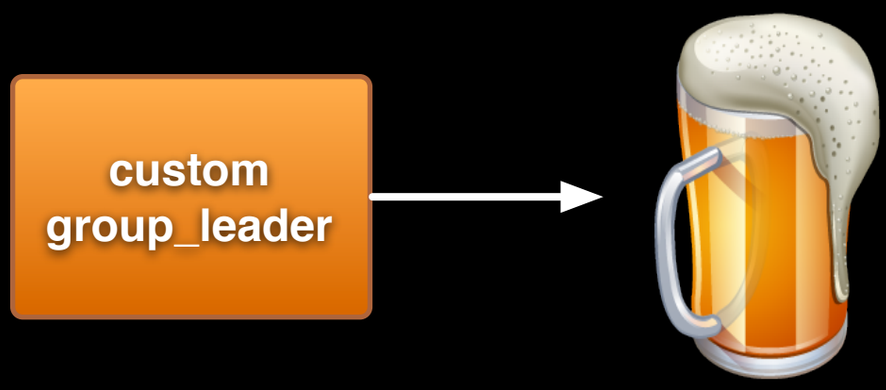

io:format
group_leader
>_


custom
group_leader

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group_leader(NewGroupLeader, self()),
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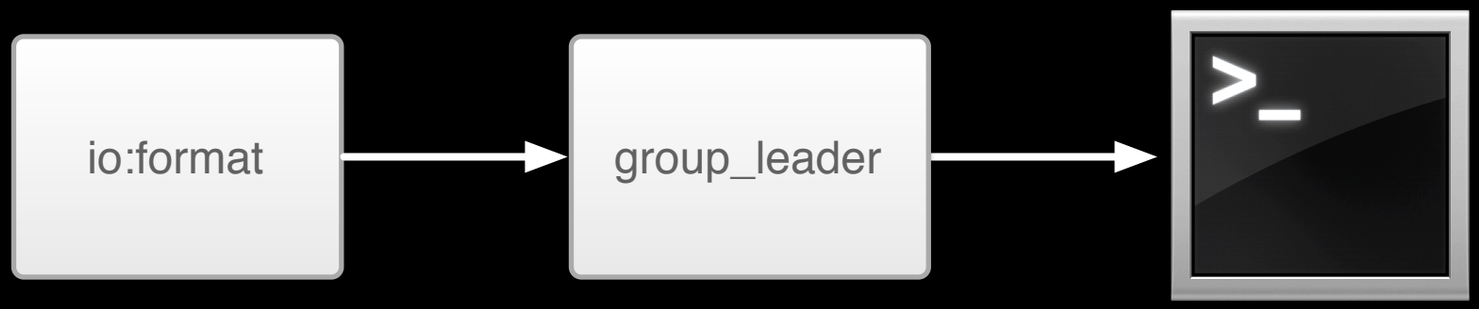

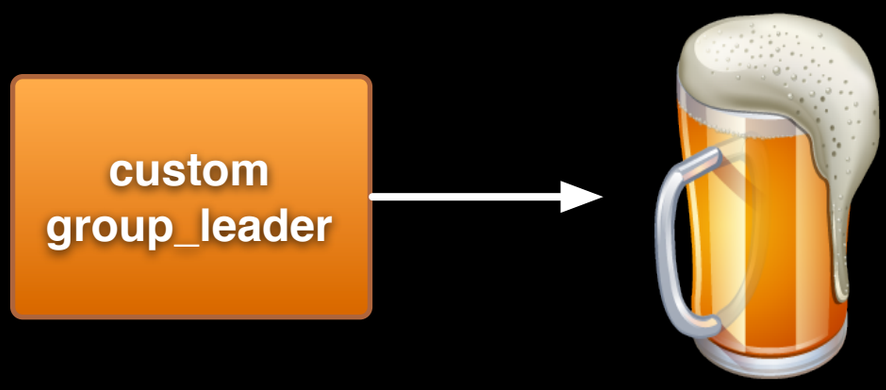

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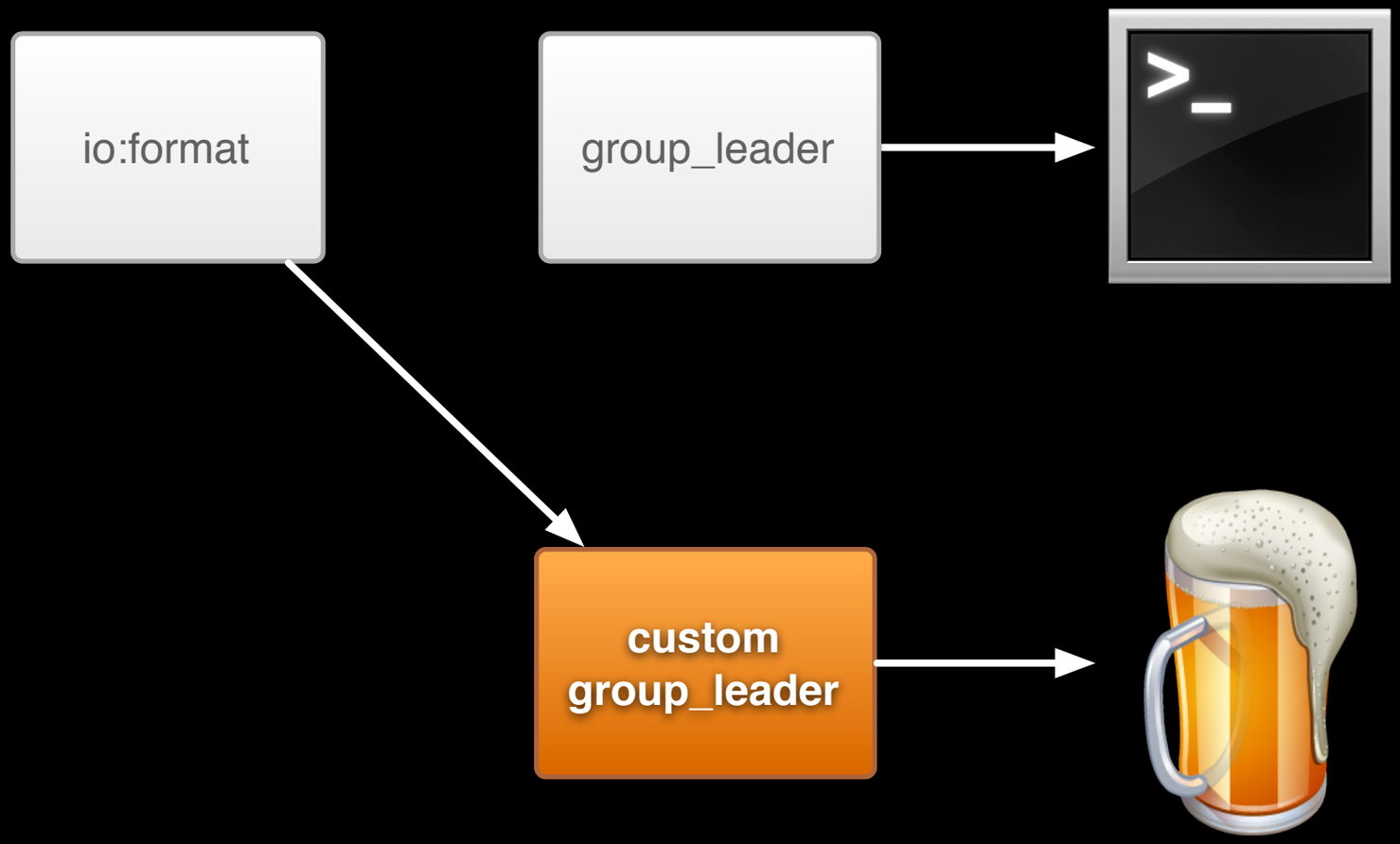

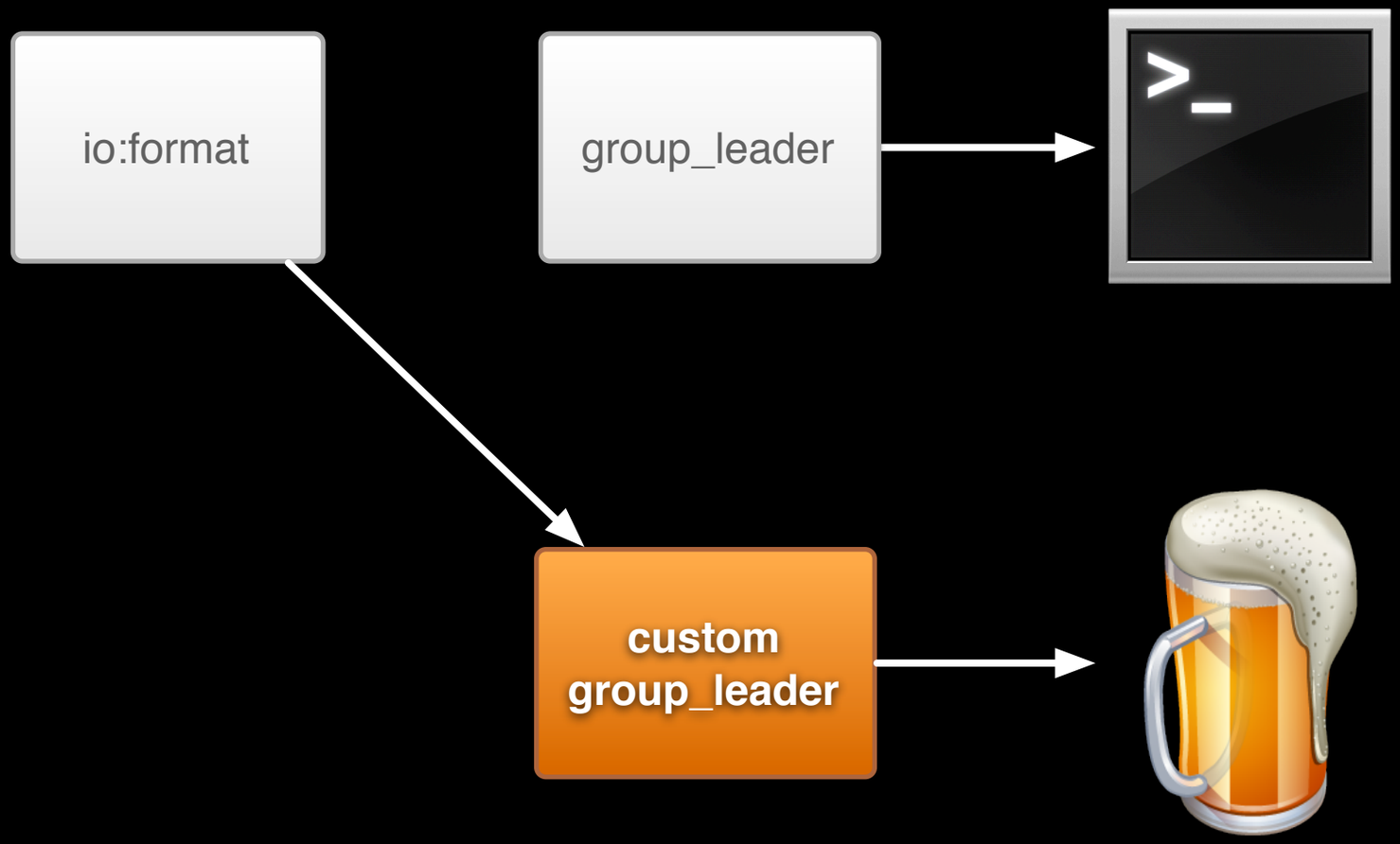
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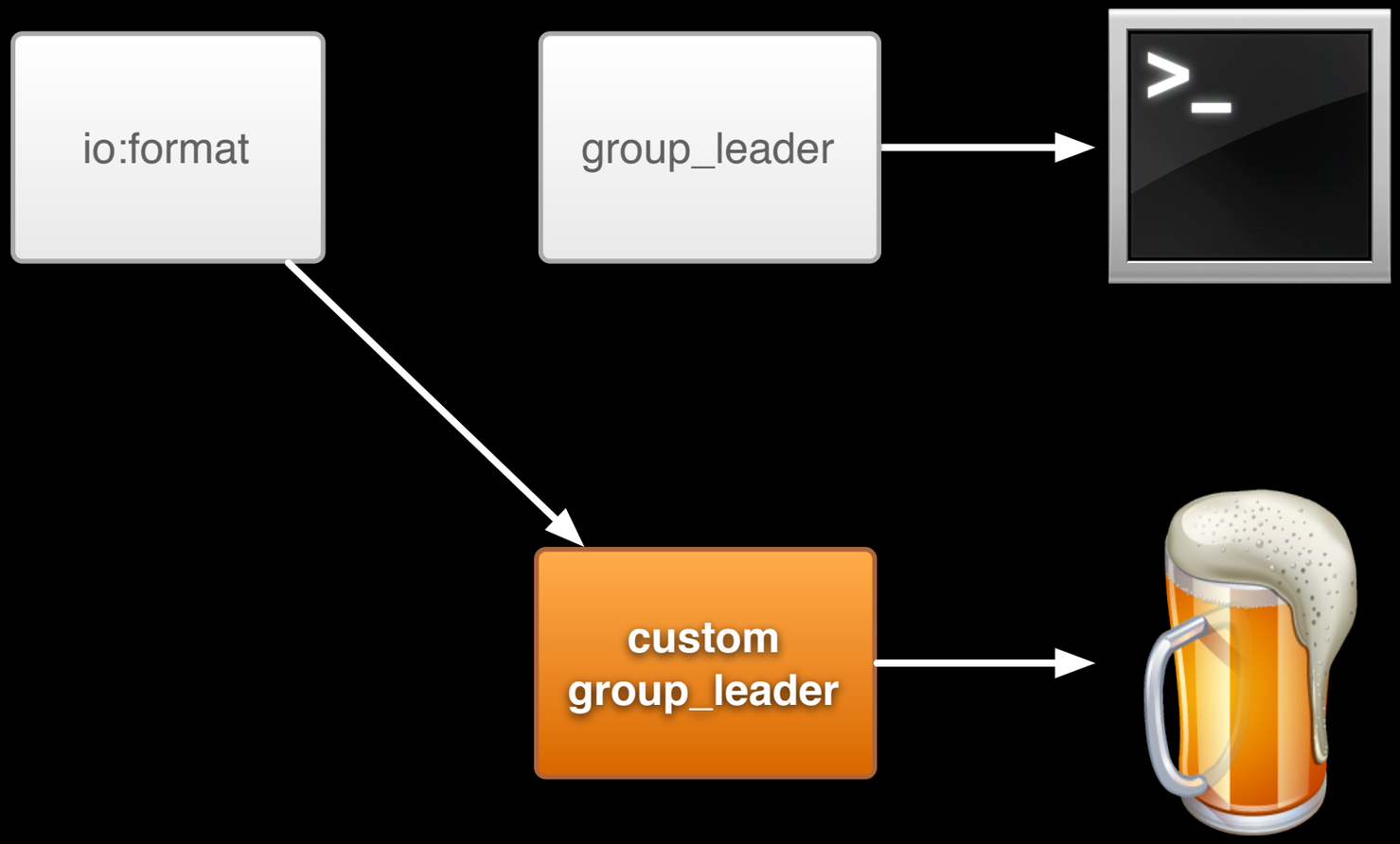


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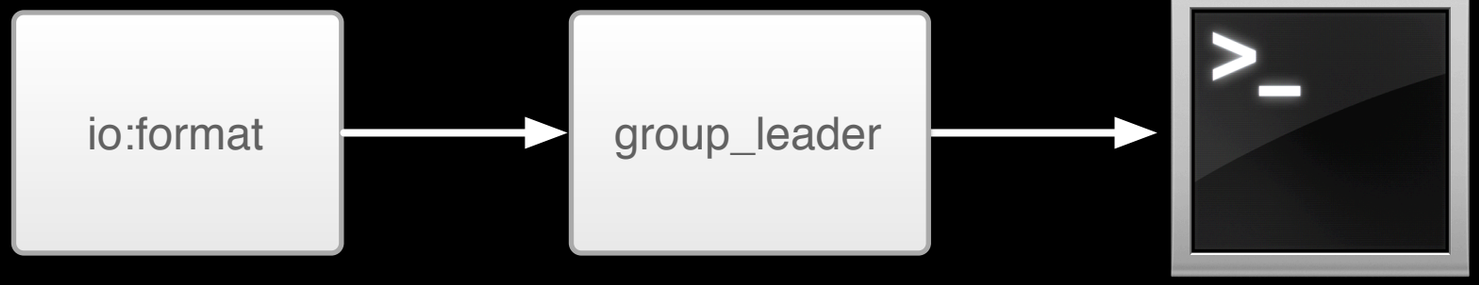

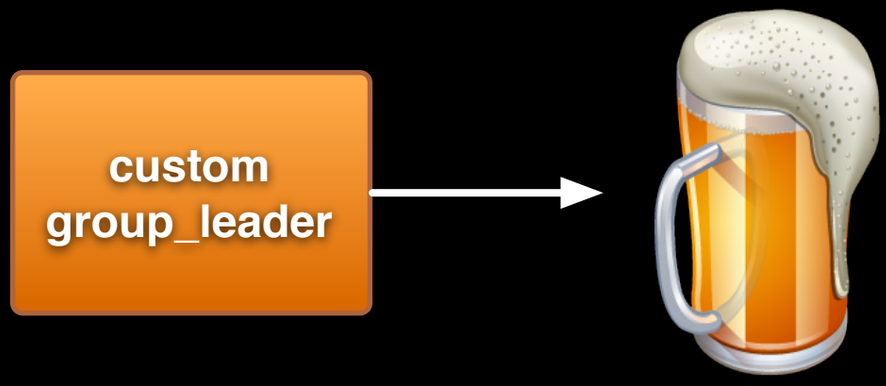


```
group_leader(OldGroupLeader, self()),
```

console interaction


Who is
port_command and
what does he do?

```
Port = open_port({spawn, Cmd},
  [stream, use_stdio, exit_status,
   binary, stderr_to_stdout]),

port_command(Port, Msg),

receive
    {Port, {data, Data}} ->
        %% do something
end
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```
rt:attach(Node, CommandExpectations),
```

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    rt:attach(Node, CommandExpectations),

[{expect, "\(^D to exit\)"},
 {send,
   "riak_core_ring_manager:get_my_ring()."},
{expect, "dict,"},
{send, [4]}] %% 4 = ^D
```

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```

commands

sean carey
@densoneold

Following

commands

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9 FAVORITES

2:39 PM - Feb 8, 2008

```
13:14:17.861 [info] Cmd: java -Dcom.basho.riak.host=127.0.0.1 -
Dcom.basho.riak.http.port=10018 -Dcom.basho.riak.pbc.port=10017 -cp /
tmp/riak_test_scratch/riak-client-1.1.0-SNAPSHOT-jar-with-
dependencies-and-tests.jar:/tmp/riak_test_scratch/riak-client-1.1.0-
SNAPSHOT-tests.jar org.junit.runner.JUnitCore
com.basho.riak.client.AllTests
13:16:54.580 [info]
JUnit version 4.4

.....................................................
.........I.................I.........................
.....................................................
.....................................................
.....................................................
.....................................................
.....................................................
.....................................................
..
Time: 153.93
OK (583 tests)
```

```
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.....
.........I.................I.....
.....
.....
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Time: 153.93
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```

```
11:29:38.463 [info] Cmd: java -Dcom.basho.riak.host=127.0.0.1 -
Dcom.basho.riak.http.port=10018 -Dcom.basho.riak.pbc.port=10017 -cp /
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11:29:38.865 [info]
11:29:38.865 [info] JUnit version 4.4
11:29:39.301 [info]
11:29:40.234 [info] ..............................................
11:29:41.049 [info] ........
11:29:42.158 [info] .
11:29:43.303 [info] .
11:29:45.009 [info] ......
11:29:46.328 [info] ......
11:29:47.286 [info] ......
11:29:49.044 [info] ...I.
11:29:50.333 [info] ....
11:29:51.190 [info] ..
11:29:52.070 [info] ......
11:29:53.845 [info] ....I.
11:29:54.939 [info] ....
11:29:55.160 [info] .
11:29:56.939 [info] .......
```

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11:29:38.463 [info] Cmd: java -Dcom.basho.riak.host=127.0.0.1 -
Dcom.basho.riak.http.port=10018 -Dcom.basho.riak.pbc.port=10017 -cp /
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11:29:55.160 [info] .
11:29:56.939 [info] .......
```

Prerequisites

```
-prereq("java").
-prereq("curl").

check_prereqs(Module) ->
    Prereqs = proplists:get_all_values(prereq,
        Module:module_info(attributes)),
    P2 = [ {Prereq, rt:which(Prereq)} || Prereq <- Prereqs],
    lager:info("~s prereqs: ~p", [Module, P2]),
    [
       lager:warning("~s prereq '~s' not installed.",
                     [Module, P])
    || {P, false} <- P2],
    GoodToGo = lists:all(fun({_, Present}) -> Present end, P2),
    ?assertEqual({all_prereqs_present, true},
                 {all_prereqs_present, GoodToGo}).
```

```
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```

```
14:27:32.712 [info] Checking for presence of java
14:27:32.721 [info] Checking for presence of curl
14:27:32.727 [info] client_java_verify prereqs:
       [{"java",true},{"curl",true}]
14:27:32.728 [notice] Running Test client_java_verify
```

```
14:27:32.712 [info] Checking for presence of java
14:27:32.721 [info] Checking for presence of curl
14:27:32.727 [info] client_java_verify prereqs:
       [{"java",true},{"curl",true}]
14:27:32.728 [notice] Running Test client_java_verify
```

```
14:27:32.712 [info] Checking for presence of java
14:27:32.721 [info] Checking for presence of curl
14:27:32.727 [info] client_java_verify prereqs:
        [{"java",true},{"curl",true}]
14:27:32.728 [notice] Running Test client_java_verify
```

```
14:27:32.712 [info] Checking for presence of java
14:27:32.721 [info] Checking for presence of curl
14:27:32.727 [info] client_java_verify prereqs:
        [{"java",true},{"curl",true}]
14:27:32.728 [notice] Running Test client_java_verify
```

```
14:27:32.712 [info] Checking for presence of java
14:27:32.721 [info] Checking for presence of curl
14:27:32.727 [info] client_java_verify prereqs:
       [{"java",true},{"curl",true}]
14:27:32.728 [notice] Running Test client_java_verify
```

```
-prereq("java").
-prereq("curl").
-prereq("missing_prereq").
```

```
-prereq("java").
-prereq("curl").
-prereq("missing_prereq").
```

```
10:59:31.402 [info] Checking for presence of java
10:59:31.414 [info] Checking for presence of curl
10:59:31.423 [info] Checking for presence of missing_prereq
10:59:31.435 [warning] `missing_prereq` is not installed
10:59:31.436 [info] client_java_verify prereqs:
     [{"java",true},{"curl",true},{"missing_prereq",false}]
10:59:31.437 [warning] client_java_verify prereq 'missing_prereq' not
installed.
escript: exception error: {assertEqual_failed,
                           [{module,riak_test_runner},
                            {line,122},
                            {expression,"{ all_prereqs_present , GoodToGo }"},
                            {expected,{all_prereqs_present,true}},
                            {value,{all_prereqs_present,false}}]}
```

```
10:59:31.402 [info] Checking for presence of java
10:59:31.414 [info] Checking for presence of curl
10:59:31.423 [info] Checking for presence of missing_prereq
10:59:31.435 [warning] `missing_prereq` is not installed
10:59:31.436 [info] client_java_verify prereqs:
     [{"java",true},{"curl",true},{"missing_prereq",false}]
10:59:31.437 [warning] client_java_verify prereq 'missing_prereq' not
installed.
escript: exception error: {assertEqual_failed,
                           [{module,riak_test_runner},
                            {line,122},
                            {expression,"{ all_prereqs_present , GoodToGo }"},
                            {expected,{all_prereqs_present,true}},
                            {value,{all_prereqs_present,false}}]}
```

```
?assertEqual(true, GoodToGo).
```

```
    ?assertEqual(true, GoodToGo).


escript: exception error: {assertEqual_failed,
 [{module,riak_test_runner},
  {line,122},
  {expression,"GoodToGo"},
  {expected,true},
  {value,false}]}
```

```
    ?assertEqual(true, GoodToGo).


escript: exception error: {assertEqual_failed,
 [{module,riak_test_runner},
  {line,122},
  {expression,"GoodToGo"},
  {expected,true},
  {value,false}]}
```

```
?assertEqual(
        {all_prereqs_present, true},
        {all_prereqs_present, GoodToGo}).
```

```
    ?assertEqual(
           {all_prereqs_present, true},
           {all_prereqs_present, GoodToGo}).


escript: exception error: {assertEqual_failed,
 [{module,riak_test_runner},
  {line,122},
  {expression,"{ all_prereqs_present , GoodToGo }"},
  {expected,{all_prereqs_present,true}},
  {value,{all_prereqs_present,false}}]}
```

```
    ?assertEqual(
           {all_prereqs_present, true},
           {all_prereqs_present, GoodToGo}).


escript: exception error: {assertEqual_failed,
 [{module,riak_test_runner},
  {line,122},
  {expression,"{ all_prereqs_present , GoodToGo }"},
  {expected,{all_prereqs_present,true}},
  {value,{all_prereqs_present,false}}]}
```

```
    ?assertEqual(
          {all_prereqs_present, true},
          {all_prereqs_present, GoodToGo}).


escript: exception error: {assertEqual_failed,
 [{module,riak_test_runner},
  {line,122},
  {expression,"{ all_prereqs_present , GoodToGo }"},
  {expected,{all_prereqs_present,true}},
  {value,{all_prereqs_present,false}}]}
```

```
    ?assertEqual(
           {all_prereqs_present, true},
           {all_prereqs_present, GoodToGo}).


escript: exception error: {assertEqual_failed,
 [{module,riak_test_runner},
  {line,122},
  {expression,"{ all_prereqs_present , GoodToGo }"},
  {expected,{all_prereqs_present,true}},
  {value,{all_prereqs_present,false}}]}
```

Reporting

GiddyUp | riak | riak_cs | riak_ee | stanchion

1.3.0 | 1.3.0rc4 | 1.3.0rc3 | 1.3.0rc2 | 1.3.0rc1 | 1.3.0pre3 | 1.3.0pre2 | 1.3.0pre1 | 1.2.1 | 1.2.0 | 1.2.1rc2

	centos-5-64	centos-6-64	fedora-17-64	freebsd-9-64	osx-64	smartos-64	solaris-10u9-64	ubuntu-1004-32	ubuntu-1004-64	ubuntu-1104-64
basic_command_line	U	U	U	U	U	U	U	U	U	U
client_java_verify	U	U	U	U	U	U	U	U	U	U
client_python_verify	L	L	L	L	L	L	L	L	L	L
client_ruby_verify	M	M	M	M	M	M	M	M	M	M
gh_riak_core_154	U	U	U	U	U	U	U	U	U	U
gh_riak_core_155	U	U	U	U	U	U	U	U	U	U
gh_riak_core_176	U	U	U	U	U	U	U	U	U	U
loaded_upgrade	B-2 B-1 L-2 L-1	B-2 B-1 L-2 L-1	B-2 B-1 L-2 L-1	B-1 L-1	B-2 B-1 L-2 L-1			B-2 B-1 L-2 L-1	B-2 B-1 L-2 L-1	B-2 B-1 L-2 L-1
mapred_verify_rt	U	U	U	U	U			U	U	U
partition_repair	U	U	U	U	U			U	U	U
riaknostic_rt	U	U	U	U	U			U	U	U

riak_test lager backend

GiddyUp | riak | riak_cs | riak_ee | stanchion

1.3.0 | 1.3.0rc4 | 1.3.0rc3 | 1.3.0rc2 | 1.3.0rc1 | 1.3.0pre3 | 1.3.0pre2 | 1.3.0pre1 | 1.2.1 | 1.2.0 | 1.2.1rc2

aded_upgrade / centos-5-64 / bitcask / previous × Hide results

Success 15 days ago [riak-1.3.0-1.3]

Success 16 days ago [riak-1.3.0-1.3]

Failure 21 days ago [riak-1.3.0-1.3]

```
ed,undefined,[],undefined},60000},60000]}} in context child_terminated
13:49:34.216 [debug] Supervisor loaded_upgrade_worker_sup started loaded_upgrade_worker_sup:test
er_start_link(search_tester, 'dev3@127.0.0.1', previous) at pid <0.17445.0>
13:52:07.528 [error] CRASH REPORT Process <0.17416.0> with 0 neighbours exited with reason: {ass
ertEqual_failed,[{module,rt},{line,589},{expression,"wait_until ( Node , F )"},{expected,ok},{va
lue,fail}]} in rt:'-wait_for_service/2-fun-2-'/3 line 589 in gen_server:init_it/6 line 328
13:52:07.536 [warning] loaded_upgrade failed: shutdown
13:52:07.539 [error]
```

open log in new windo

	centos-5-64	centos-6-64	fedora-17-64	freebsd-9-64	osx-64	smartos-64	solaris-10u9-64	ubuntu-1004-32	ubuntu-1004-64	ubuntu-1104-64	ubuntu-1204-64
basic_command_line	U	U	U	U	U	U	U	U	U	U	U
client_java_verify	U	U	U	U	U	U	U	U	U	U	U
client_python_verify	L	L	L	L	L	L	L	L	L	L	L
client_ruby_verify	M	M	M	M	M	M	M	M	M	M	M
gh_riak_core_154	U	U	U	U	U	U	U	U	U	U	U
gh_riak_core_155	U	U	U	U	U	U	U	U	U	U	U
gh_riak_core_176	U	U	U	U	U	U	U	U	U	U	U
loaded_upgrade	B-2	B-2	B-2	B-1	B-2	B-2	B-2	B-2	B-2	B-2	B-2

Test Suites

GiddyUp | riak | riak_cs | riak_ee | stanchion

1.3.0 | 1.3.0rc4 | 1.3.0rc3 | 1.3.0rc2 | 1.3.0rc1 | 1.3.0pre3 | 1.3.0pre2 | 1.3.0pre1 | 1.2.1 | 1.2.0 | 1.2.1rc2

	centos-5-64	centos-6-64	fedora-17-64	freebsd-9-64	osx-64	smartos-64	solaris-10u9-64	ubuntu-1004-32	ubuntu-1004-64	ubuntu-1104-64
basic_command_line	U	U	U	U	U	U	U	U	U	U
client_java_verify	U	U	U	U	U	U	U	U	U	U
client_python_verify	L	L	L	L	L	L	L	L	L	L
client_ruby_verify	M	M	M	M	M	M	M	M	M	M
gh_riak_core_154	U	U	U	U	U	U	U	U	U	U
gh_riak_core_155	U	U	U	U	U	U	U	U	U	U
gh_riak_core_176	U	U	U	U	U			U	U	U
loaded_upgrade	B-2 B-1 L-2 L-1	B-2 B-1 L-2 L-1	B-2 B-1 L-2 L-1	B-1 L-1	B-2 B-1 L-2 L-1			B-2 B-1 L-2 L-1	B-2 B-1 L-2 L-1	B-2 B-1 L-2 L-1
mapred_verify_rt	U	U	U	U	U			U	U	U
partition_repair	U	U	U	U	U			U	U	U
riaknostic_rt	U	U	U	U	U			U	U	U

Returning to a Pristine State

```
10:59:27.995 [info] Resetting nodes to fresh
state
10:59:27.995 [debug] Running: git --git-
dir="~/riak_test/.git" --work-tree="~/
riak_test/" reset HEAD --hard
10:59:29.662 [debug] Running: git --git-
dir="~/riak_test/.git" --work-tree="~/
riak_test/" clean -fd
```

```
10:59:27.995 [info] Resetting nodes to fresh
state
10:59:27.995 [debug] Running: git --git-
dir="~/riak_test/.git" --work-tree="~/
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10:59:29.662 [debug] Running: git --git-
dir="~/riak_test/.git" --work-tree="~/
riak_test/" clean -fd
```

Race Conditions?

It's all wibbly wobbly timey whimey stuff

Race Conditions?

It's all wibbly wobbly timey whimey stuff

```
wait_until(Node, Fun, Retry,
           Delay, TimeoutFun) ->
    Pass = Fun(Node),
    case {Retry, Pass} of
        {_, true} ->
            ok;
        {0, _} ->
            TimeoutFun(Node);
        _  ->
            timer:sleep(Delay),
            wait_until(Node, Fun, Retry-1,
                       Delay, TimeoutFun)
    end.
```

```
wait_until(Node, Fun, Retry,
           Delay, TimeoutFun) ->
    Pass = Fun(Node),
    case {Retry, Pass} of
        {_, true} ->
            ok;
        {0, _} ->
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        _ ->
            timer:sleep(Delay),
            wait_until(Node, Fun, Retry-1,
                       Delay, TimeoutFun)
    end.
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        _ ->
            timer:sleep(Delay),
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                       Delay, TimeoutFun)
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            timer:sleep(Delay),
            wait_until(Node, Fun, Retry-1,
                       Delay, TimeoutFun)
    end.
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        _ ->
            timer:sleep(Delay),
            wait_until(Node, Fun, Retry-1,
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    end.
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wait_until(Node, Fun, Retry,
           Delay, TimeoutFun) ->
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        {_, true} ->
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            timer:sleep(Delay),
            wait_until(Node, Fun, Retry-1,
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wait_until(Node, Fun, Retry,
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        _ ->
            timer:sleep(Delay),
            wait_until(Node, Fun, Retry-1,
                       Delay, TimeoutFun)
    end.
```
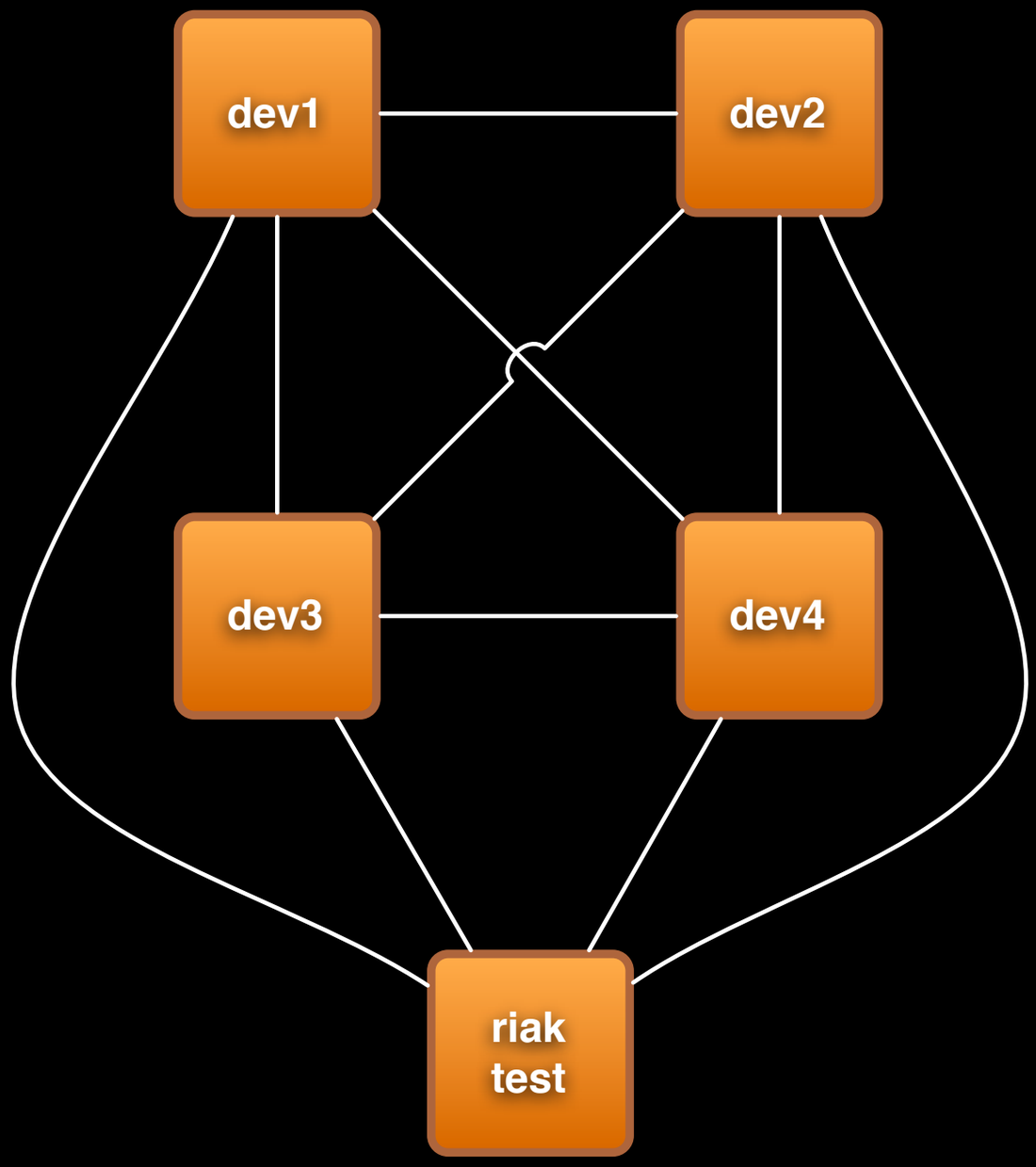
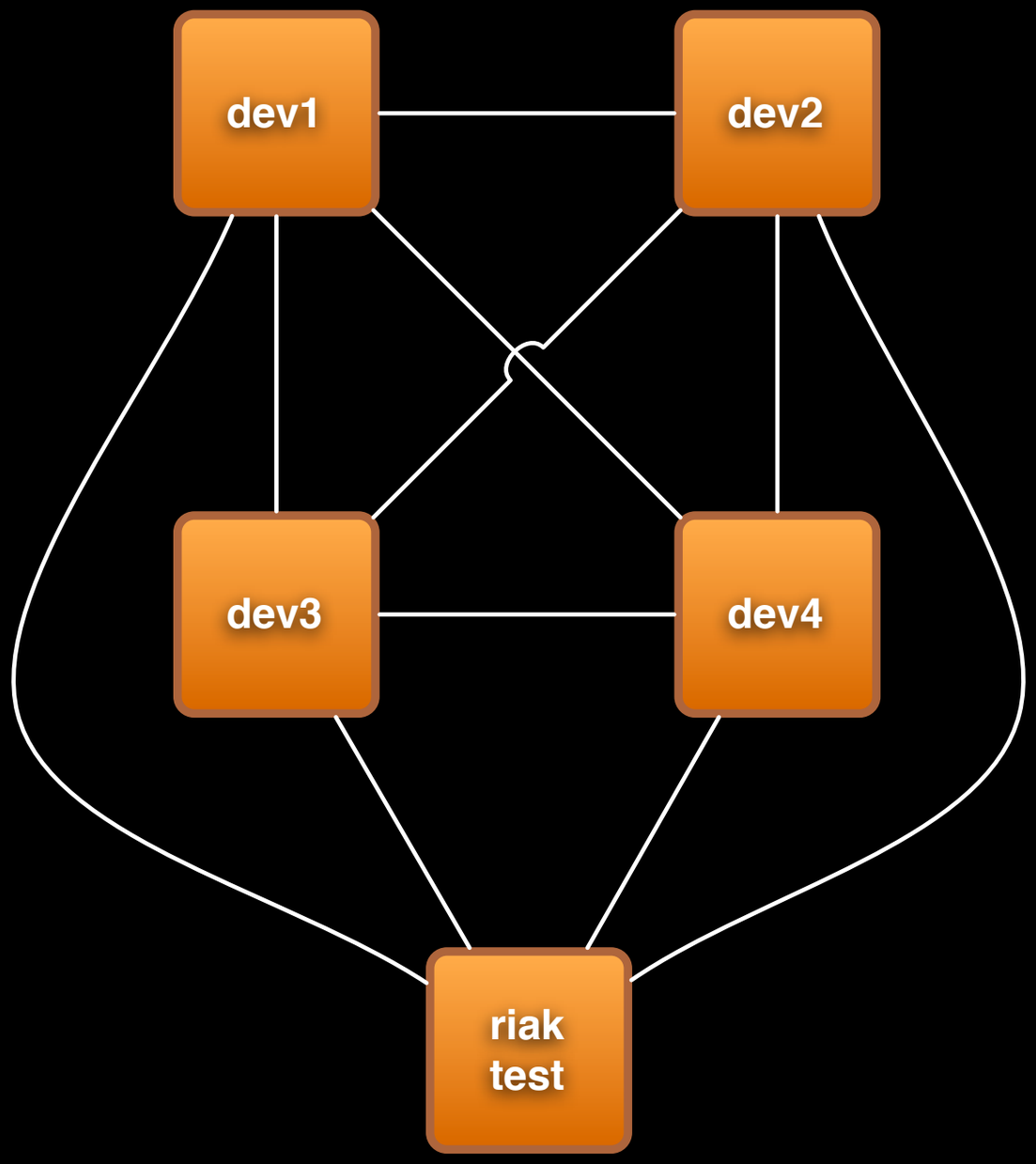

```
wait_until(Node, Fun, Retry,
           Delay, TimeoutFun) ->
    Pass = Fun(Node),
    case {Retry, Pass} of
        {_, true} ->
            ok;
        {0, _} ->
            TimeoutFun(Node);
        _  ->
            timer:sleep(Delay),
            wait_until(Node, Fun, Retry-1,
                       Delay, TimeoutFun)
    end.
```

Network Partitions

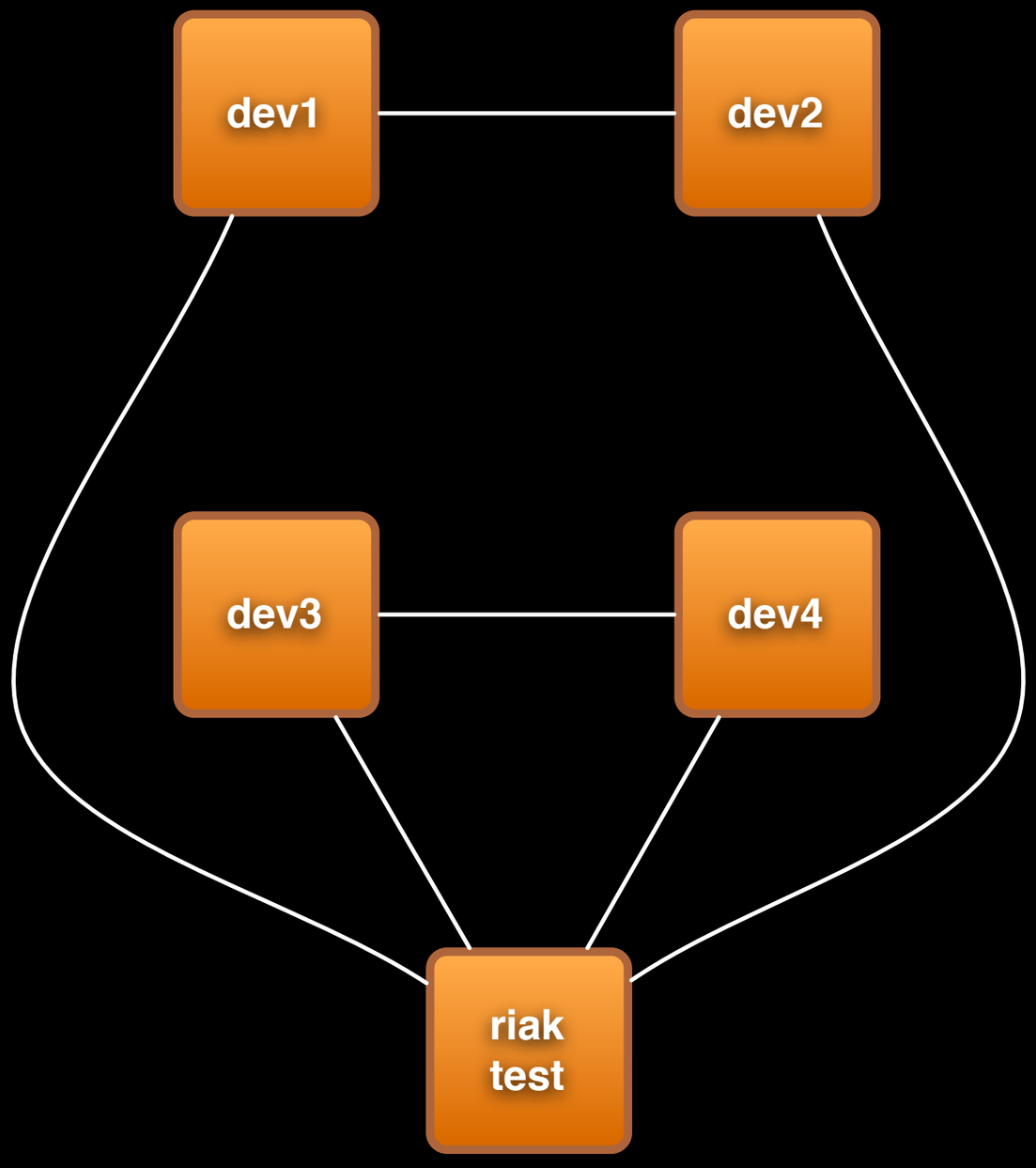
The Prefix Code?

The Cookie!


dev1
dev2
dev3
dev4
riak
test

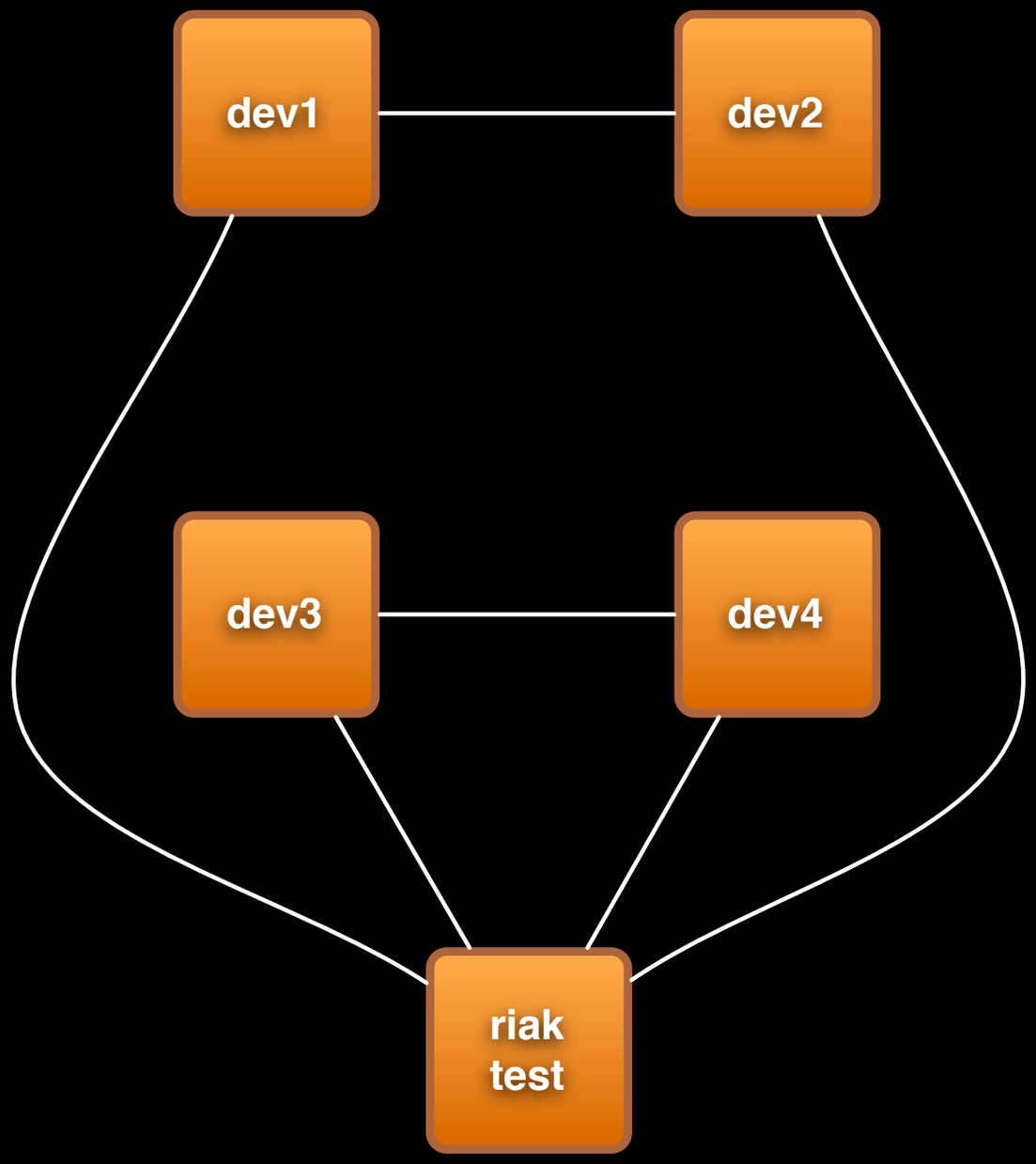


reverse the cookie on dev3 and dev4



reverse the cookie on
dev3 and dev4

disconnect dev3 and dev4
from dev1 and dev2

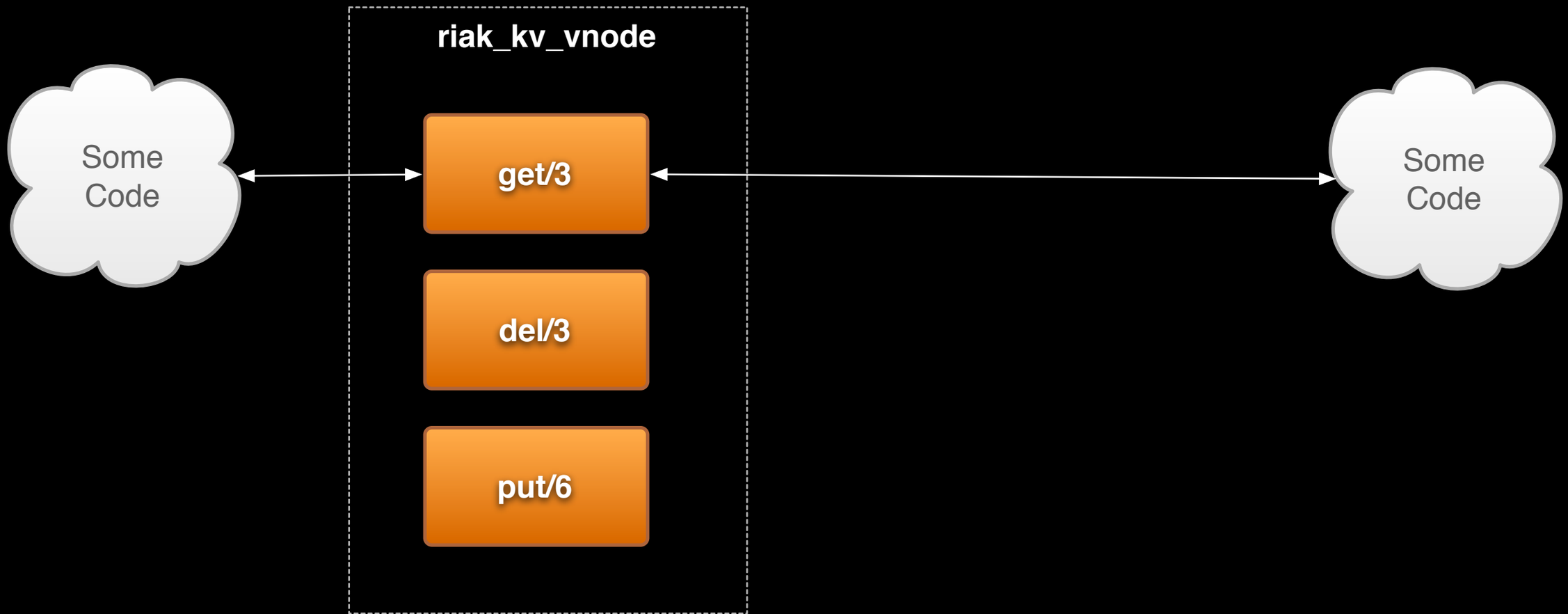


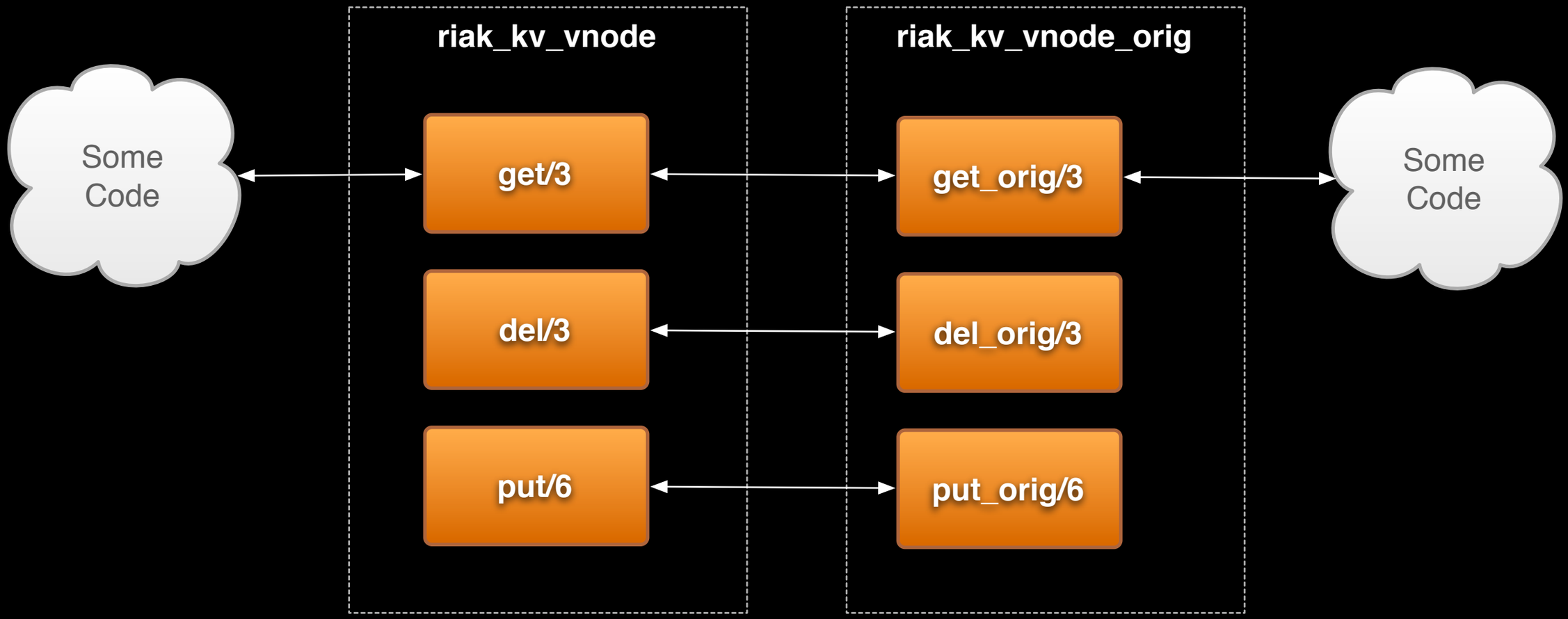
reverse the cookie on dev3 and dev4

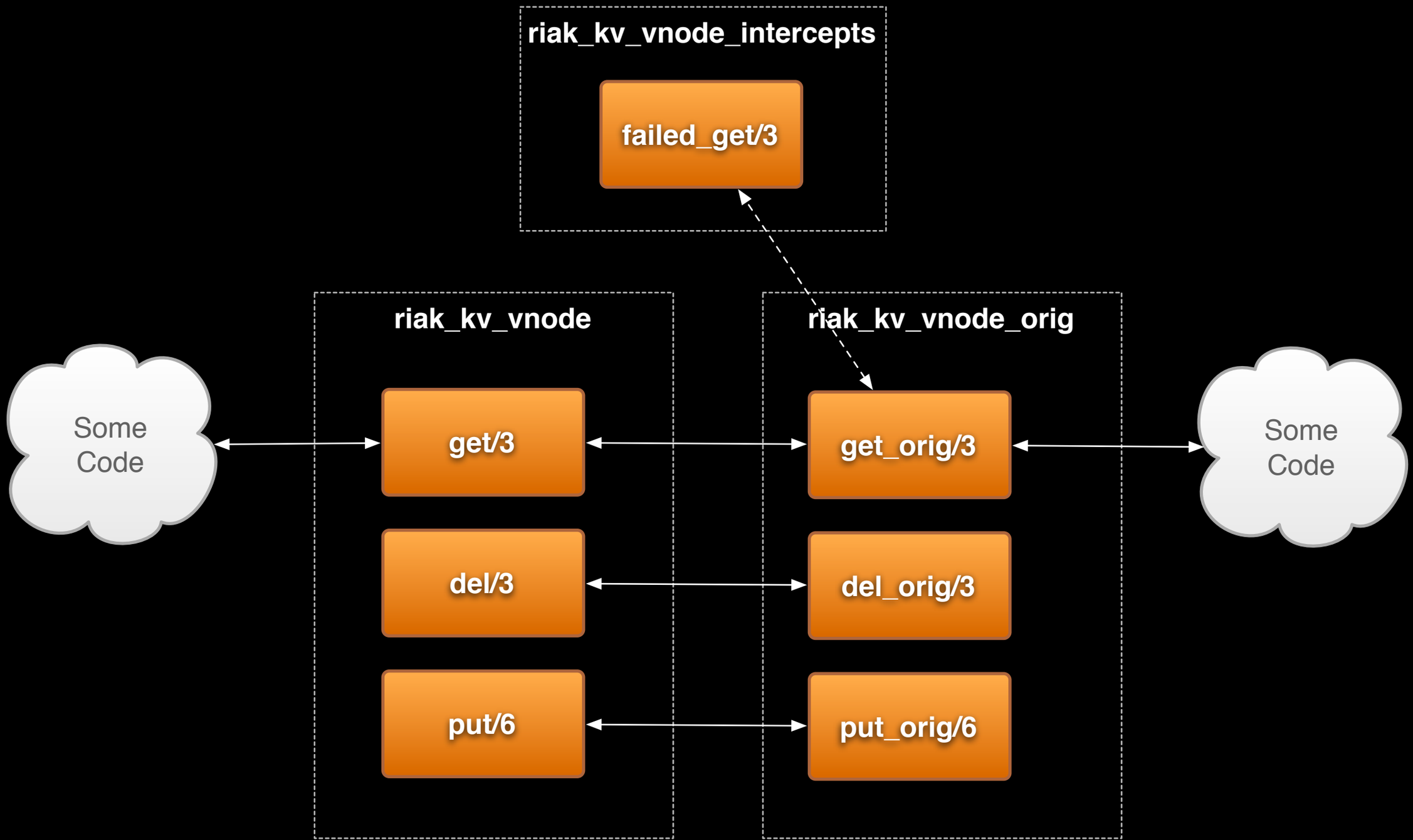
disconnect dev3 and dev4 from dev1 and dev2

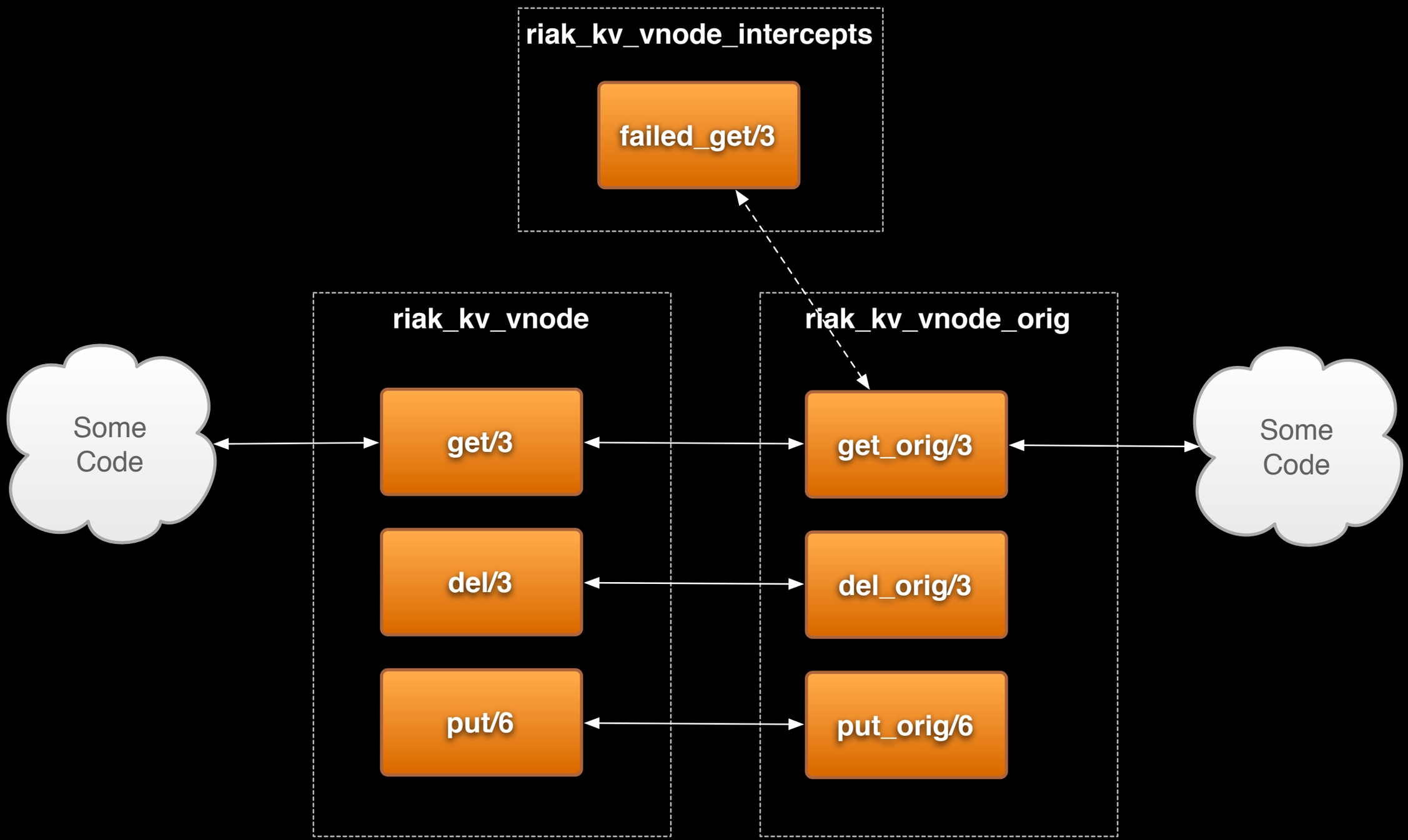
leave riak_test node connected to all 4

Intercepts

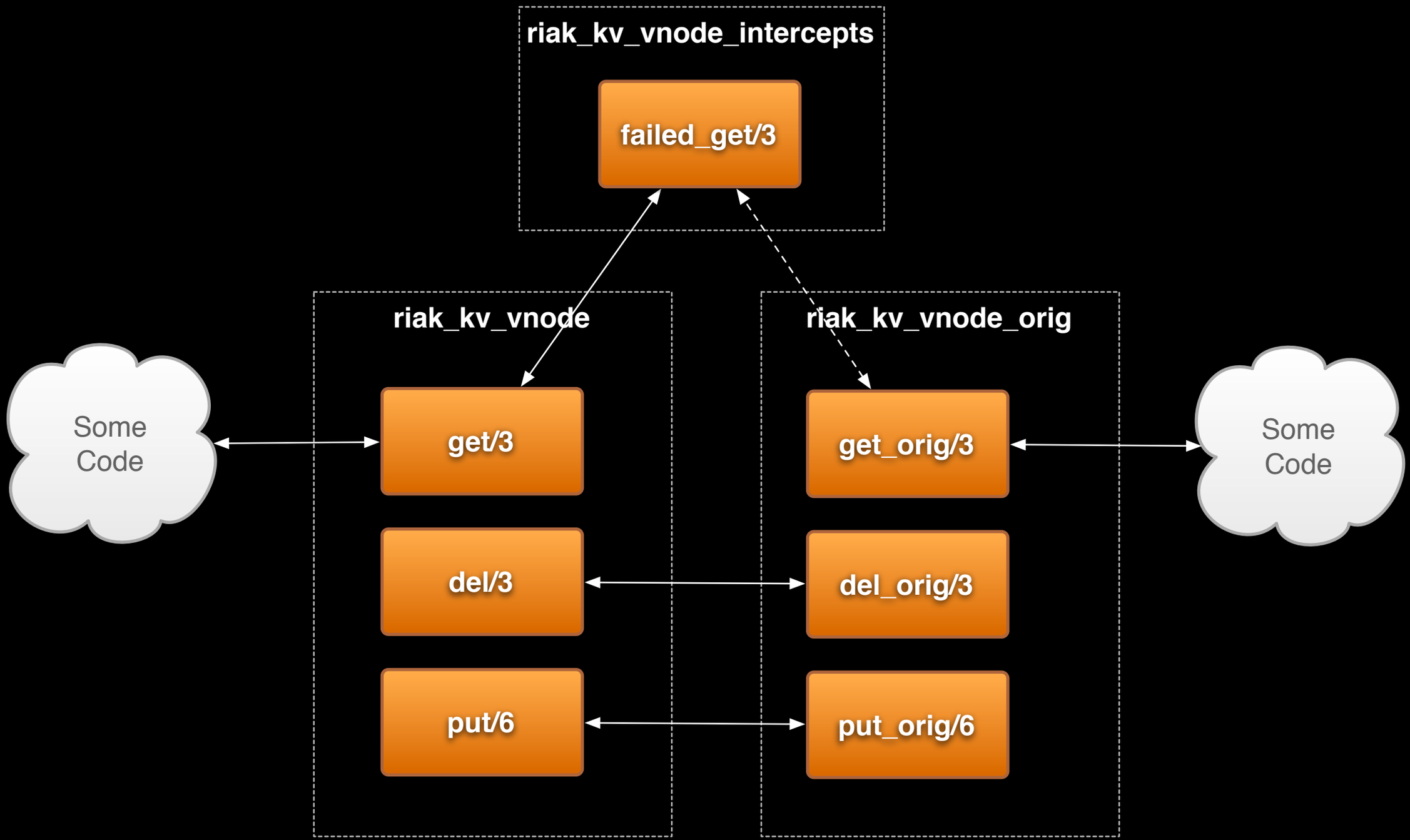

riak_kv_vnode
Some Code
get/3
del/3
put/6
Some Code


riak_kv_vnode
riak_kv_vnode_orig
Some Code
get/3
get_orig/3
Some Code
del/3
del_orig/3
put/6
put_orig/6


riak_kv_vnode_intercepts
failed_get/3
riak_kv_vnode
riak_kv_vnode_orig
Some Code
get/3
get_orig/3
Some Code
del/3
del_orig/3
put/6
put_orig/6



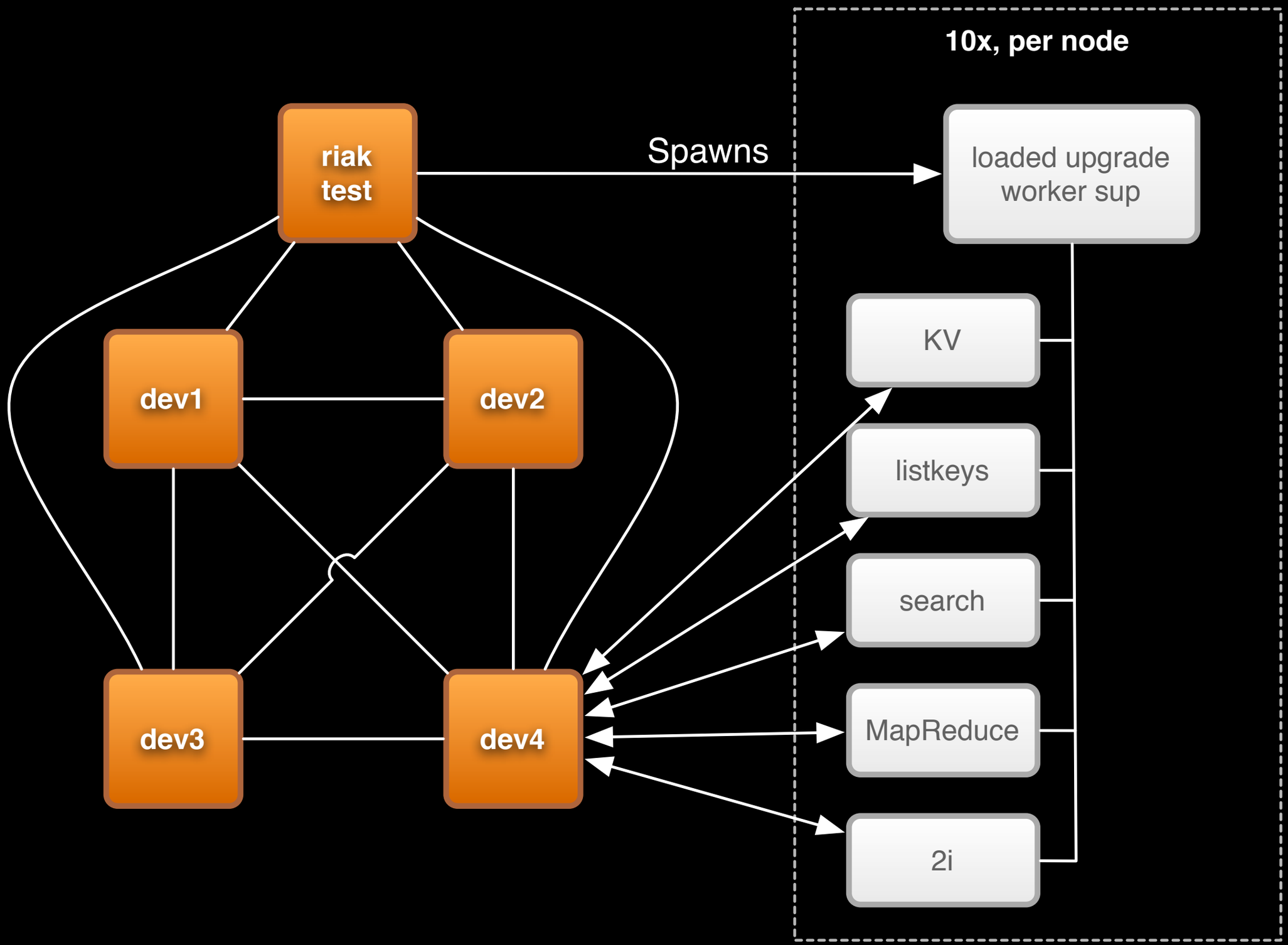

```
rt_intercept:add(Node,
                 {riak_kv_vnode, [{{get,3}, failed_get}]})
```




```
rt_intercept:add(Node,
                 {riak_kv_vnode, [{{get,3}, failed_get}]})
```


ENOTENUFPIXELS

My Melty-Faced Spock Moment


10x, per node
riak test
Spawns
loaded upgrade worker sup
KV
listkeys
search
MapReduce
2i
dev1
dev2
dev3
dev4

Joe DeVivo
@joedevivo

Come to my talk and I'll explain why I was opening more file descriptors than Mac OS X's erlang VM could handle: erlang-factory.com/conference/SFB...

Reply Delete Favorite More

4 RETWEETS **2** FAVORITES

6:03 PM - 4 Feb 13

Where do we go from here?

Successes!

Successes!

- less people spend less hours on release validation

Successes!

- less people spend less hours on release validation
- For Erlangers by Erlangers

Successes!

- less people spend less hours on release validation

- For Erlangers by Erlangers

- Features can be developed with integration testing

Failure was an

Failure was an

- Release Validation took a long calendar time

Failure was an

- Release Validation took a long calendar time
- A process problem Nightlies can't solve

Failure was an

- Release Validation took a long calendar time
- A process problem Nightlies can't solve
- Performance Testing still Manual

Failure was an

- Release Validation took a long calendar time
- A process problem Nightlies can't solve
- Performance Testing still Manual
- Test Environment can cause issues with results, giving us a "giddyup who cried wolf"

tl;dr best release yet; will only get better

Thanks!

- Joe Blomstedt
- Sean Cribbs
- Chris Meiklejohn
- Jared Morrow
- John Newman
- Dave “Chest Burster” Parfitt
- Engel Sanchez
- Ryan Zezeski

And many more!

QUESTIONS?

QUESTIONS?

WHO'S TAKING


CLAP IF YOU LOVE


CLAP IF YOU LOVE
JOE DEVIVO