

Kicking Asses with Asynchronous Processing

without getting your ass kicked by
Asynchronous Processing



⇒ Thin ⇒



52,204
apps running right now



shopify

e-commerce made easy



<http://macournoyer.com/make-me-a-server/>

<http://sauteapps.com>



TALKER

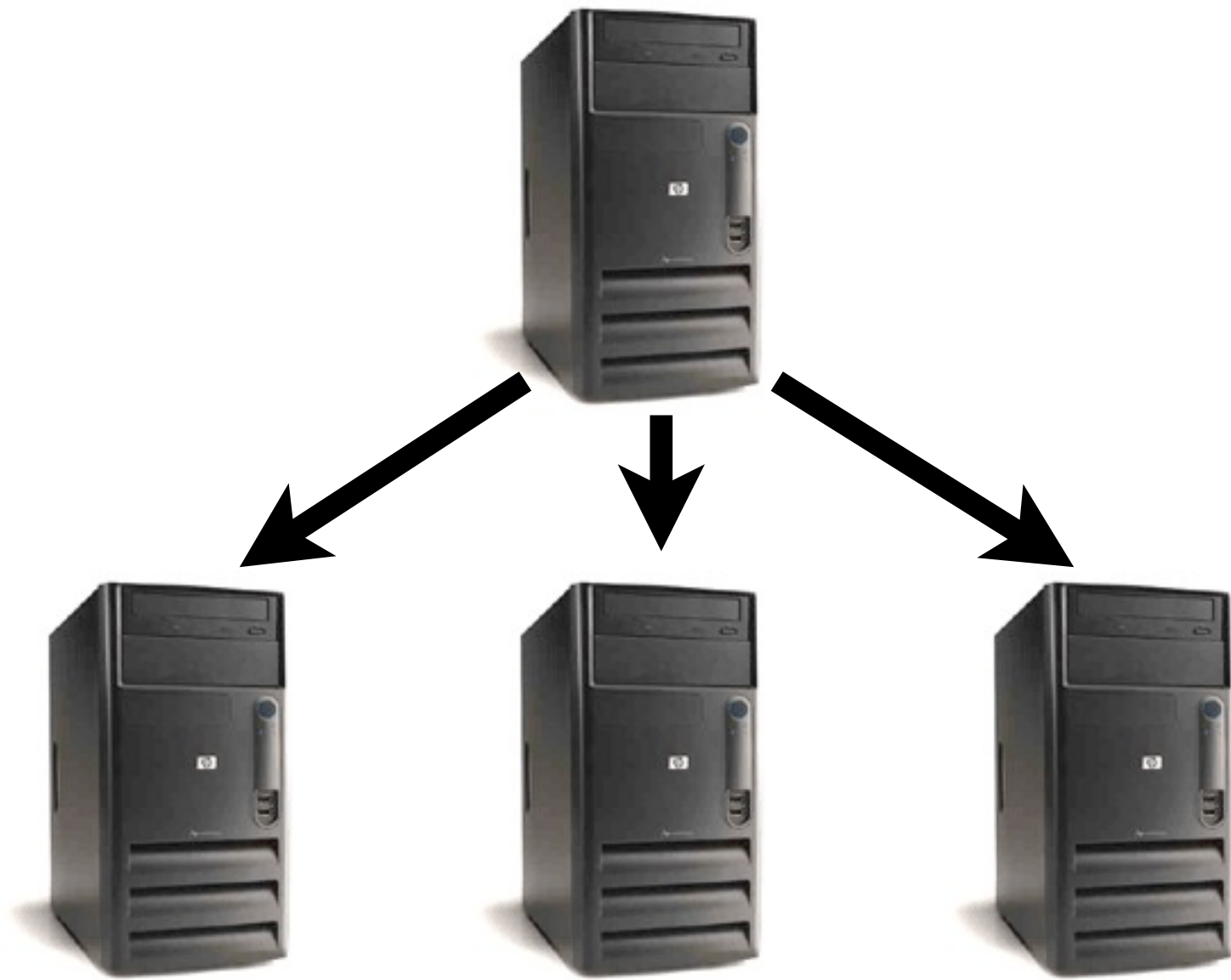
Fast, intuitive and extensible group chat

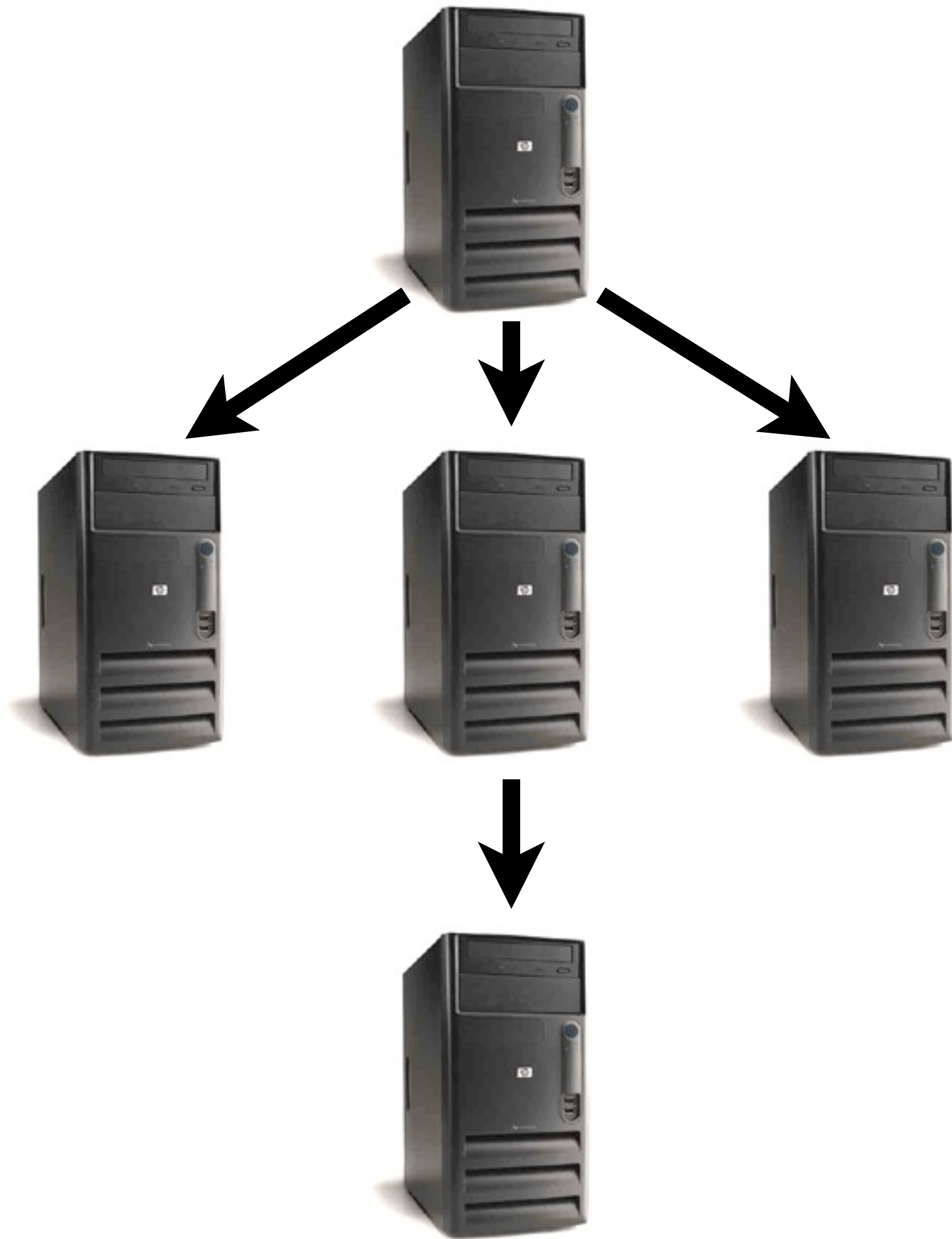
<http://talkerapp.com>

Scalling

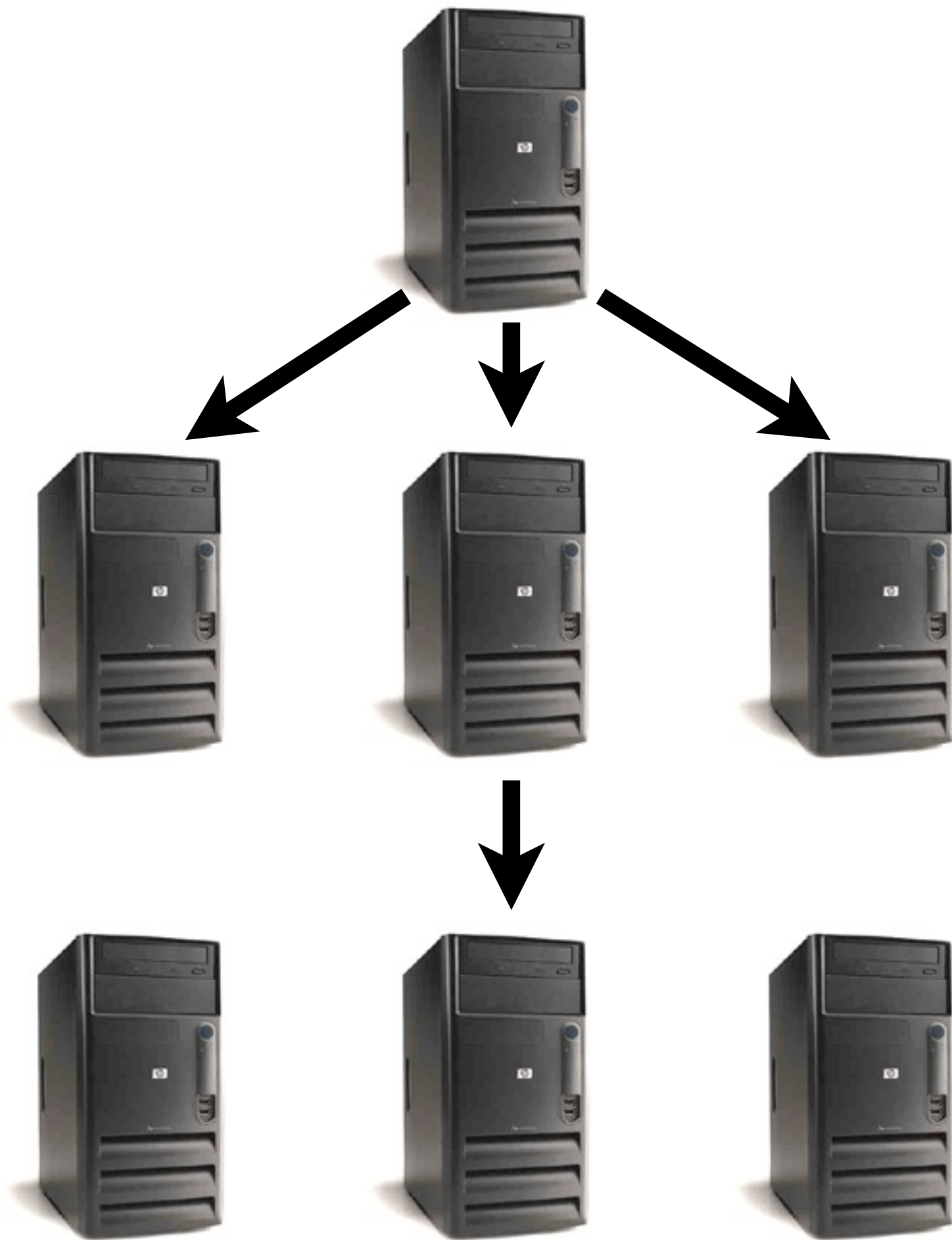




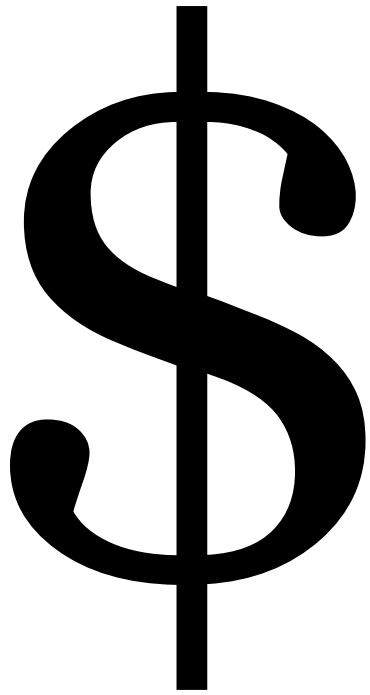




<http://www.weeklyreader.com/readandwriting/content/binary/harddrivetower.gif>



<http://www.weeklyreader.com/readandwriting/content/binary/harddrivetower.gif>



\$

>





> profit = fun



©ThinkGeek.com

<http://www.thinkgeek.com/geektoys/cubegoodies/c208/>

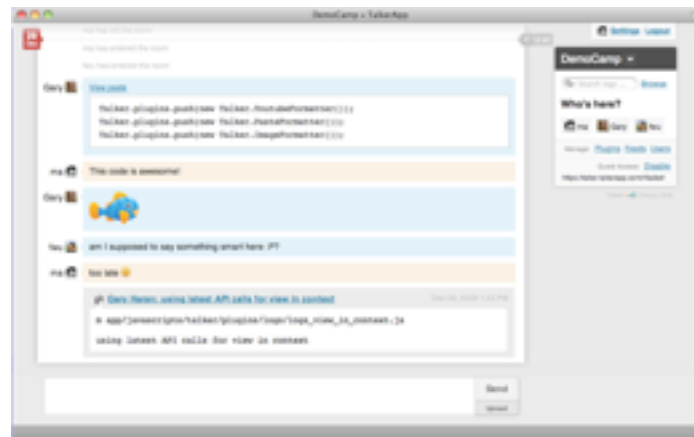




PRIVATEISLANDSMAG.COM



Source: <http://www.superherostuff.com/blog/images/superman-standing.gif>





YEAAAAH!



SLOOOOW!



3.0

beta



YEAAAAAH!



SLOOOOW!

Source: <http://www.superherostuff.com/blog/images/superman-standing.gif>



3.0

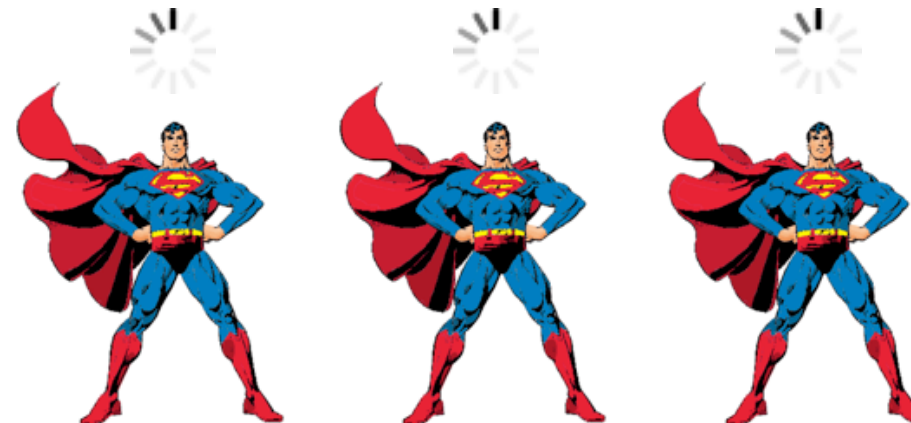
beta



Ruby 1.9
A Programmer's Best Friend



YEAAAAH!

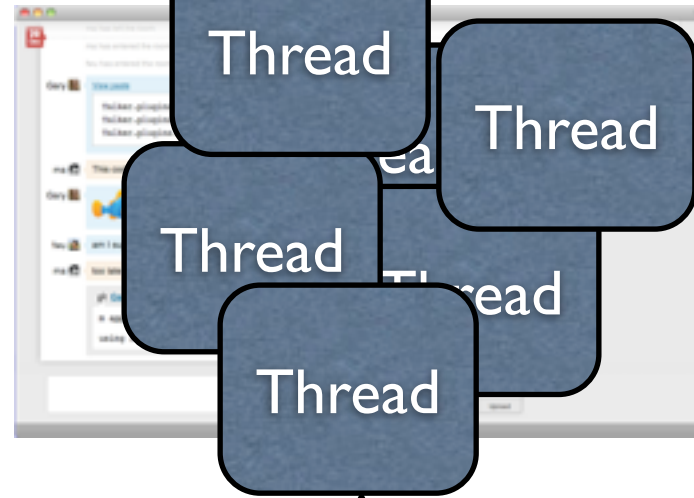


SLOOOOW!

Source: <http://www.superherostuff.com/blog/images/superman-standing.gif>



3.0
beta



Ruby 1.9
A Programmer's Best Friend



YEAAAAAH!



SLOOOOW!

Source: <http://www.superherostuff.com/blog/images/superman-standing.gif>

4 problems

I/O & CPU

I/O Bound

 **Waiting for disk / socket ...**





Threads



Stack Race conditions

Thread

Deadlocks

Synchronization

Context Switching

Mutex

Asynchronous I/O

Non-blocking I/O

Evented I/O

Asynchronous:
(adjective) occurring at
different times; allowing the
client to continue during
processing

<http://en.wiktionary.org/wiki/asynchronous>

```
results = db.query("select * from T")
```

```
Tread.new do  
  results = db.query("select * from T")  
end
```

```
db.query("select * from T") do |results|  
  # use results  
end  
# do other stuff here ...
```


Event-Driven Programming

high concurrency

EXTREME

high concurrency

“ The Asynchronous I/O
stuff makes a big deal.
We’re trying to move most
of our stuff to fit that
model ...

- Reddit dude, PyCon 2009

friendfeed



Tornado

non-blocking web server



<http://image3.examiner.com/images/blog/EXID7311/images/steve-jobs-iPad.jpg>



<http://image3.examiner.com/images/blog/EXID7311/images/steve-jobs-iPad.jpg>

Ruby/EventMachine

Fast Network I/O and Event Management for Ruby Programmers

Let's code ...

HTTP
Memcache
MySQL
Postgres
SMTP
STOMP

```
EM.start_server("0.0.0.0", 3000, Connection)
```

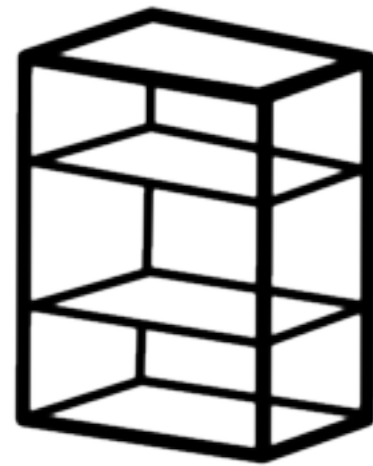
```
EM.connect("google.com", 80, Connection)
```

```
EM.add_timer(10) do  
  puts "10 sec later..."  
end
```

```
EM.defer do  
  index_the_whole_internet  
end
```

```
EM.system('ls') do |output|  
  puts output  
end
```

⇒ Thin ⇒



rack
powers web applications

[http://github.com/macournoyer/**thin_async**](http://github.com/macournoyer/thin_async)

More code ...

2 problems

Ist

```
user = User.find(name)
puts "Name: " + user.name
```

```
User.find(name) do |user|  
  puts "Name: " + user.name  
end
```

```
User.find(name) do |user|
  Project.find(p) do |project|
    if user && project
      request.get do |response|
        # ...
      end
    end
  end
end
end
```


2nd

 Sphinx



memcached

redis

 Sphinx

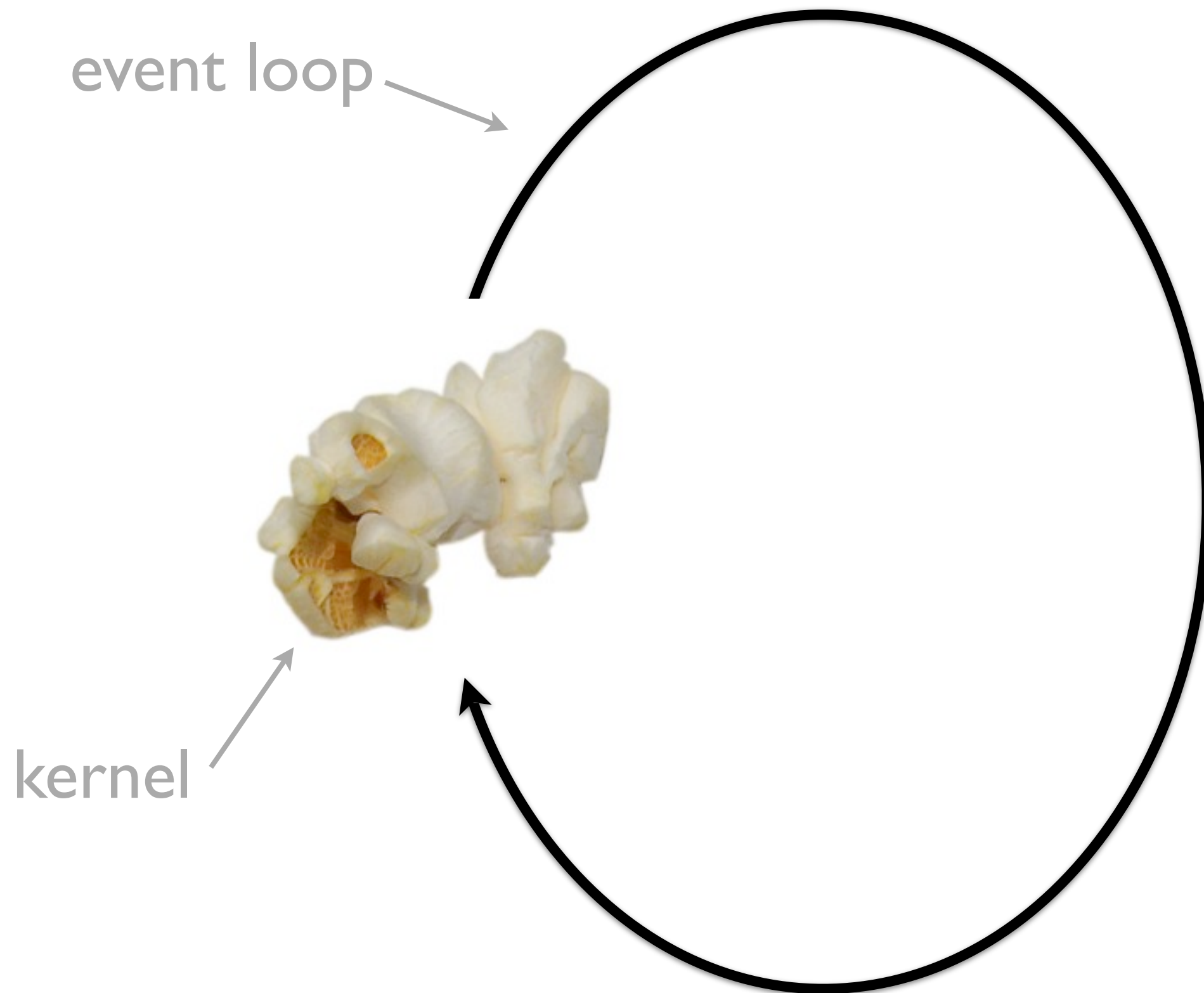


BLOCKING



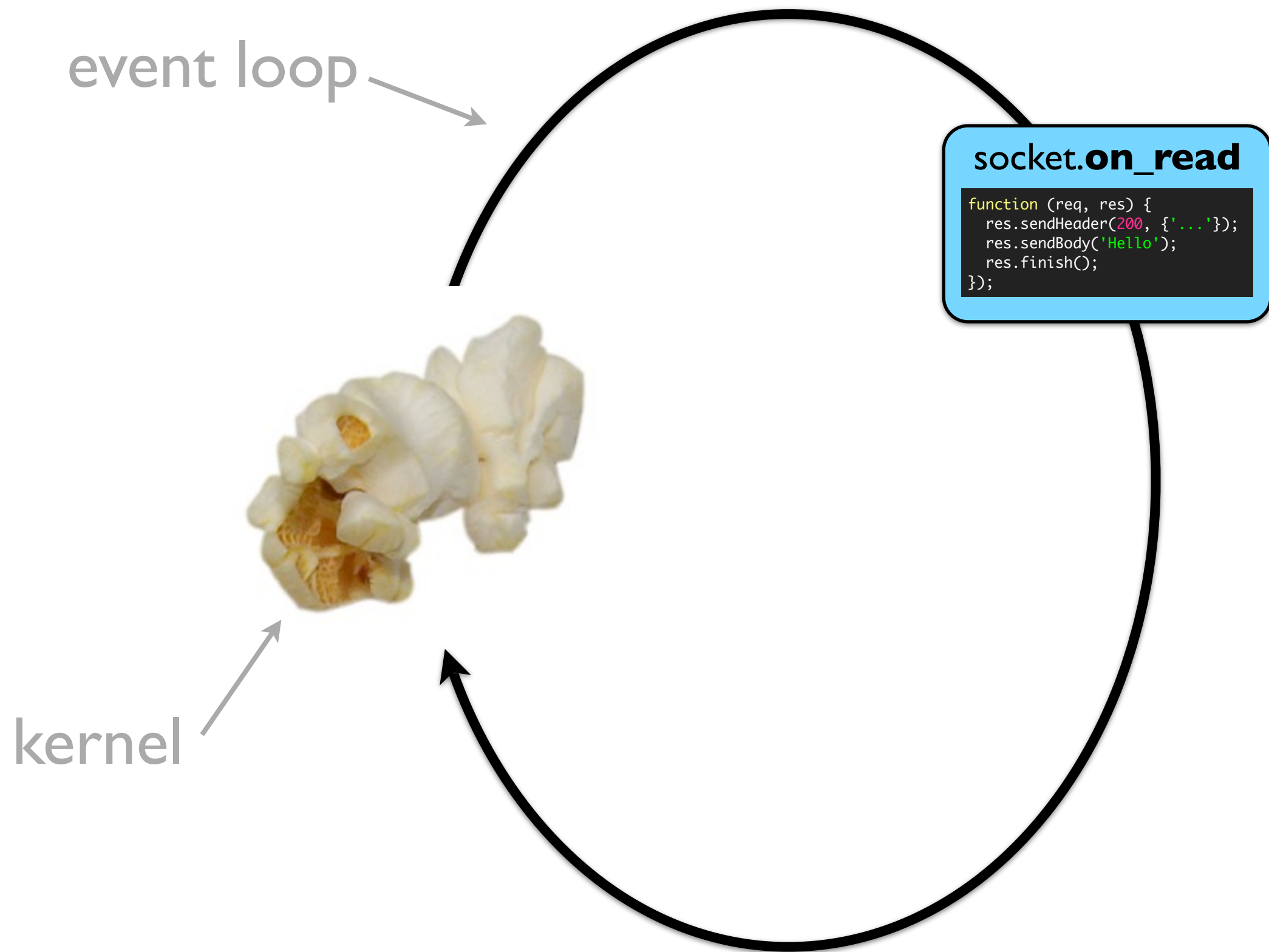
memcached

redis



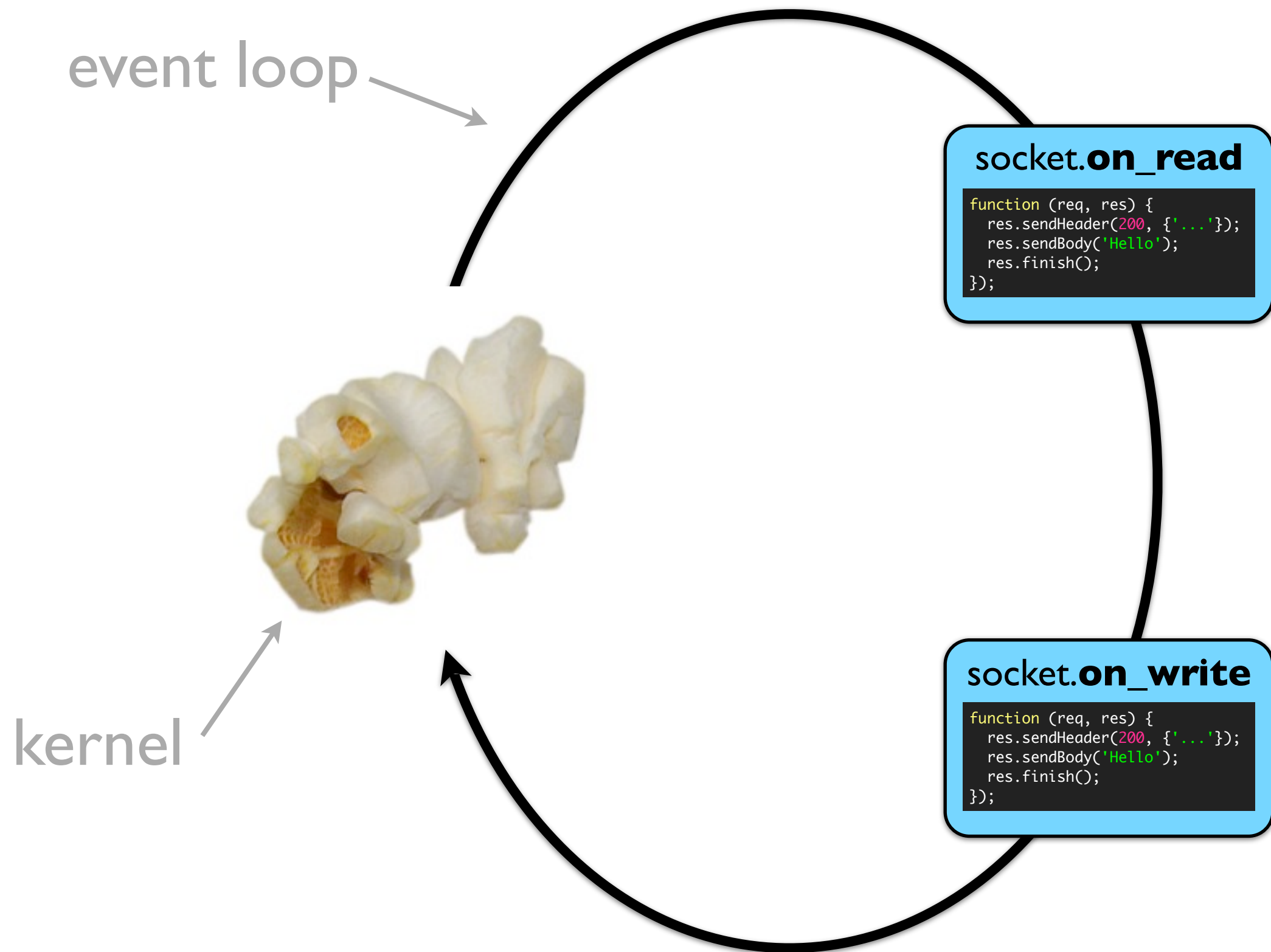
(Artistic representation)

Source: http://pack283.chieftarhe.org/wp-content/uploads/2008/08/butterfly_kernel.jpg



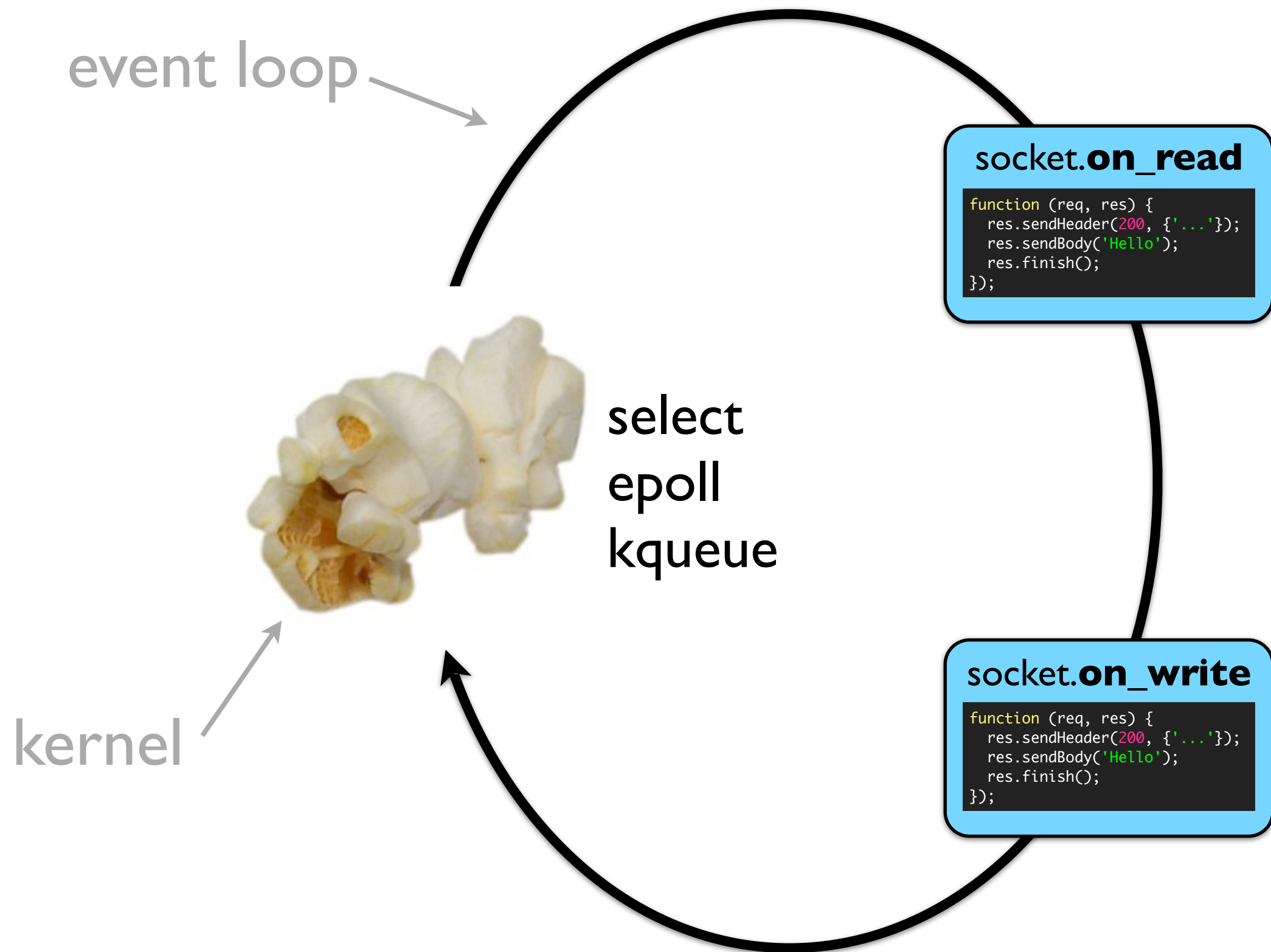
(Artistic representation)

Source: http://pack283.chieftarhe.org/wp-content/uploads/2008/08/butterfly_kernel.jpg



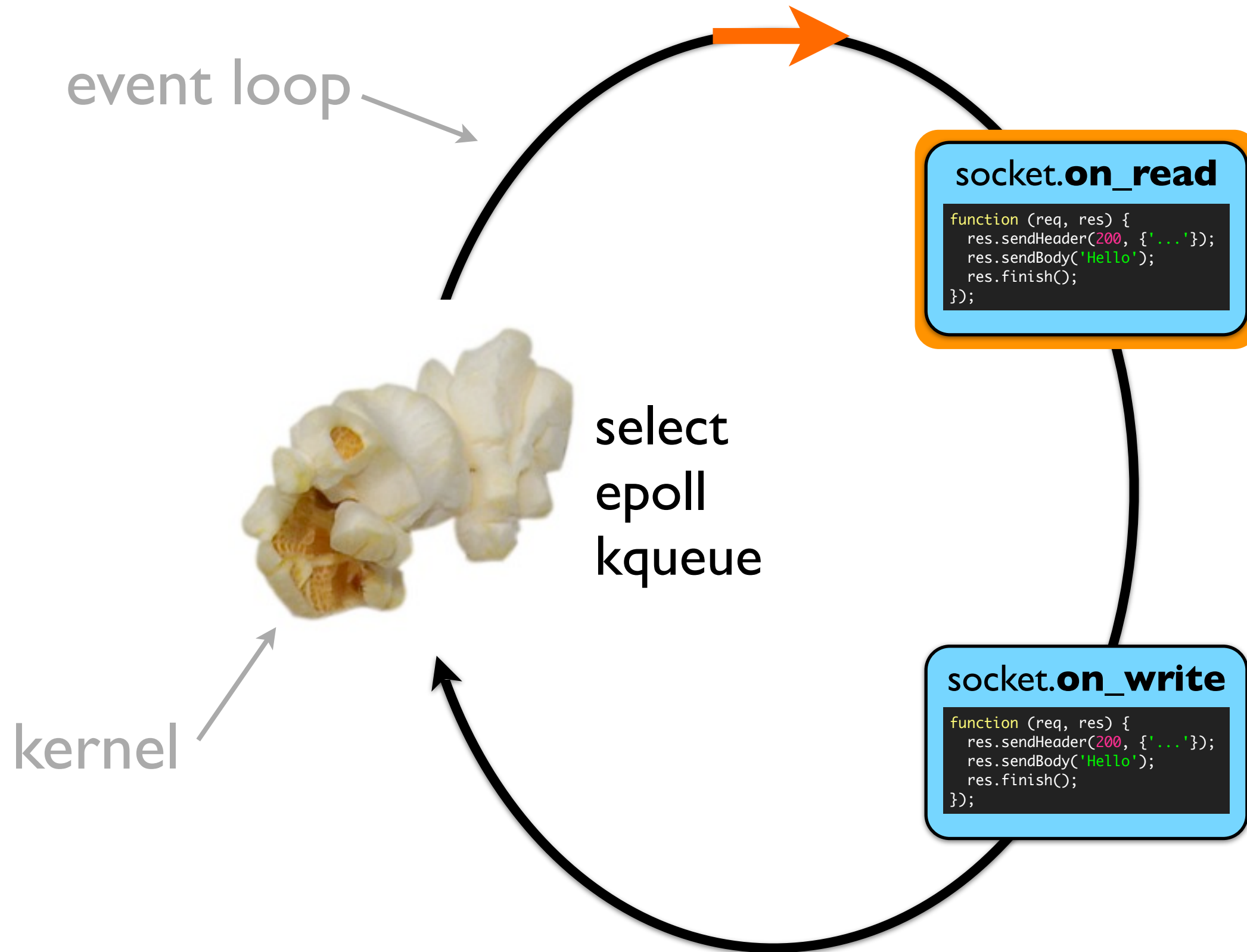
(Artistic representation)

Source: http://pack283.chieftarhe.org/wp-content/uploads/2008/08/butterfly_kernel.jpg

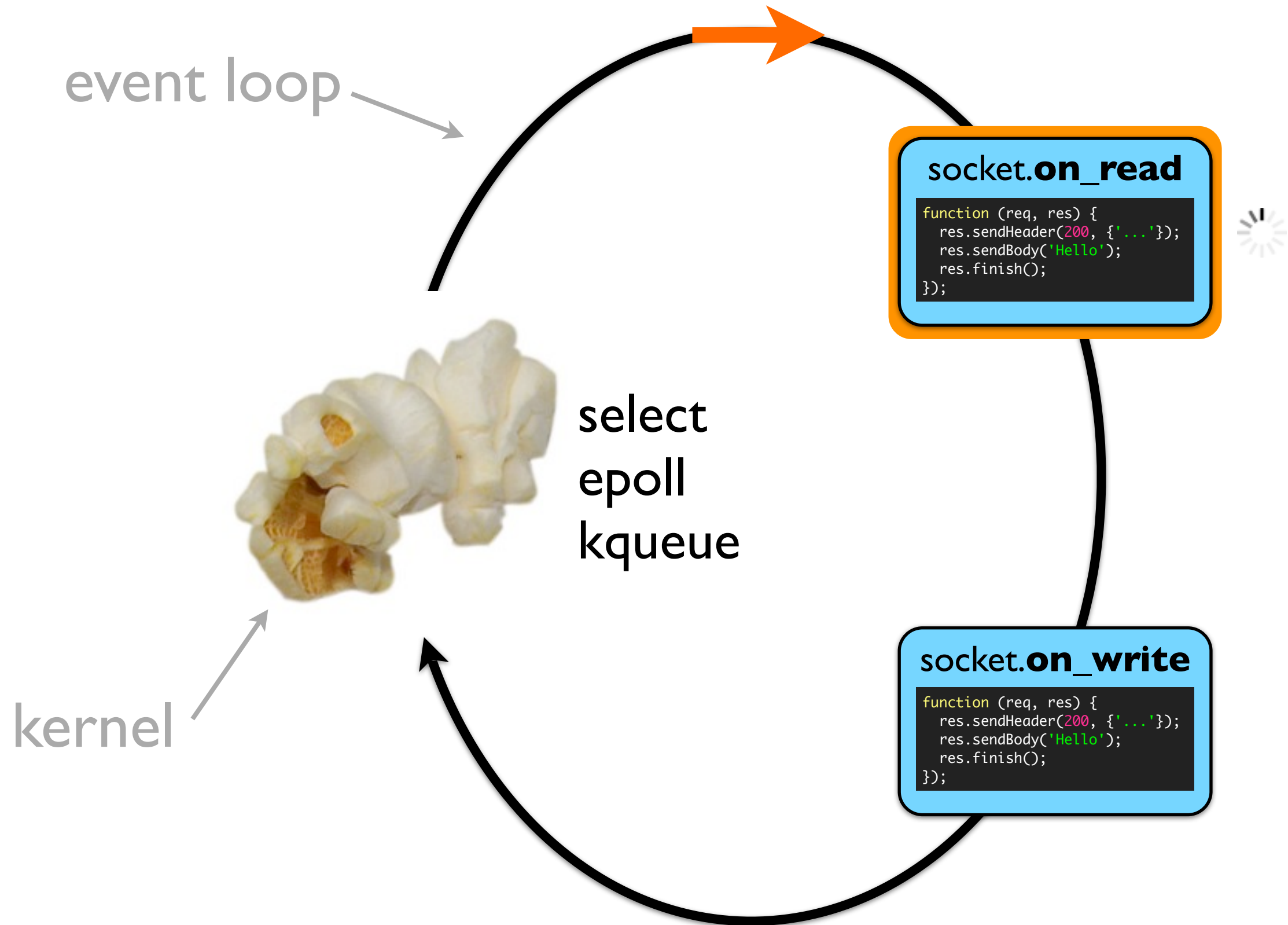


(Artistic representation)

Source: http://pack283.chieftarhe.org/wp-content/uploads/2008/08/butterfly_kernel.jpg

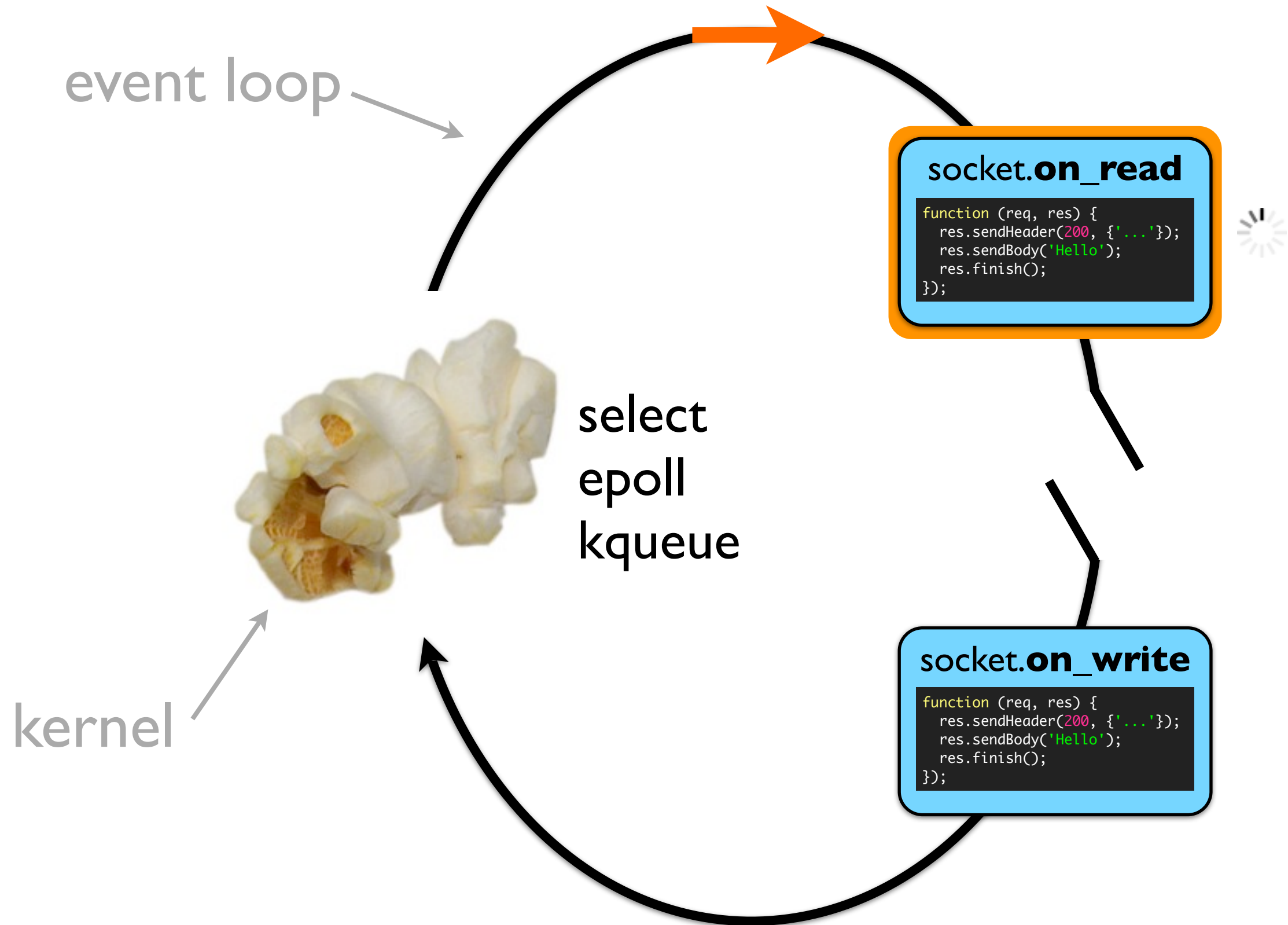


Source: http://pack283.chieftarhe.org/wp-content/uploads/2008/08/butterfly_kernel.jpg



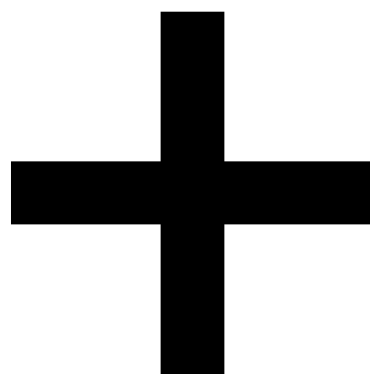
(Artistic representation)

Source: http://pack283.chieftarhe.org/wp-content/uploads/2008/08/butterfly_kernel.jpg



(Artistic representation)

Source: http://pack283.chieftarhe.org/wp-content/uploads/2008/08/butterfly_kernel.jpg



> 10 000

concurrent connections

The C10K problem

<http://www.kegel.com/c10k.html>



Real Life™

I Love Muffins

The Perfectly Portable Snack

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Welcome to I Love Muffins

I have loved muffins for many years and I am always on the lookout for new muffin recipes to add to my ever-growing collection. I've got so many I needed a place to keep them! The best part of keeping them online is that I can share them with you.

Here you will find a big collection of great muffin recipes. Whether you're looking for a healthy muffin to start your day or a decadent treat with your afternoon tea, you'll find it here. Feel free to browse by muffin recipe category, at right or browse through our Archives to see all our recipes.

[Browse the Muffin Recipes Archive »](#)



Low Fat Bran and Fruit Muffins

These muffins are low-fat and high in fibre and are great warm right from the oven!

Ingredients

1/4 cup hot water
2 tablespoons whole or milled flax seeds
2 cups 100% bran cereal (not flakes)
3/4 cup low-fat milk (skim or 1%)
1 cup unsweetened applesauce
1/2 cup brown sugar
1/2 teaspoon salt
2 tablespoons oil
1 large egg
1 1/2 cups unbleached all-purpose flour
1 tablespoon baking powder
1/2 cup raisins

© ilovemuffins.ca




```
ab -c50 -n5000 http://ilovemuffins.ca/recipes/random.json
```

```
...
```

```
Requests per second:    3.29 [#/sec] (mean)
```

```
ab -c50 -n5000 http://ilovemuffins.ca/recipes/random.json
```

...

Requests per second: 3.29 [#/sec] (mean)

ouch!





⇒ Thin ⇒

[http://github.com/macournoyer/**thin_async**](http://github.com/macournoyer/thin_async)

Let's code again ...



<http://twistedmatrix.com>



<http://rubyeventmachine.com>



<http://mina.apache.org>



<http://software.schmorp.de/pkg/libev.html>

The C10K problem

<http://www.kegel.com/c10k.html>

I/O & CPU

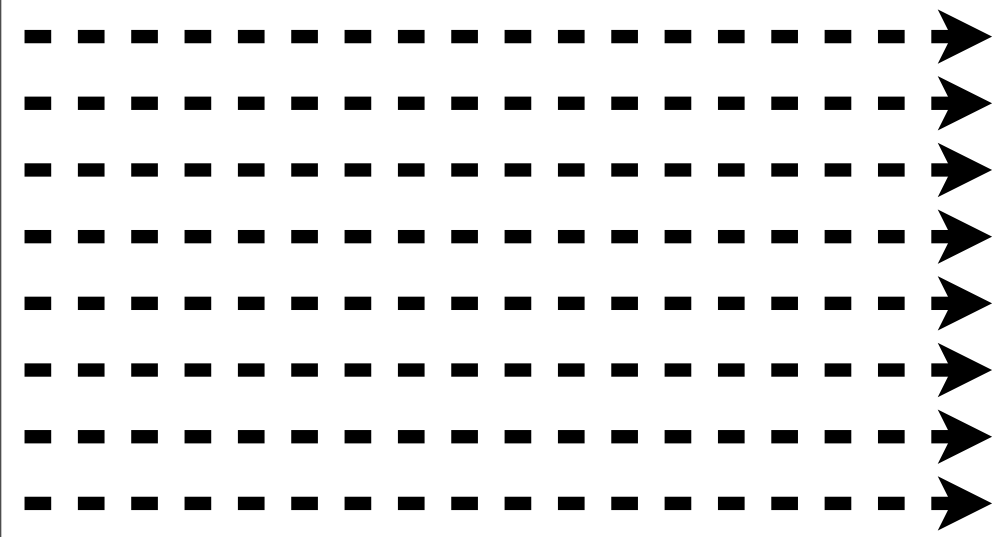
CPU Bound

$$\begin{aligned}
\mathcal{F}^{-1}\{G(f)\} &= \mathcal{F}^{-1}\left\{\sum_{n=-\infty}^{\infty} G[n] \cdot \delta\left(f - \frac{n}{\tau}\right)\right\} \\
&= \sum_{n=-\infty}^{\infty} G[n] \cdot \underbrace{\mathcal{F}^{-1}\left\{\delta\left(f - \frac{n}{\tau}\right)\right\}}_{e^{i2\pi \frac{n}{\tau} x} \underbrace{\mathcal{F}^{-1}\{\delta(f)\}}_1} \\
&= \sum_{n=-\infty}^{\infty} G[n] \cdot e^{i2\pi \frac{n}{\tau} x} = g(x).
\end{aligned}$$

Blocking I/O

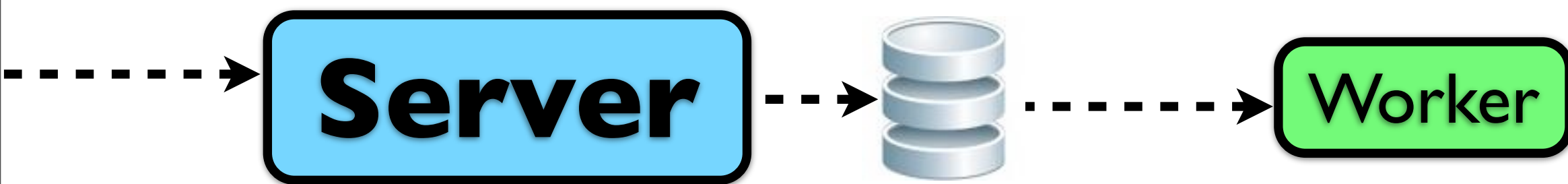


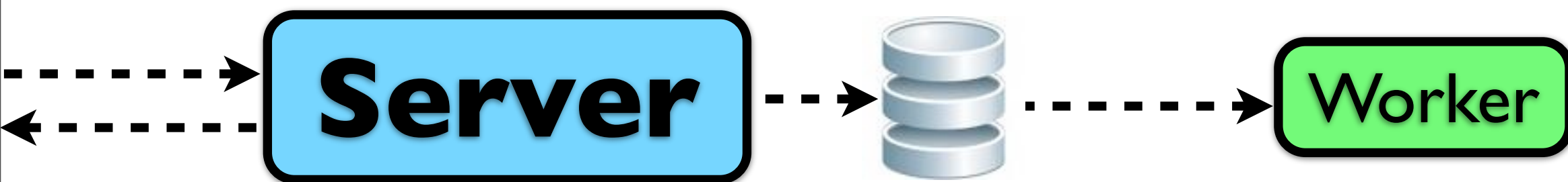
Server

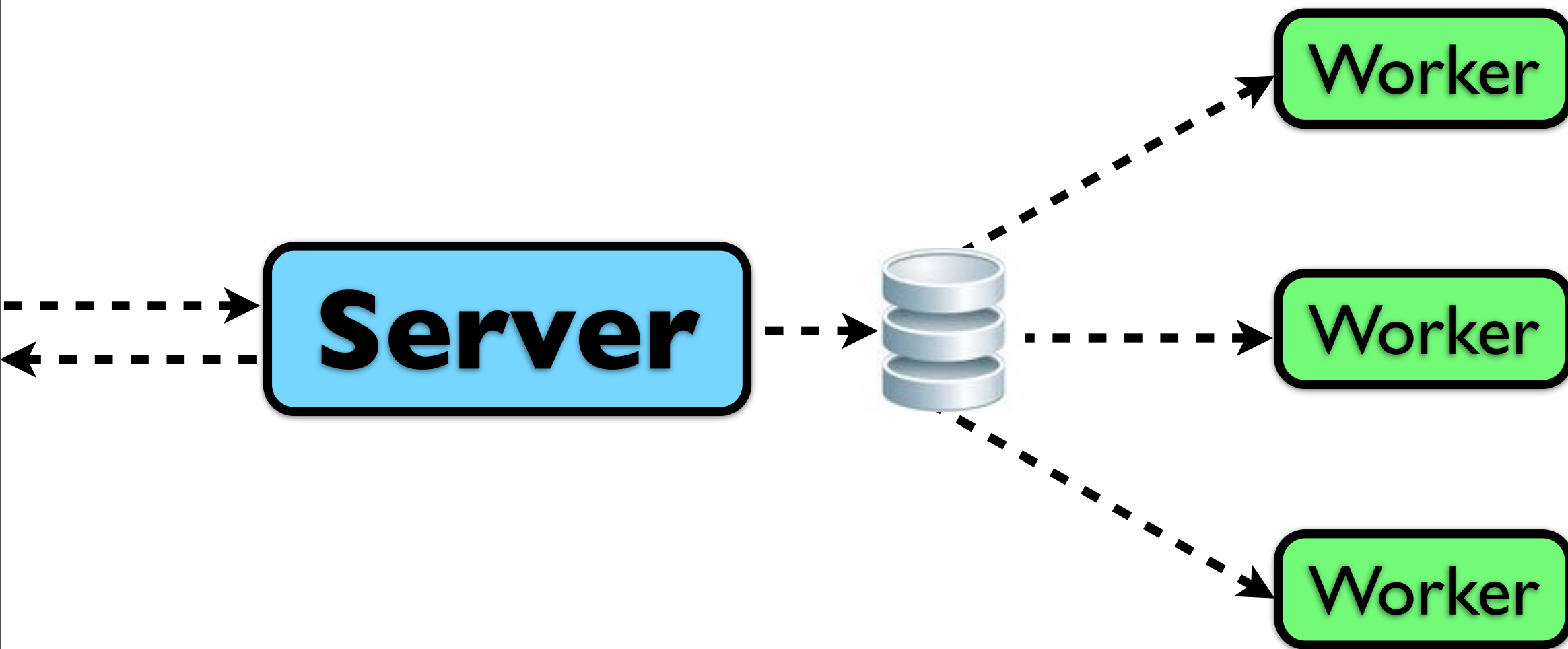


Server









```
class MyJob
  def perform
    index_the_internet_twice
  end
end
```

```
Delayed::Job.enqueue MyJob.new
```

[http://github.com/tobi/**delayed_job**](http://github.com/tobi/delayed_job)

[http://github.com/defunkt/**resque**](http://github.com/defunkt/resque)

[http://github.com/ask/**celery**](http://github.com/ask/celery)

[http://php.net/manual/en/book.**gearman**.php](http://php.net/manual/en/book.gearman.php)

Now

Questions ?

Please!

<http://macournoyer.com>