

Users as Data

Paul Ingles
@pingles

Forward



Data Ecosystem

IN THE PLEX

HOW GOOGLE THINKS, WORKS,
AND SHAPES OUR LIVES

STEVEN LEVY

AUTHOR OF *HACKERS*

AUTHOR OF *HACKERS*

STEVEN LEVY

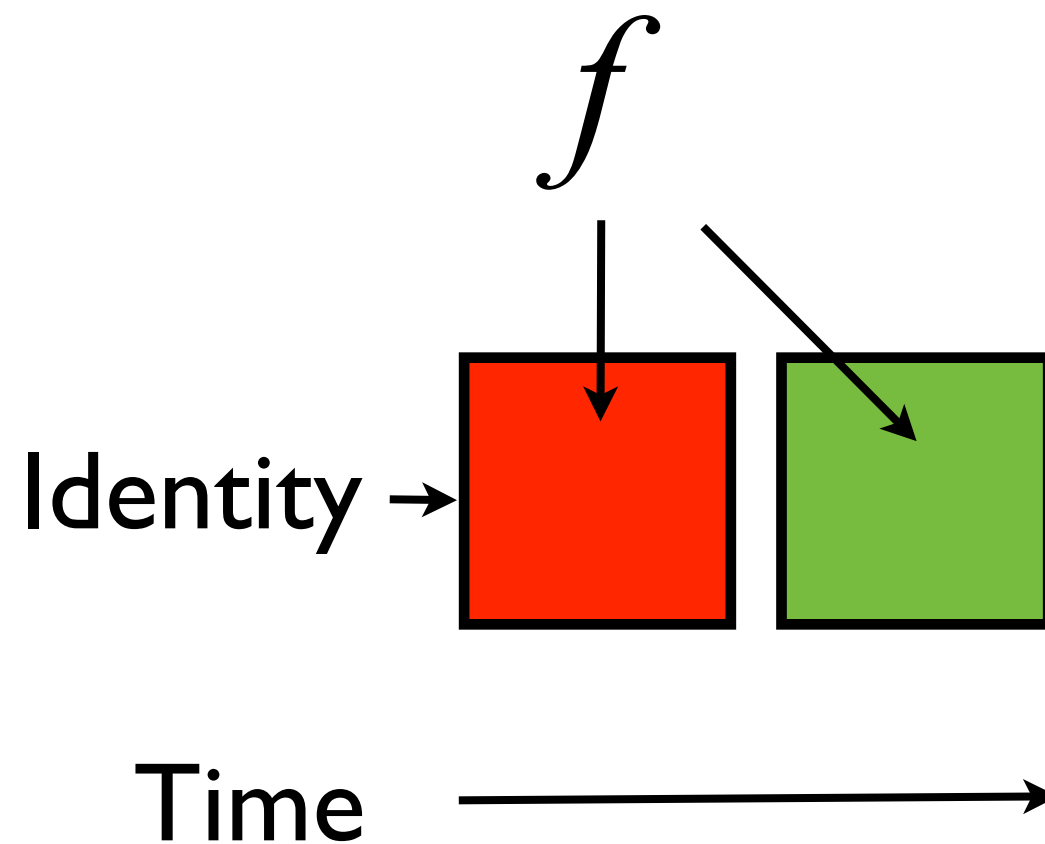
Functional Programming

Data is Immutable

Clojure



Time, State and Identity



Everything as Data

```
{:postcode "NW3 2LB"  
  :user-id "pingles"}
```



Simple, Composable



Simple, Composable

```
(true? true) # true
```



Simple, Composable

```
(true? true) # true
```

```
(comp not true?) # fn
```



Simple, Composable

```
(true? true) # true
```

```
(comp not true?) # fn
```

```
(def false? (comp not true?)) # fn
```



Sequences

```
(true? true) # true
```

```
(take 2 [1 2 3]) # 1 2
```

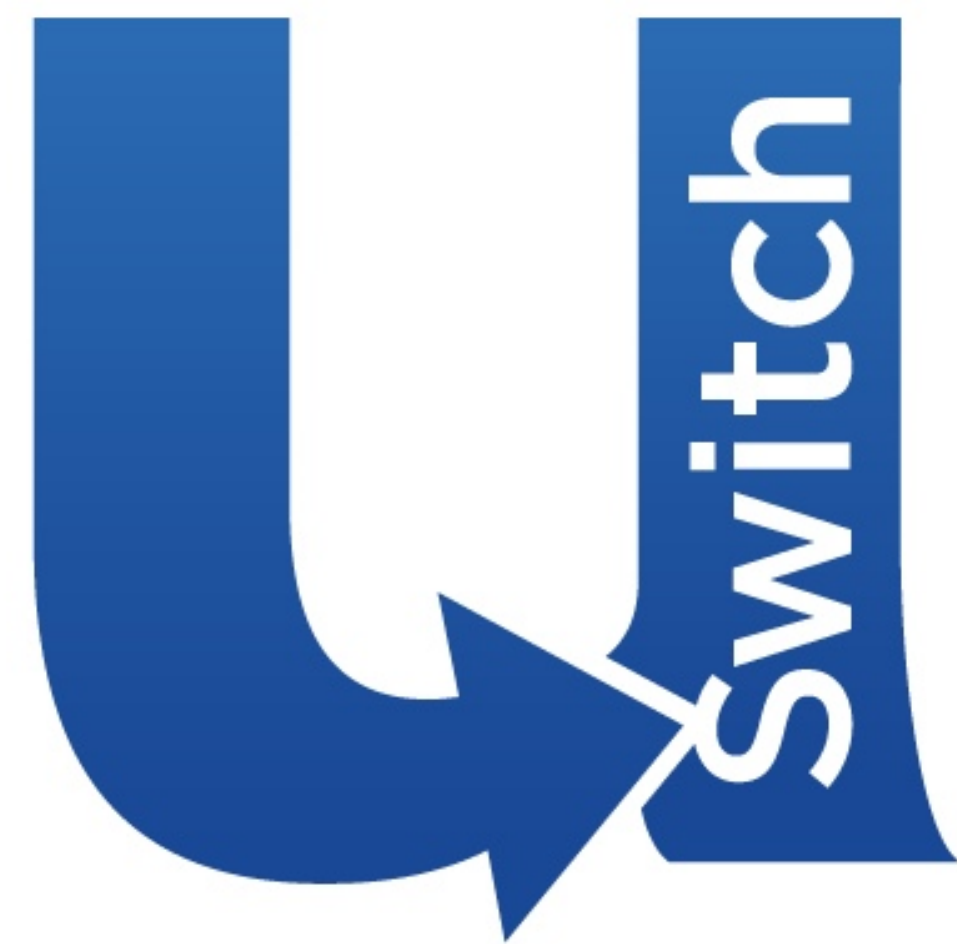
```
(take 2 (map inc [1 2 3])) # 2 3
```



Clojure

- Everything is Data
- Simple, Composable
- Sequences
- Immutable





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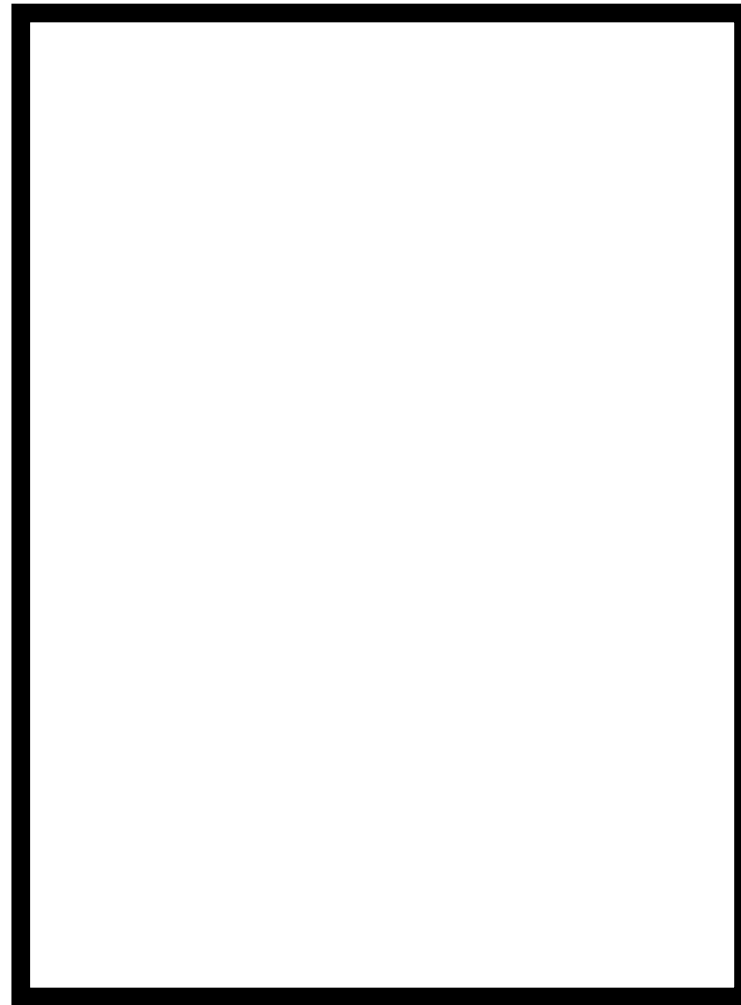
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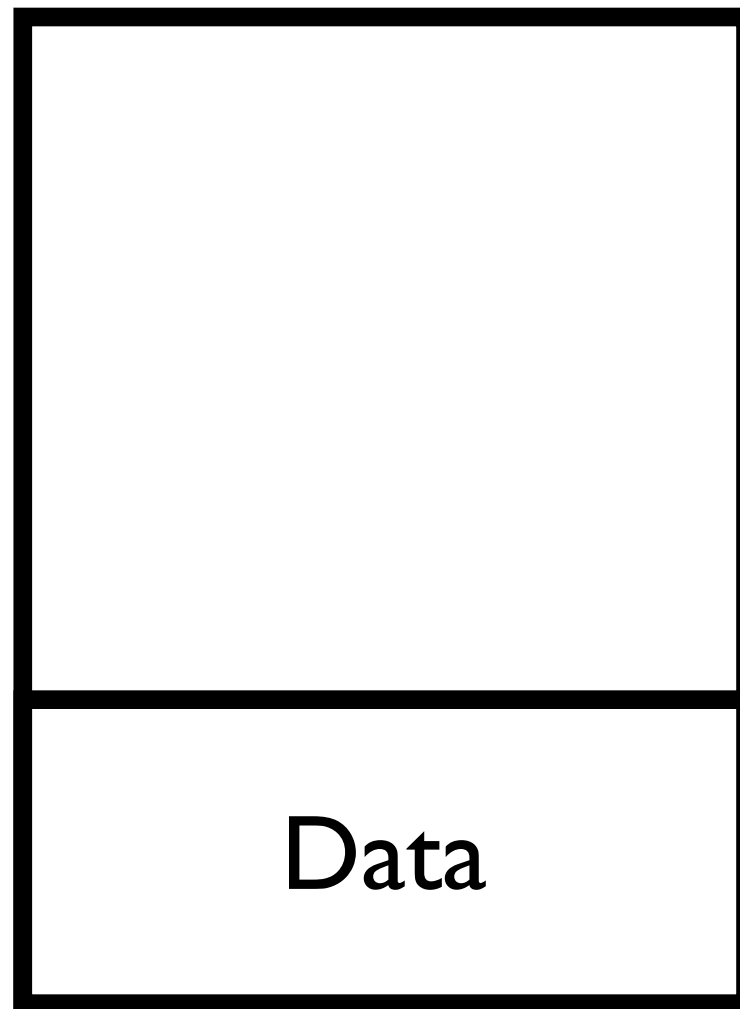
Where we were...

Traditional Enterprise

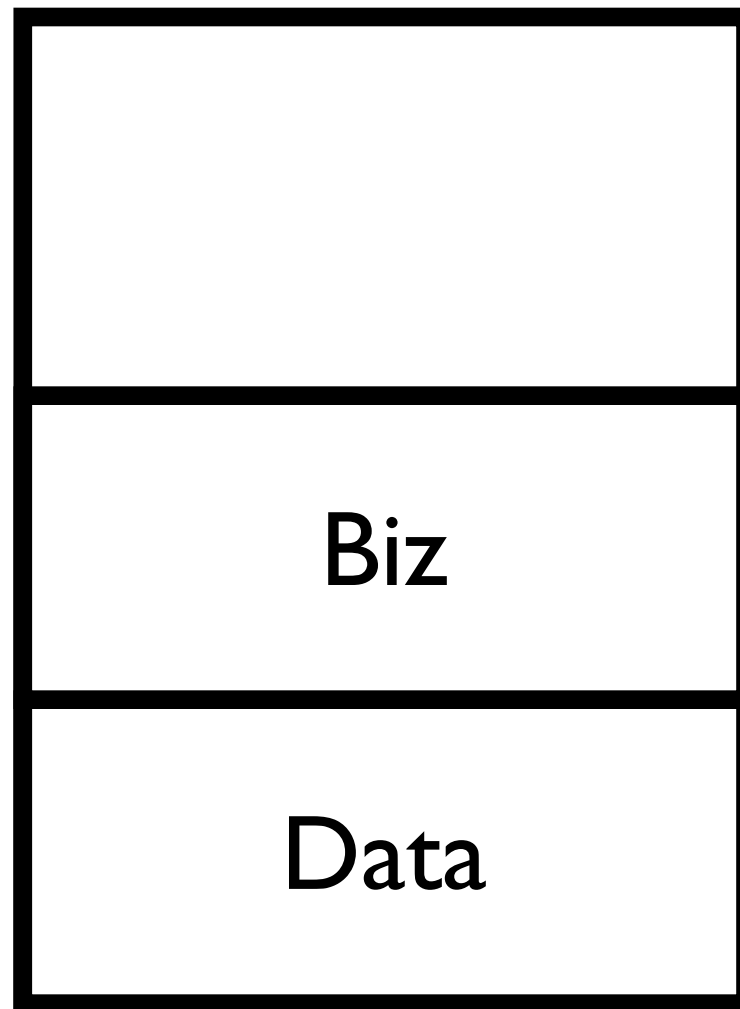
Traditional Enterprise



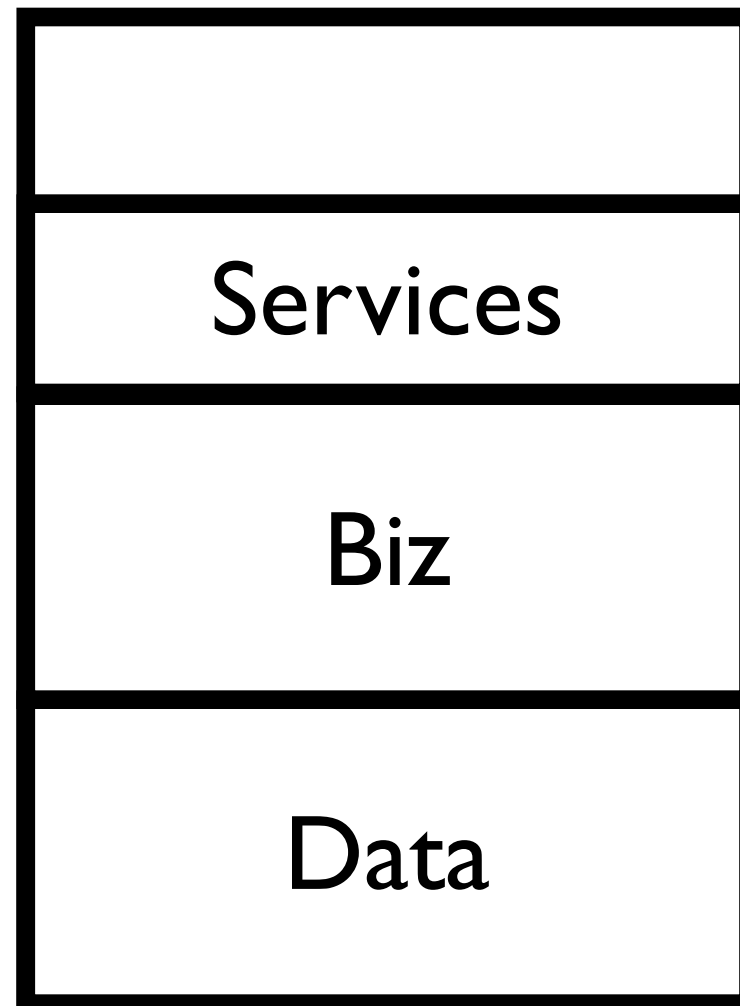
Traditional Enterprise



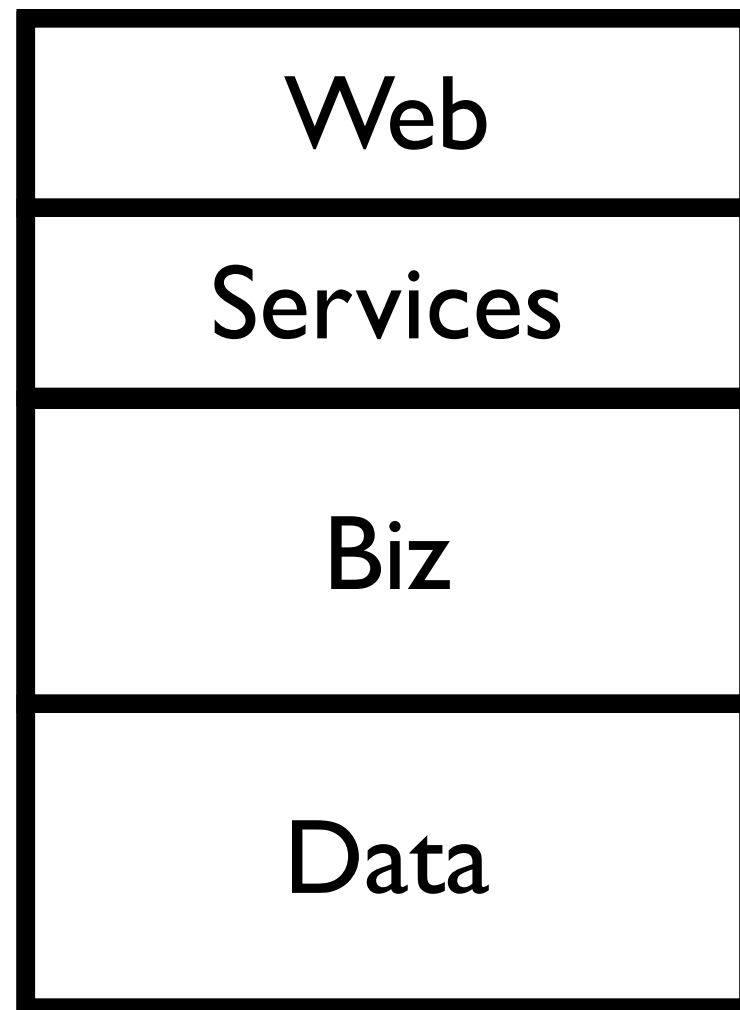
Traditional Enterprise



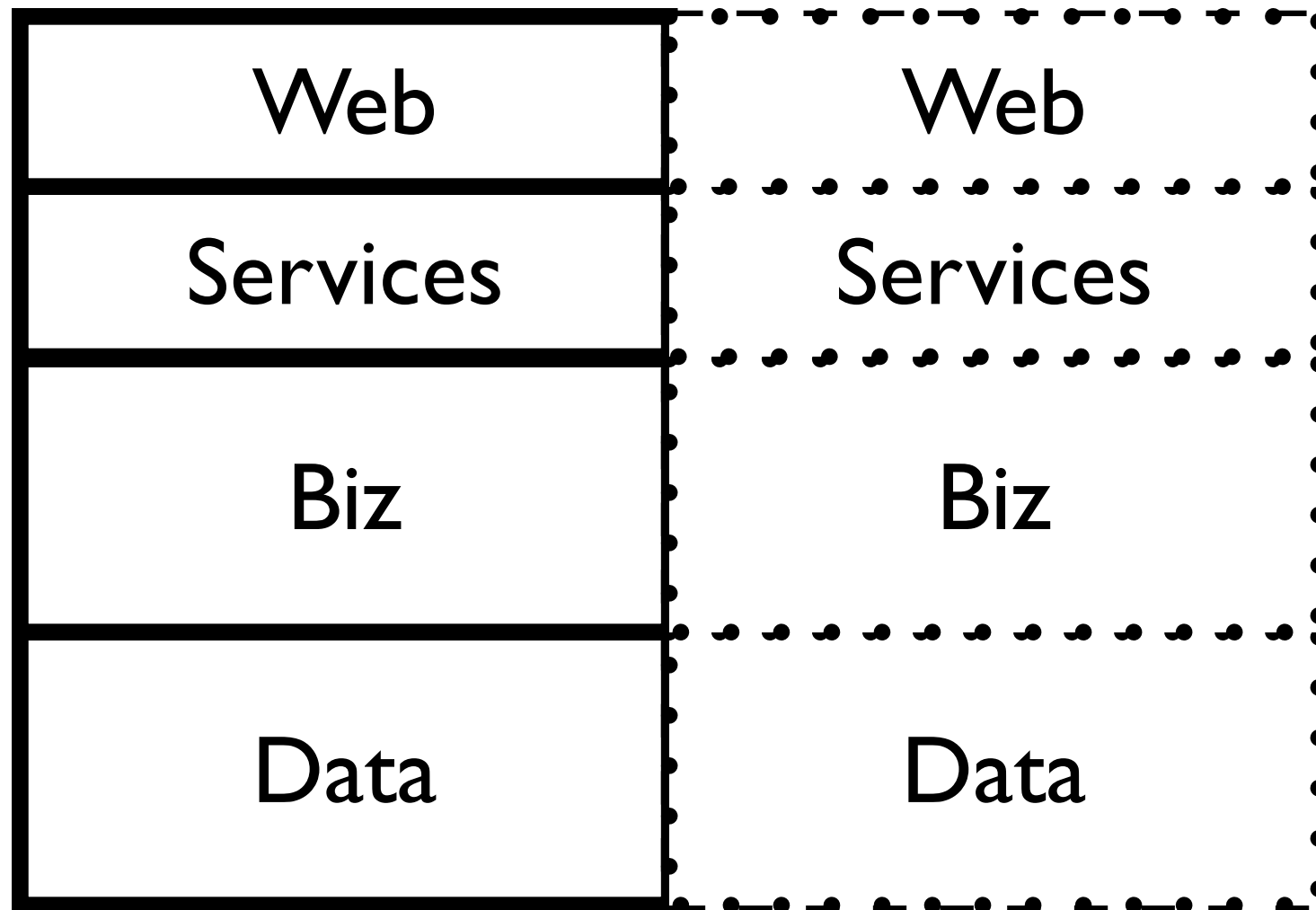
Traditional Enterprise



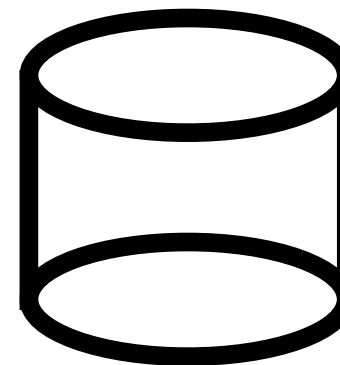
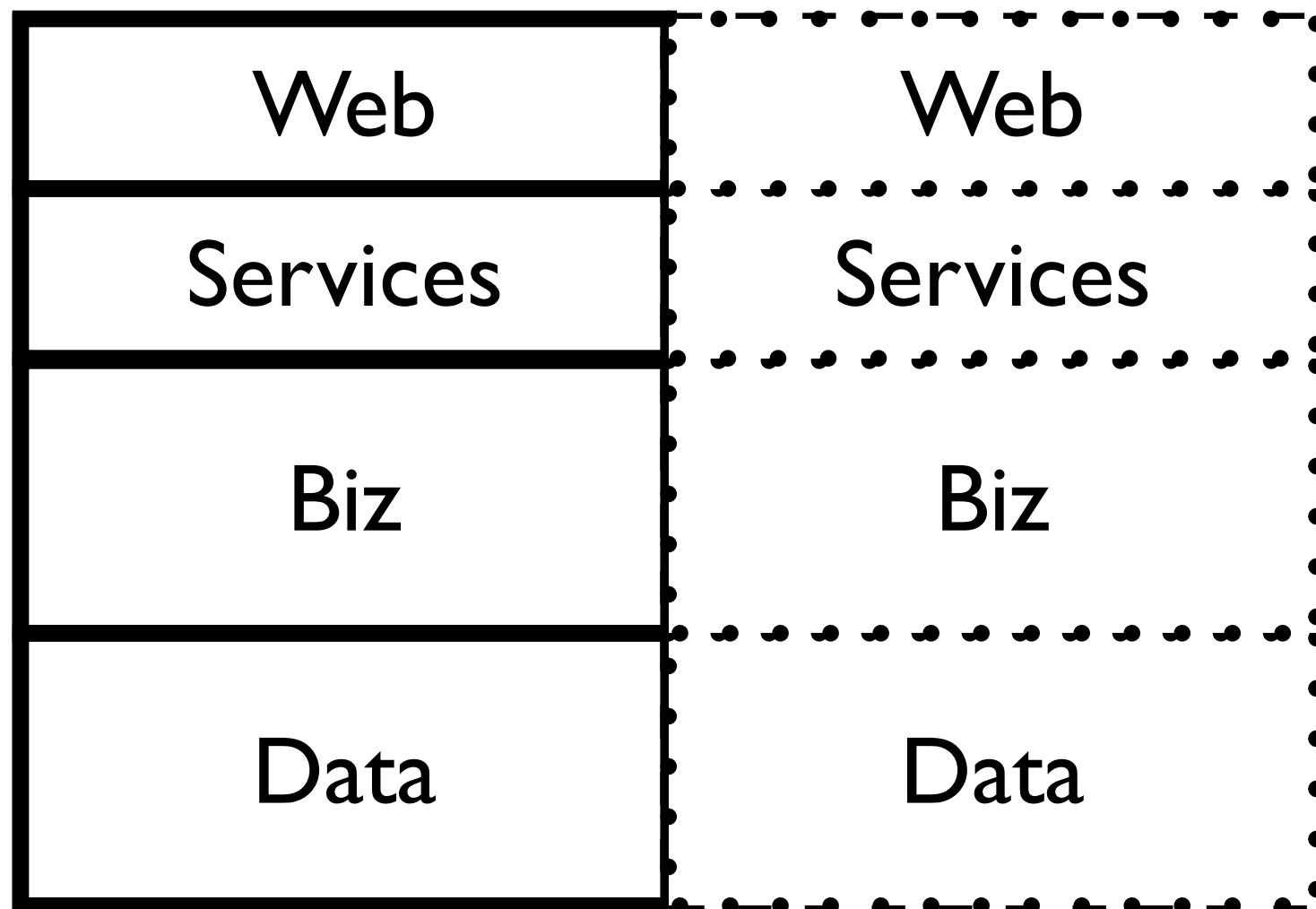
Traditional Enterprise



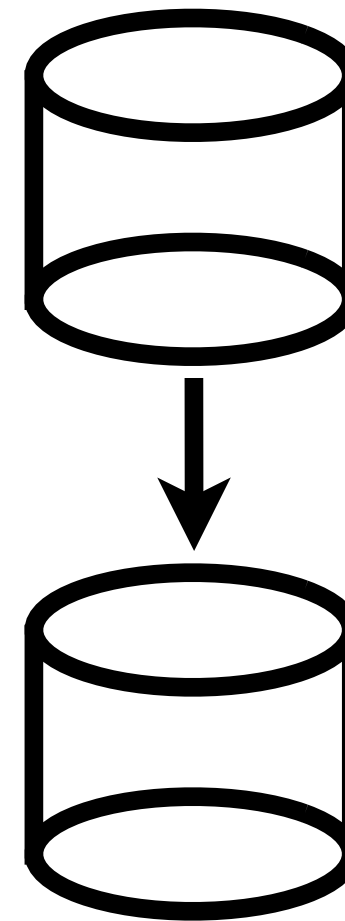
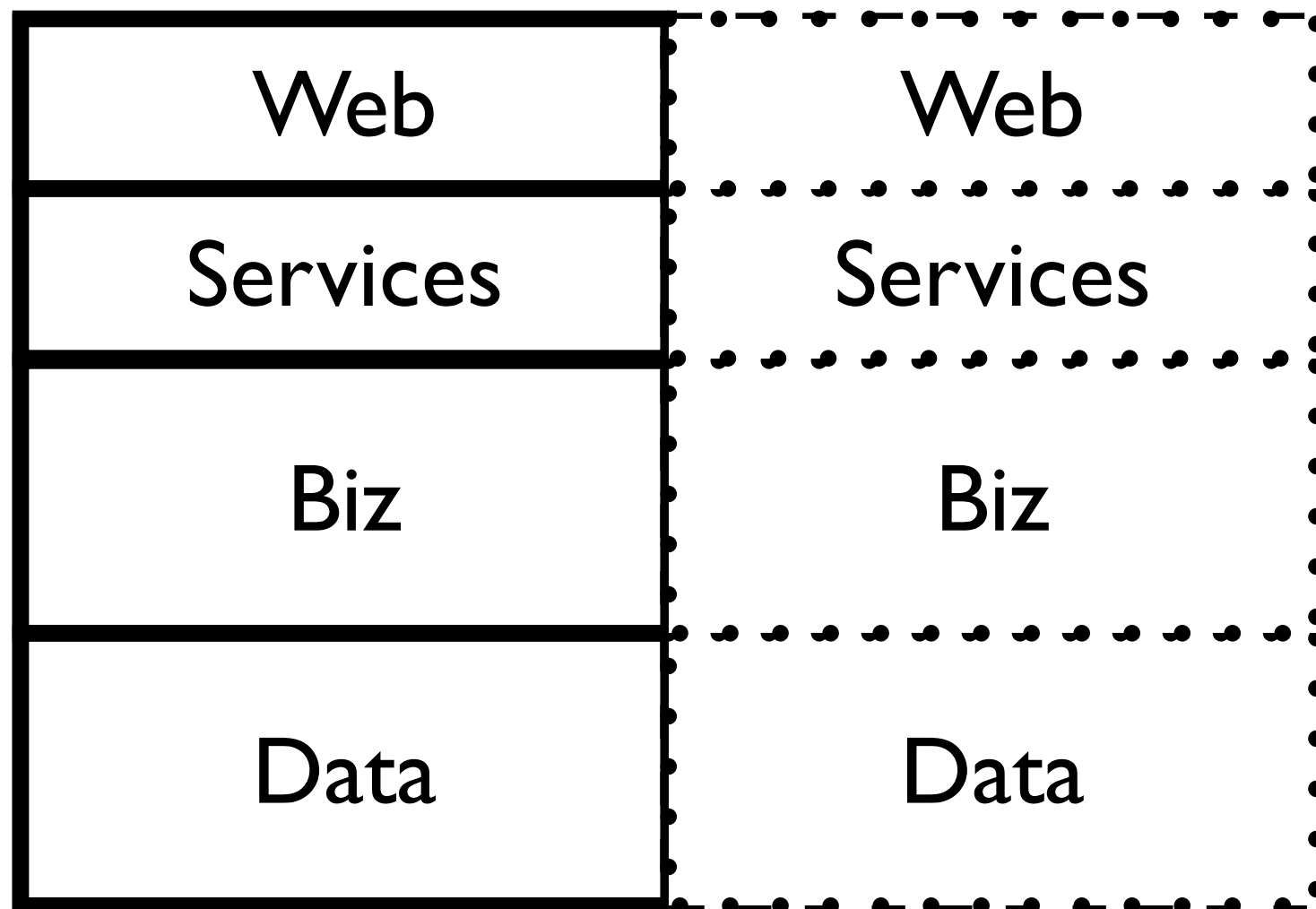
Traditional Enterprise



Traditional Enterprise



Traditional Enterprise



ETL/
Data
Muddling

Reporting

Time

Computation

Change

Before

Time

Current

Computation

Batch Only

Change

Rigid

Before

After

Time

Current

Current + History

Computation

Batch Only

Batch + Realtime

Change

Rigid

Curated Ecosystem

What we wanted (and built)...

Cloud of signals

Cloud of signals

Cloud of signals

Postcode

Email Read

Name

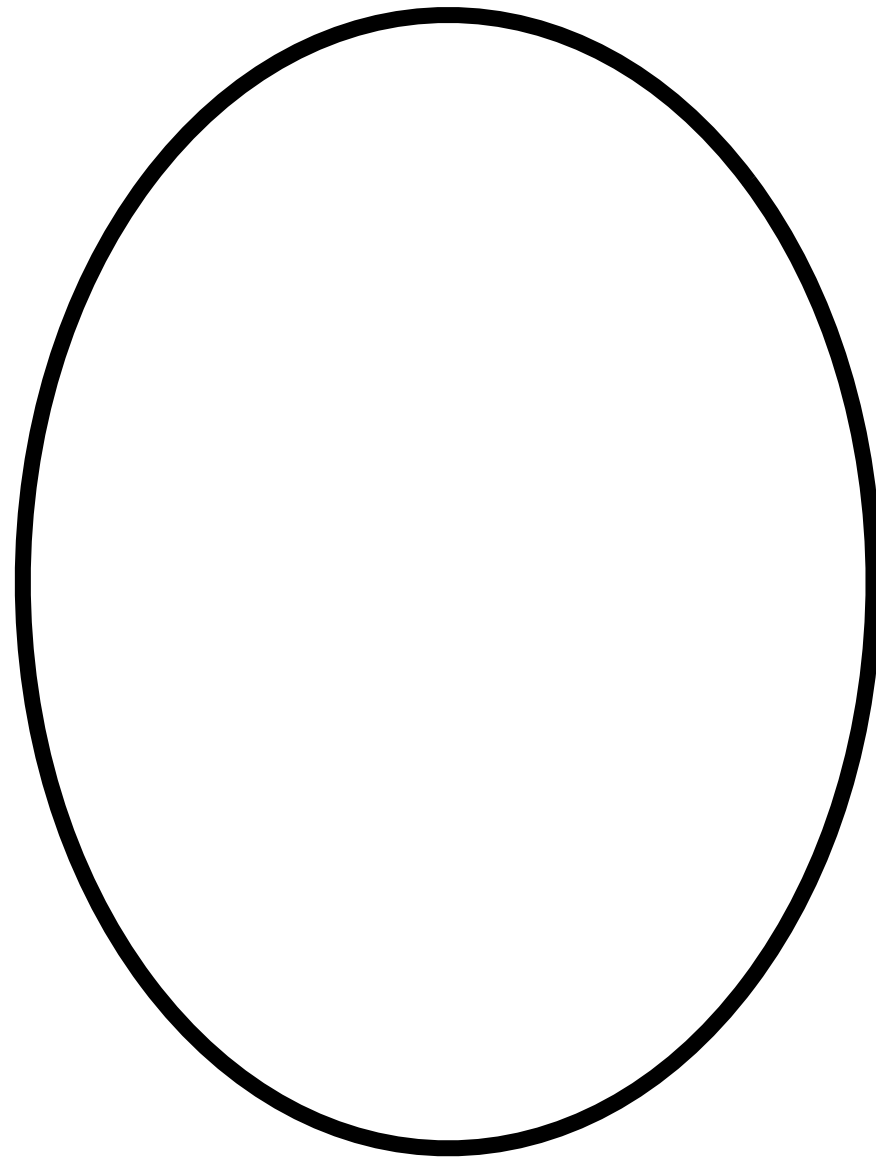
Email Address

Postal Address

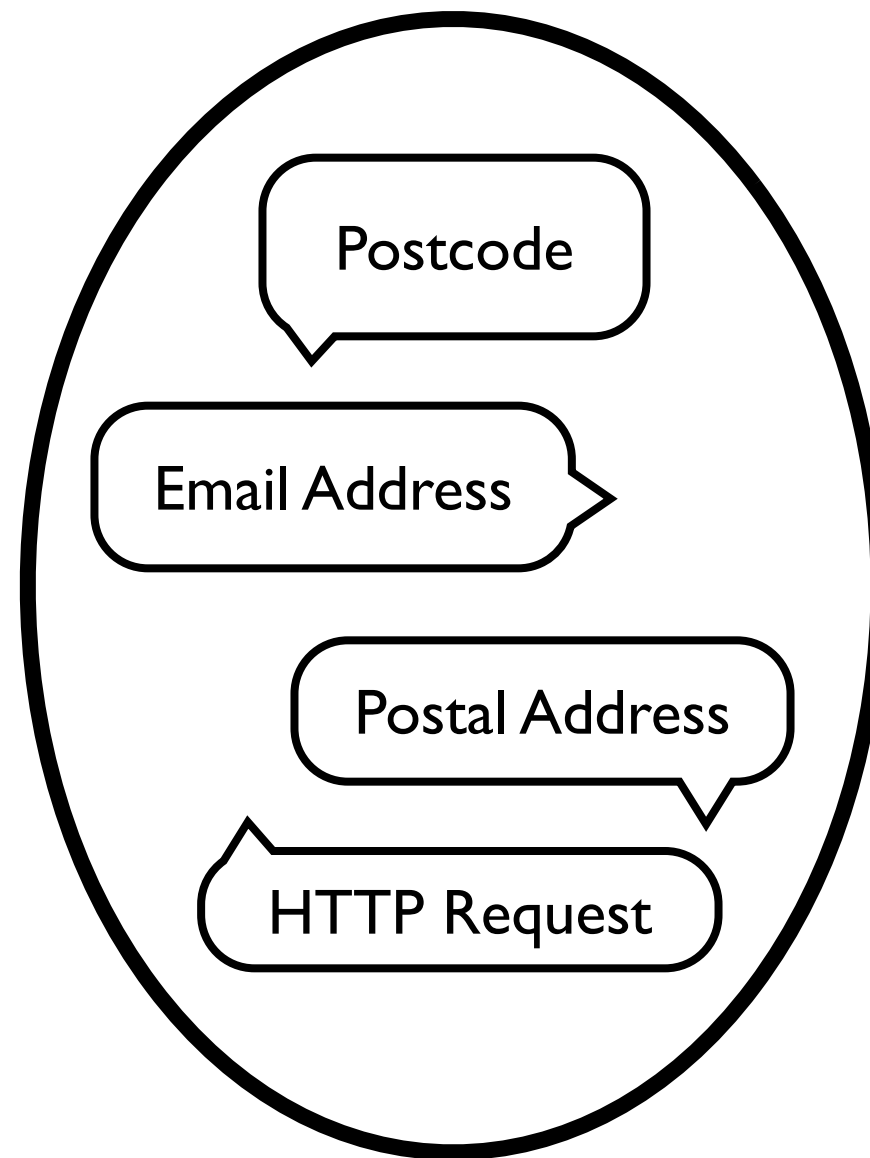
Server Load

URL Request

Data Ecosystem

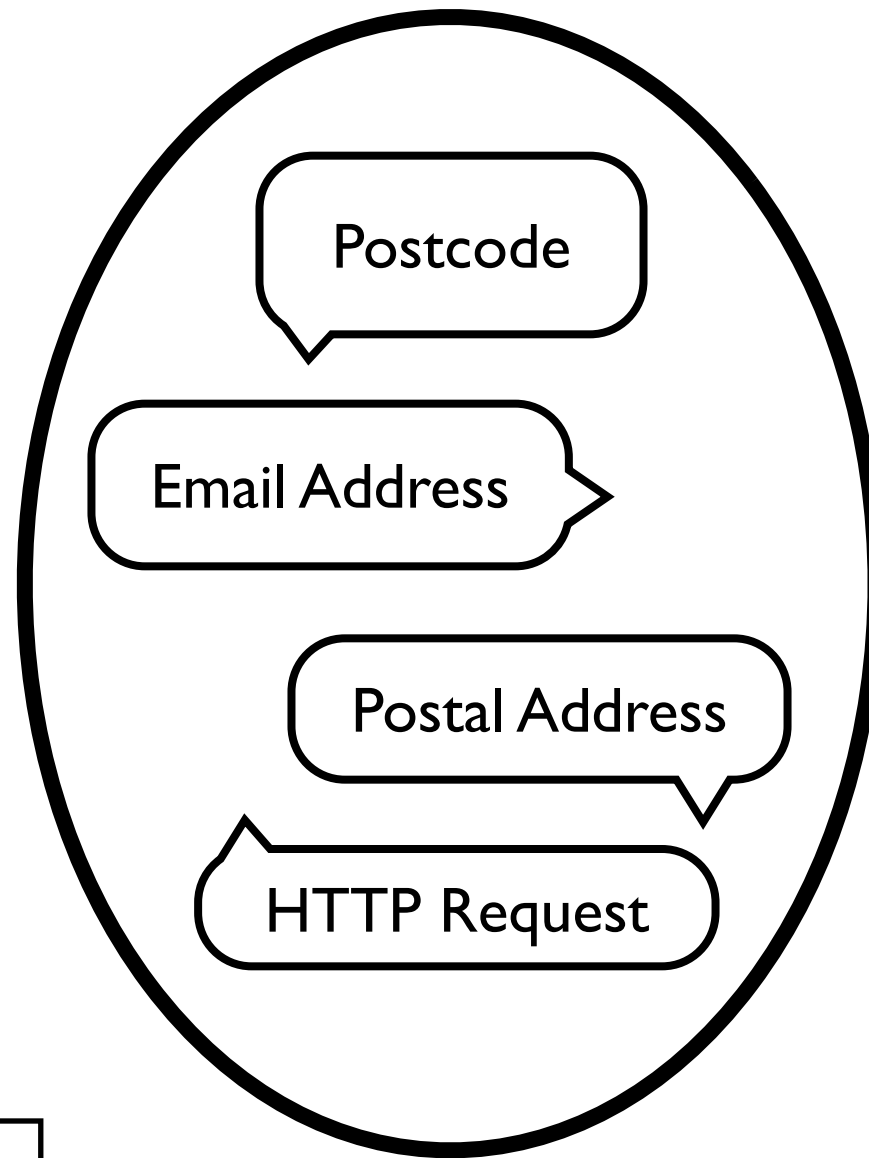
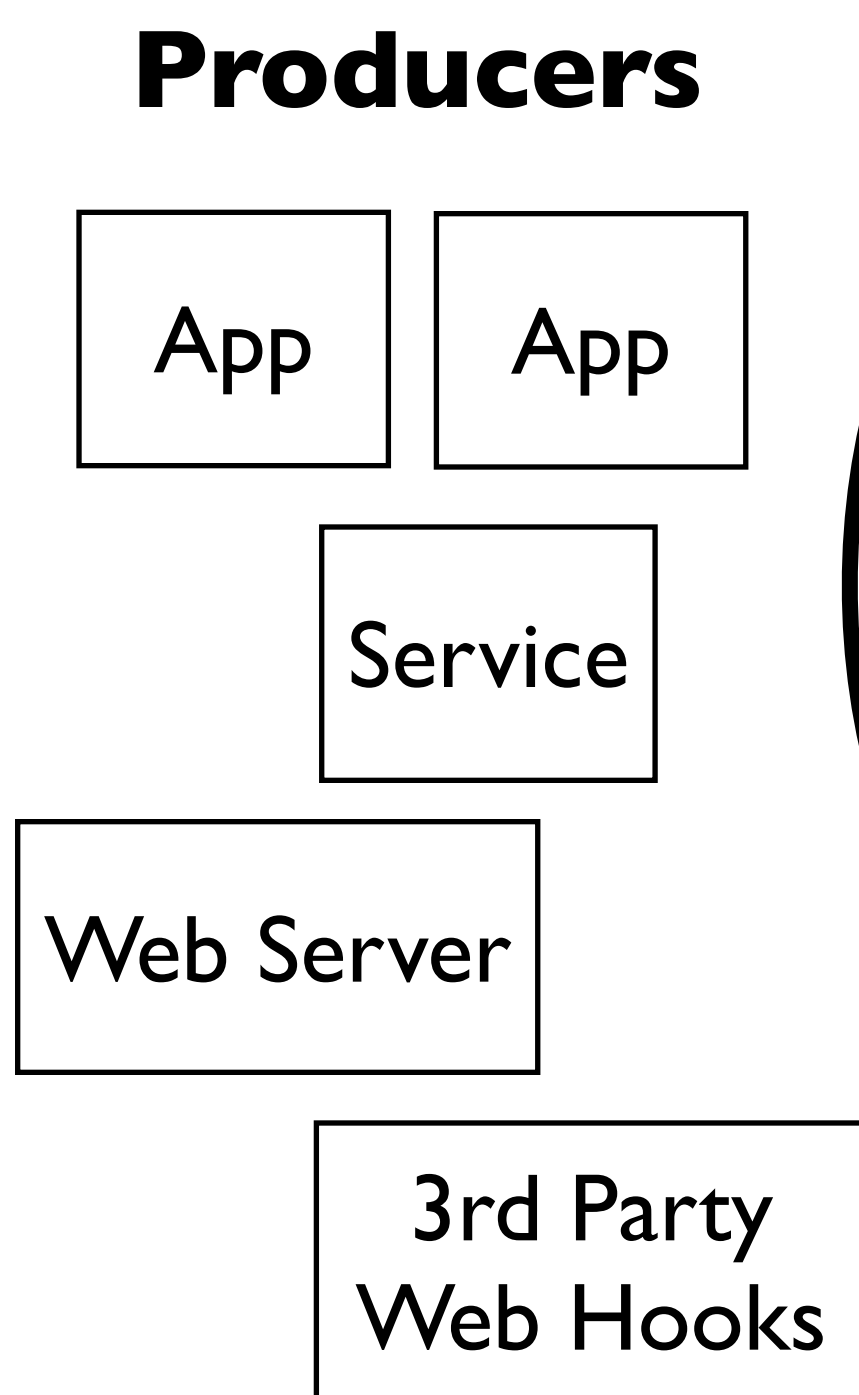


Data Ecosystem

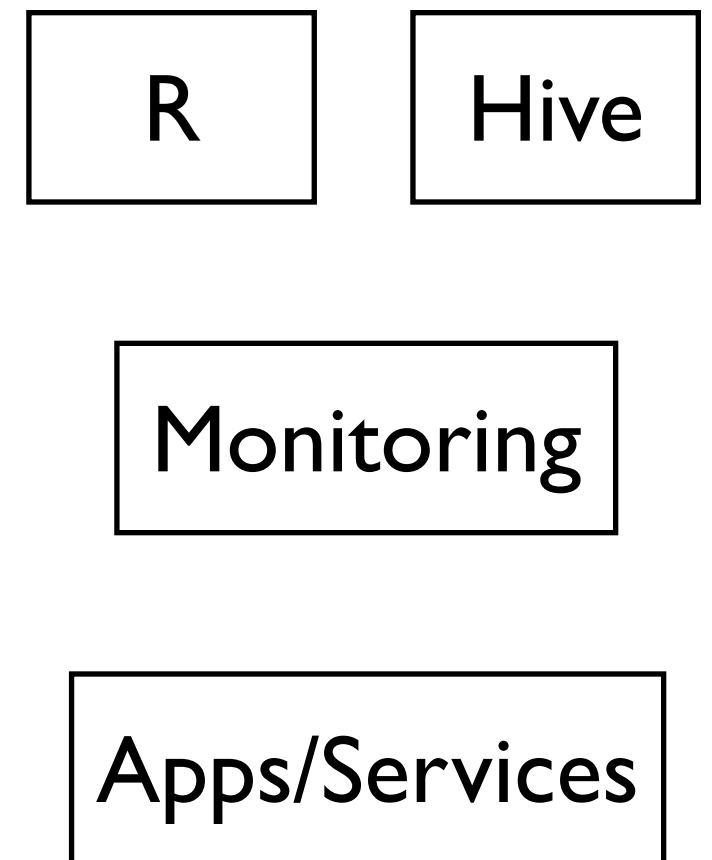


Data Ecosystem

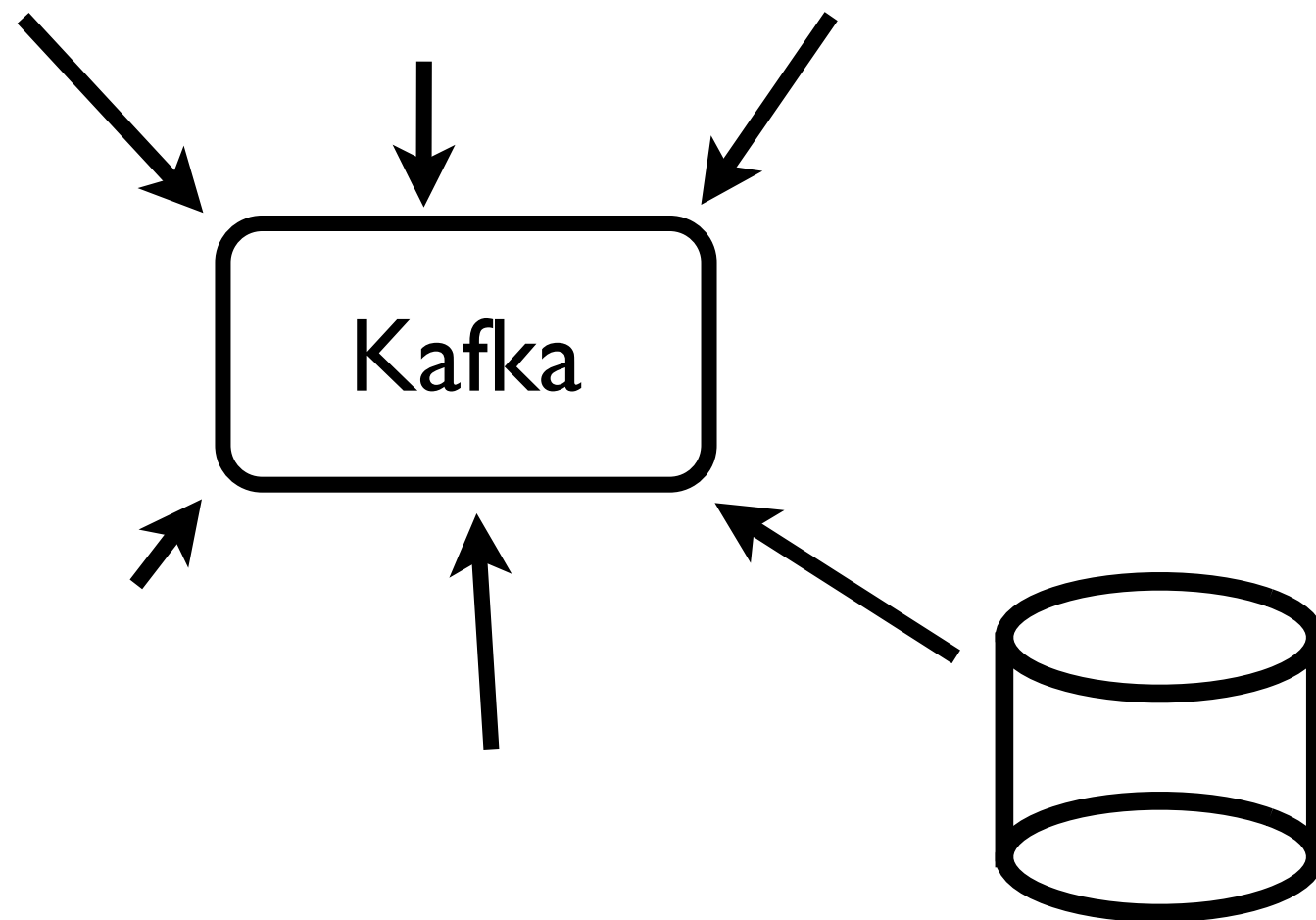
Producers



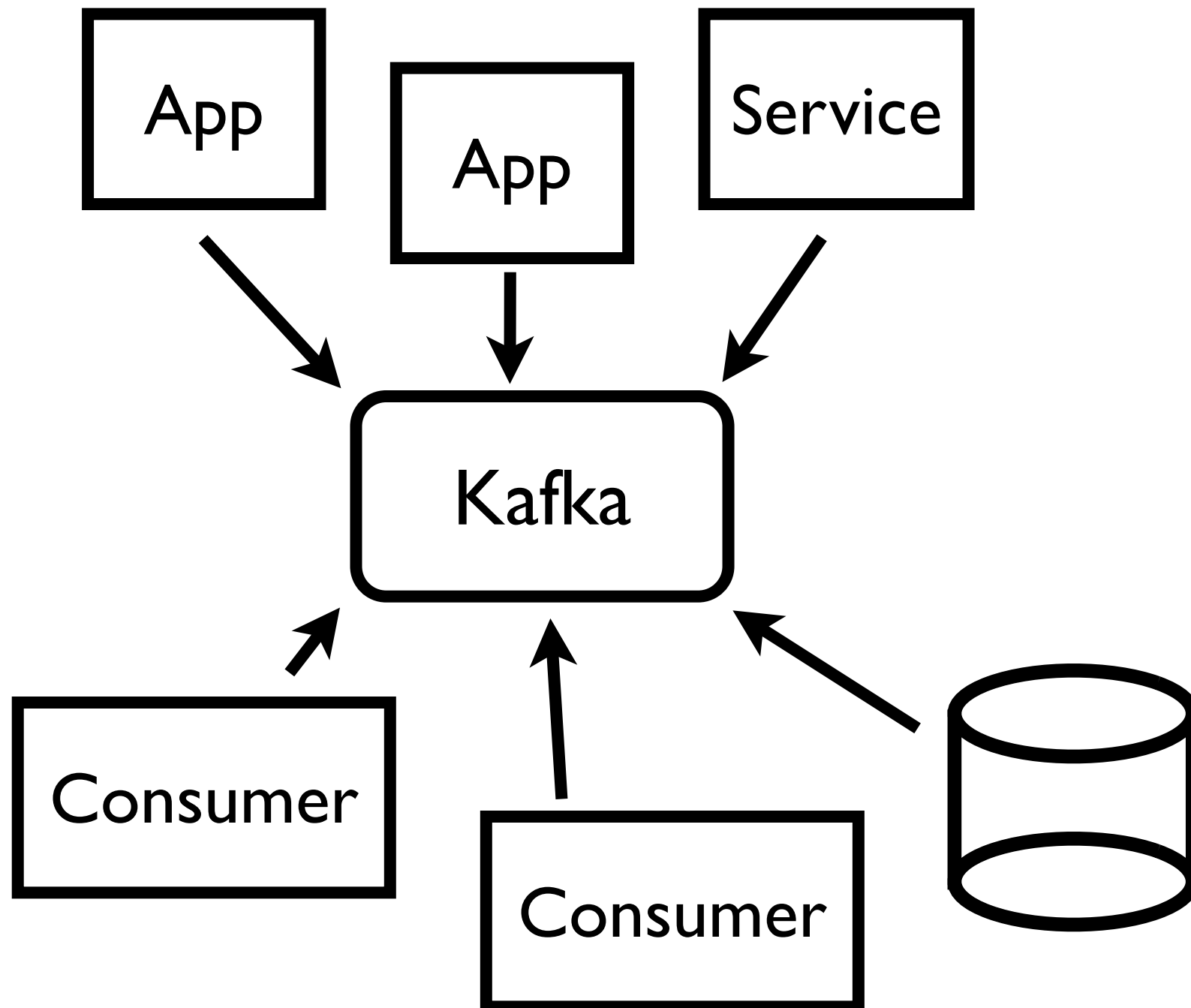
Consumers



Data Ecosystem



Data Ecosystem



Closure Example

Closure Example

Clojure Example

```
(emit-signal kafka-broker  
  "my-topic"  
  { :postcode "NW3 2LB"  
    :user-id  "pingles" })
```

Clojure Example

```
(emit-signal kafka-broker  
  "my-topic"  
  { :postcode "NW3 2LB"  
    :user-id "pingles" })
```

```
(->> (messages kafka-broker ["my-topic"])  
      (filter (criteria :user-id "pingles"))  
      (take 5))
```

How we've used it...

Summary

Average Response Time

In milliseconds, for the last 60 seconds

164

Success Request Rate

2xx + 3xx responses, for the last 60 seconds

3786

3786.00

3786.00

Error Request Rate

4xx and 5xx responses, for the last 60 seconds

0.66%

0.66

0.63

Error URLs

30 most-recent error URLs and their referrers

Status Code	Path	Requests in last hour	Referrer
404	/gas-electricity/directory/npower/sign-online---paperless-billing/	1	-
404	/broadband/providers/orange/_content/	2	http://uk.ask.com/web?q=orange+offers

```
$ ./print.sh -u <user-id>
```

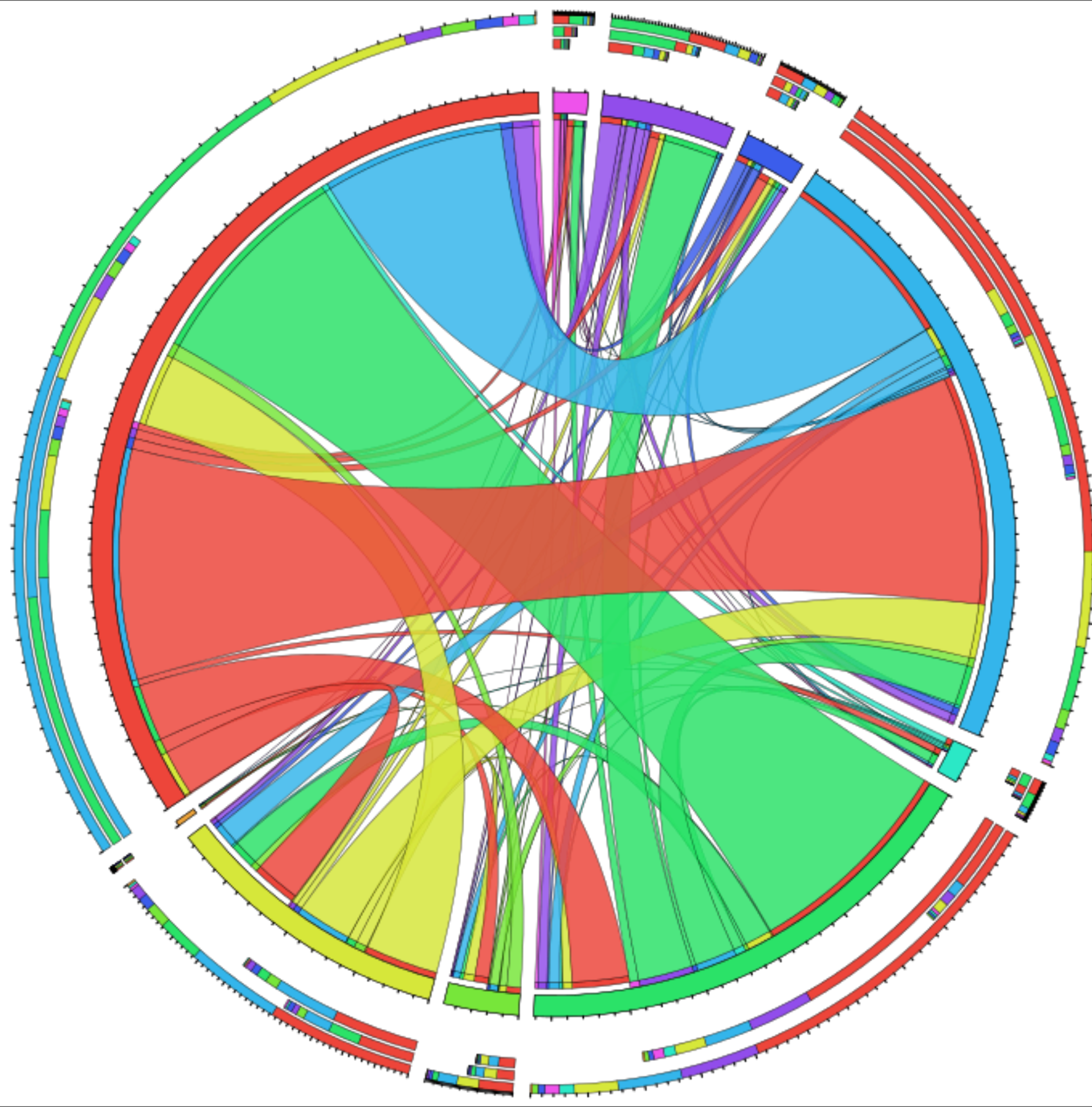

\$./print.sh -u <user-id>

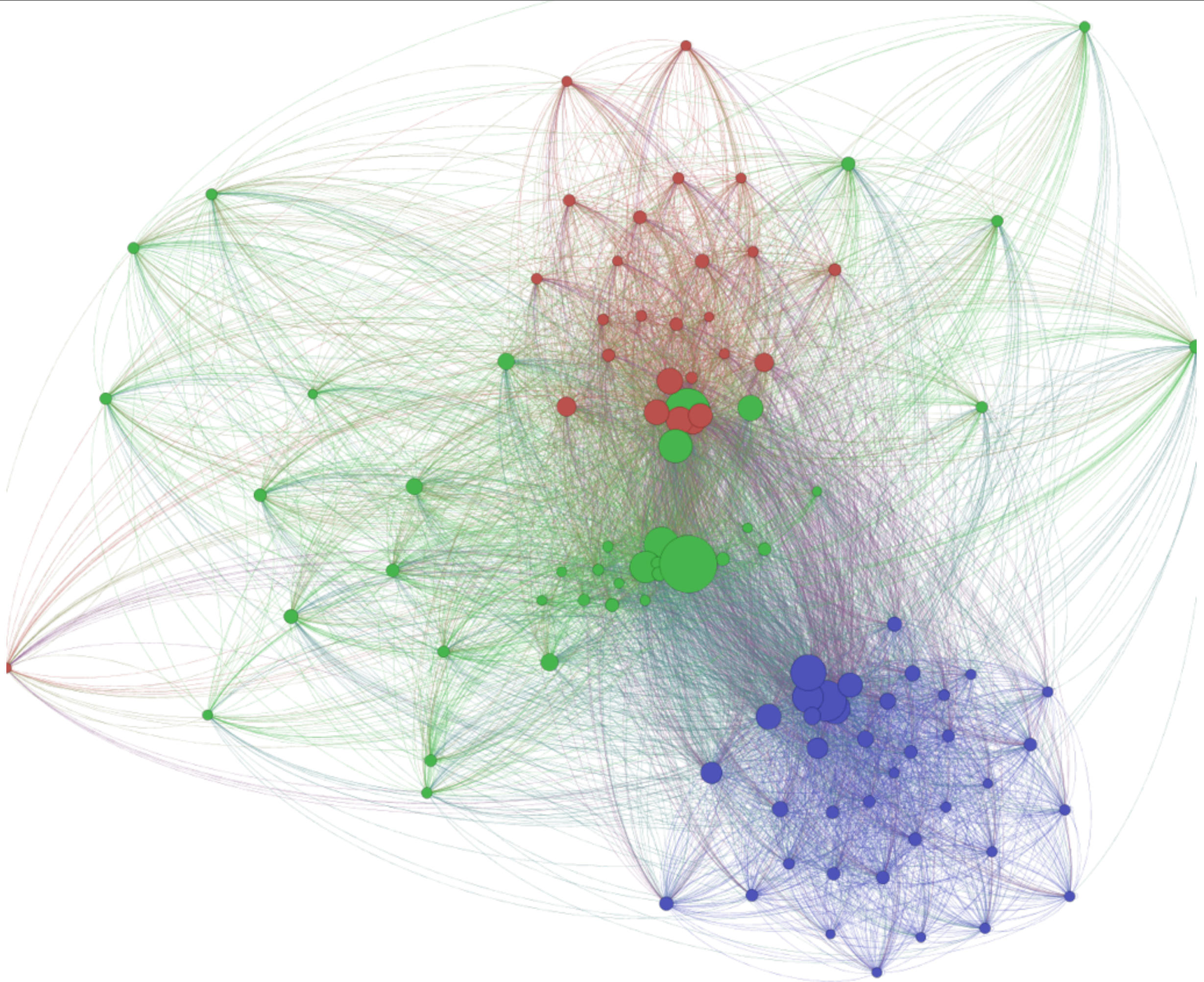
```
pe -, :cookie-urefs uswitch%7Ehomepage%7Ehomepage%7C1334675914%7Ccustomer_cookie, :request GET /home-1/assets/application-a
6e36ccfd9272d059feb8129d49f5a73.css HTTP/1.1, :upstream-response-time 0.014, :sent-http-content-type text/css, :hostname ng
inx-lb-20120229-1942-24.uswitchinternal.com, :sent-http-location -, :time-local 17/Apr/2012:15:36:17 +0000, :http-referer h
ttp://www.uswitch.com/, :http-user-agent Mozilla/5.0 (Macintosh; Intel Mac OS X 10_7_3) AppleWebKit/534.55.3 (KHTML, like G
ecko) Version/5.1.5 Safari/534.55.3, :request-time 0.033, :request-body -, :http-host www.uswitch.com, :upstream-addr 46.51
.177.182:80, :sent-http-server -, :upstream-status 200, :uscc uscc=136A3A0AB7868D4FA04AA48802F72C03}
{:status 304, :scheme http, :pipe ., :request-uri /home-1/images/list_arrow.png, :http-x-forwarded-for -, :msec 1334676977.
429, :sent-http-set-cookie -, :body-bytes-sent 0, :query-string -, :request-content-type -, :cookie-urefs uswitch%7Ehomepag
e%7Ehomepage%7C1334675914%7Ccustomer_cookie, :request GET /home-1/images/list_arrow.png HTTP/1.1, :upstream-response-time 0
.008, :sent-http-content-type -, :hostname nginx-lb-20120229-1942-24.uswitchinternal.com, :sent-http-location -, :time-loca
l 17/Apr/2012:15:36:17 +0000, :http-referer http://www.uswitch.com/, :http-user-agent Mozilla/5.0 (Macintosh; Intel Mac OS
X 10_7_3) AppleWebKit/534.55.3 (KHTML, like Gecko) Version/5.1.5 Safari/534.55.3, :request-time 0.025, :request-body -, :ht
tp-host www.uswitch.com, :upstream-addr 46.137.167.105:80, :sent-http-server -, :upstream-status 304, :uscc uscc=136A3A0AB7
868D4FA04AA48802F72C03}
{:status 304, :scheme http, :pipe ., :request-uri /home-1/images/articles/cheapest-electricity.jpg, :http-x-forwarded-for -,
:msec 1334676977.433, :sent-http-set-cookie -, :body-bytes-sent 0, :query-string -, :request-content-type -, :cookie-uref
s uswitch%7Ehomepage%7Ehomepage%7C1334675914%7Ccustomer_cookie, :request GET /home-1/images/articles/cheapest-electricity.j
pg HTTP/1.1, :upstream-response-time 0.008, :sent-http-content-type -, :hostname nginx-lb-20120229-1942-24.uswitchinternal.
com, :sent-http-location -, :time-local 17/Apr/2012:15:36:17 +0000, :http-referer http://www.uswitch.com/, :http-user-agent
Mozilla/5.0 (Macintosh; Intel Mac OS X 10_7_3) AppleWebKit/534.55.3 (KHTML, like Gecko) Version/5.1.5 Safari/534.55.3, :re
quest-time 0.028, :request-body -, :http-host www.uswitch.com, :upstream-addr 46.51.177.182:80, :sent-http-server -, :upstr
eam-status 304, :uscc uscc=136A3A0AB7868D4FA04AA48802F72C03}
{:status 304, :scheme http, :pipe ., :request-uri /home-1/images/articles/speed-big.jpg, :http-x-forwarded-for -, :msec 133
4676977.434, :sent-http-set-cookie -, :body-bytes-sent 0, :query-string -, :request-content-type -, :cookie-urefs uswitch
```

```
$ ./print.sh -u <user-id>
```

```
(->> (messages kafka-broker)  
      (filter (criteria :user-id "pingles")))
```







Data Ecosystem

Data Ecosystem

Before

After

Time

Current

Current + History

Computation

Batch Only

Batch + Realtime

Change

Rigid

Curated Ecosystem

Thanks!

Questions?

Forward

We're hiring!

@pingles

paul@forward.co.uk

www.forwardtechnology.o.uk

www.forward.co.uk