Deploying Large Scale Webapps

Thierry Sans

Users respond to speed

“Amazon found every 100ms of latency cost them 1% in sales”

“Google found an extra .5 seconds in search page generation time dropped traffic by 20%”

“A broker could lose $4 million in revenues per millisecond if their electronic trading platform is 5 milliseconds behind the competition”

http://blog.gigaspaces.com/amazon-found-every-100ms-of-latency-cost-them-1-in-sales/

How to serve millions

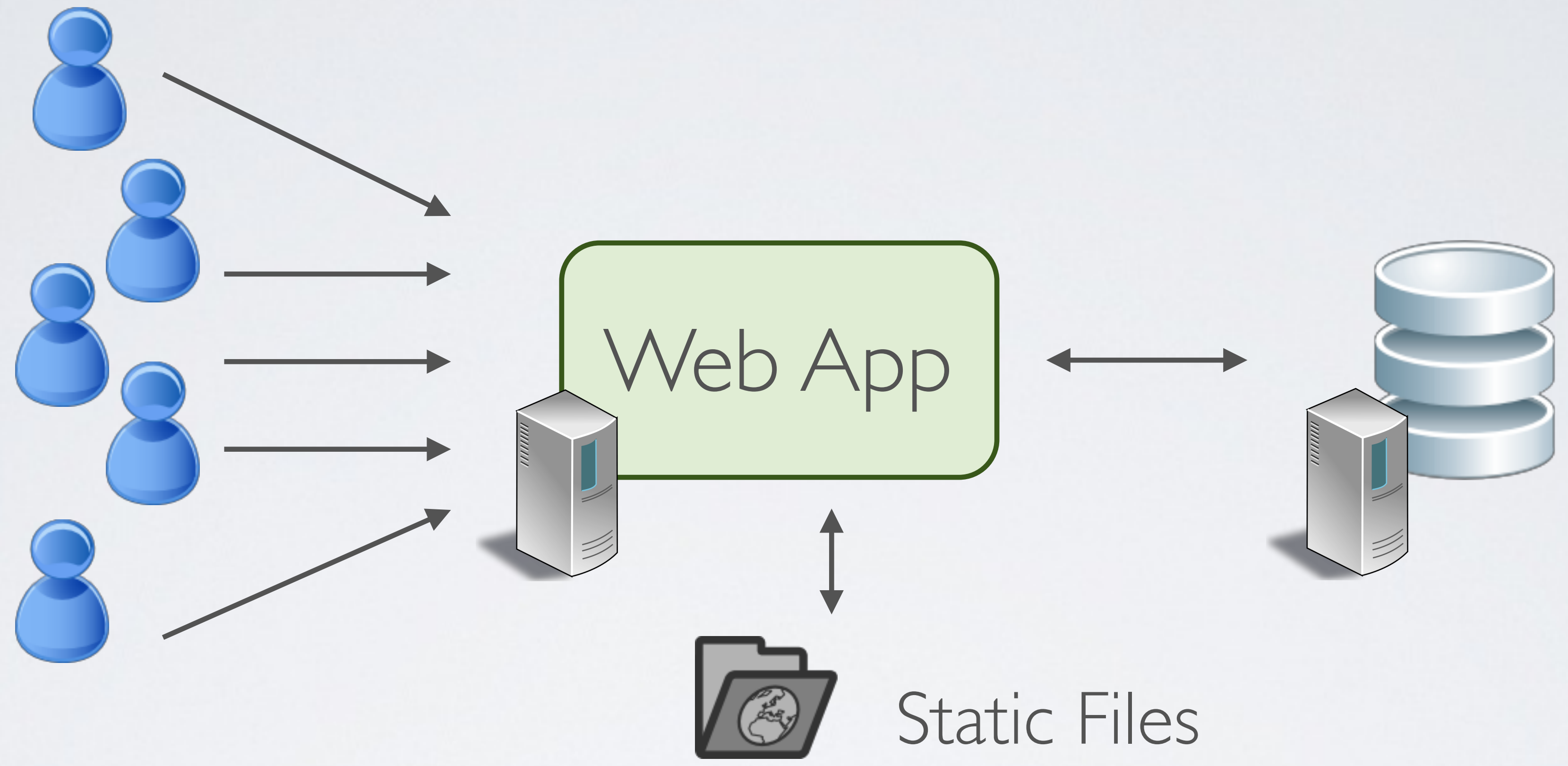
Optimizing frontend code (separate lecture)

Optimizing backend code with

- **Web caching**
- **Scaling over multiple servers**

Backend Web Caching

Current situation



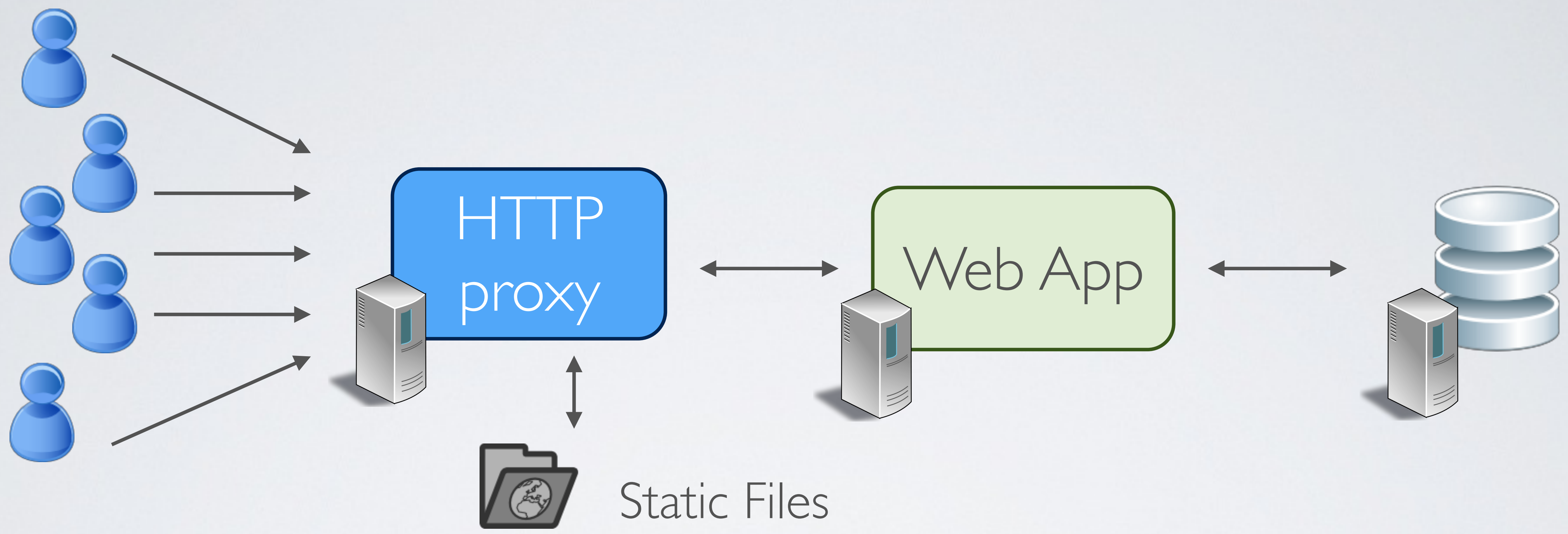
Two types of content

- Static content : html, css, js, images and so on
- Dynamic content : database, uploaded files

Two ways to do backend web cache

Content type	Cache Strategy	Cache Technique
Static Content	Architecture	HTTP proxy cache
Dynamic Content	Program	Memory Cache

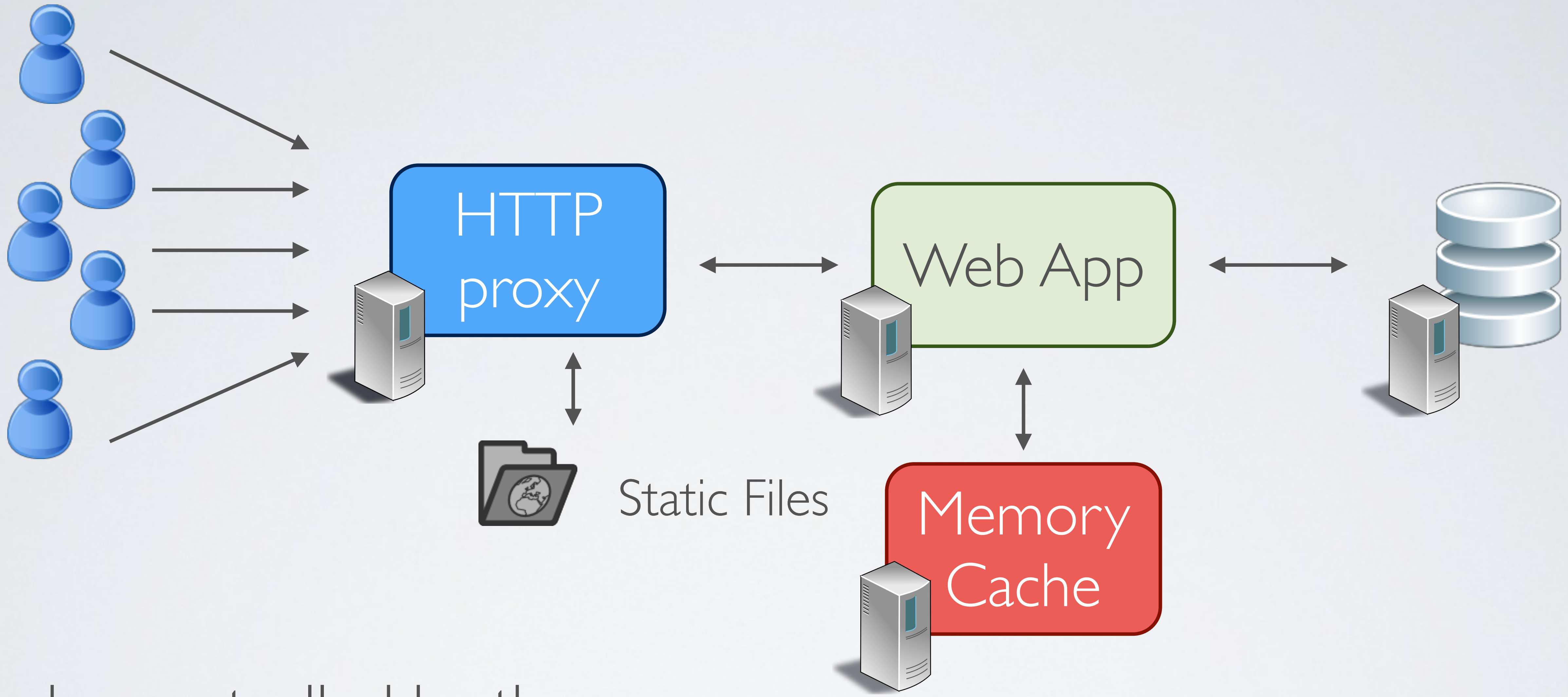
HTTP caching with a proxy server (for static content)



Cache repeated HTTP requests for a given time

- ◉ Bad for dynamic content (latency when the content is updated)
- ✓ Good for static content (Javascript, CSS, Media, static HTML)
- ➡ Popular HTTP proxies : Squid and Varnish

Fine-grained caching with the web application (for dynamic content)



Cache controlled by the program

◉ Specific for each app

✓ Good for dynamic content

➡ Popular memory cache: Memcached

What to put in the cache to improve performances?

Processing the request means:

1. Parse the HTTP request
2. Map the URL to the handler
3. Query the database or third-party API
4. Compute the view

DB and API accesses are expensive (time and money when your host charges you each access)

Distributed Shared Cache : Memcached

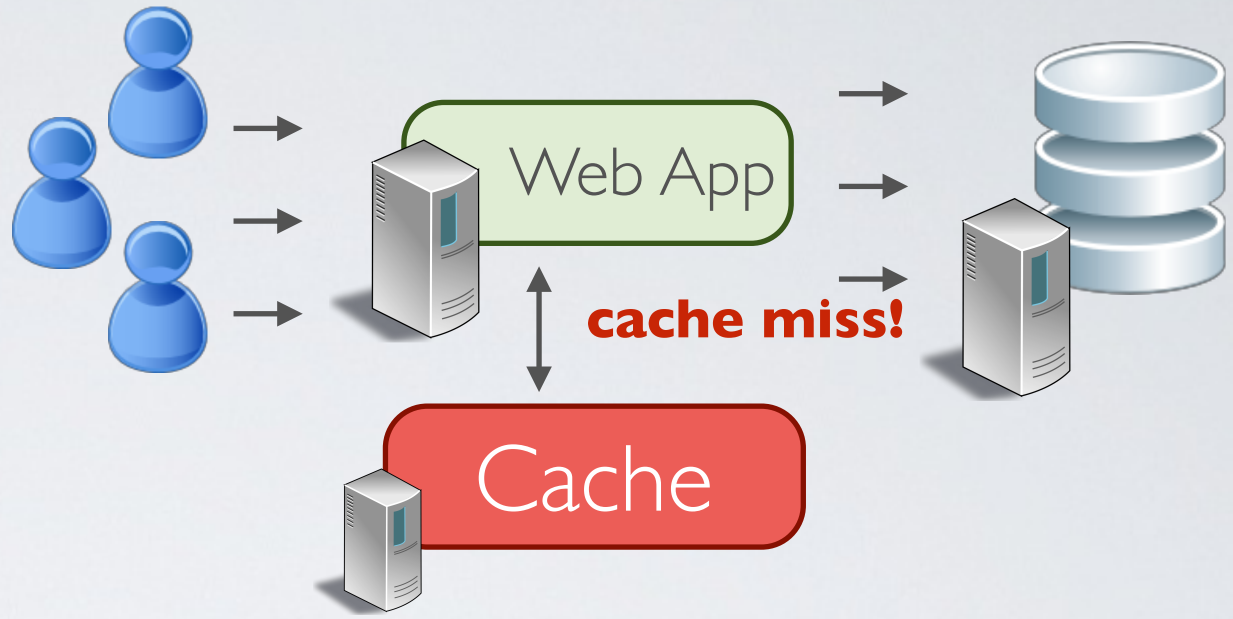
http://memcached.org/

- Store key/value pairs in memory
- Throw away data that is the least recently used

A typical cache algorithm

```
retrieve from cache
if data not in cache:
   # cache miss
   query the database or API
   update the cache
return result
```

Cache Stampede (a.k.a dog piling)



Problem:

Multiple concurrent requests doing the same request because cache was cleared

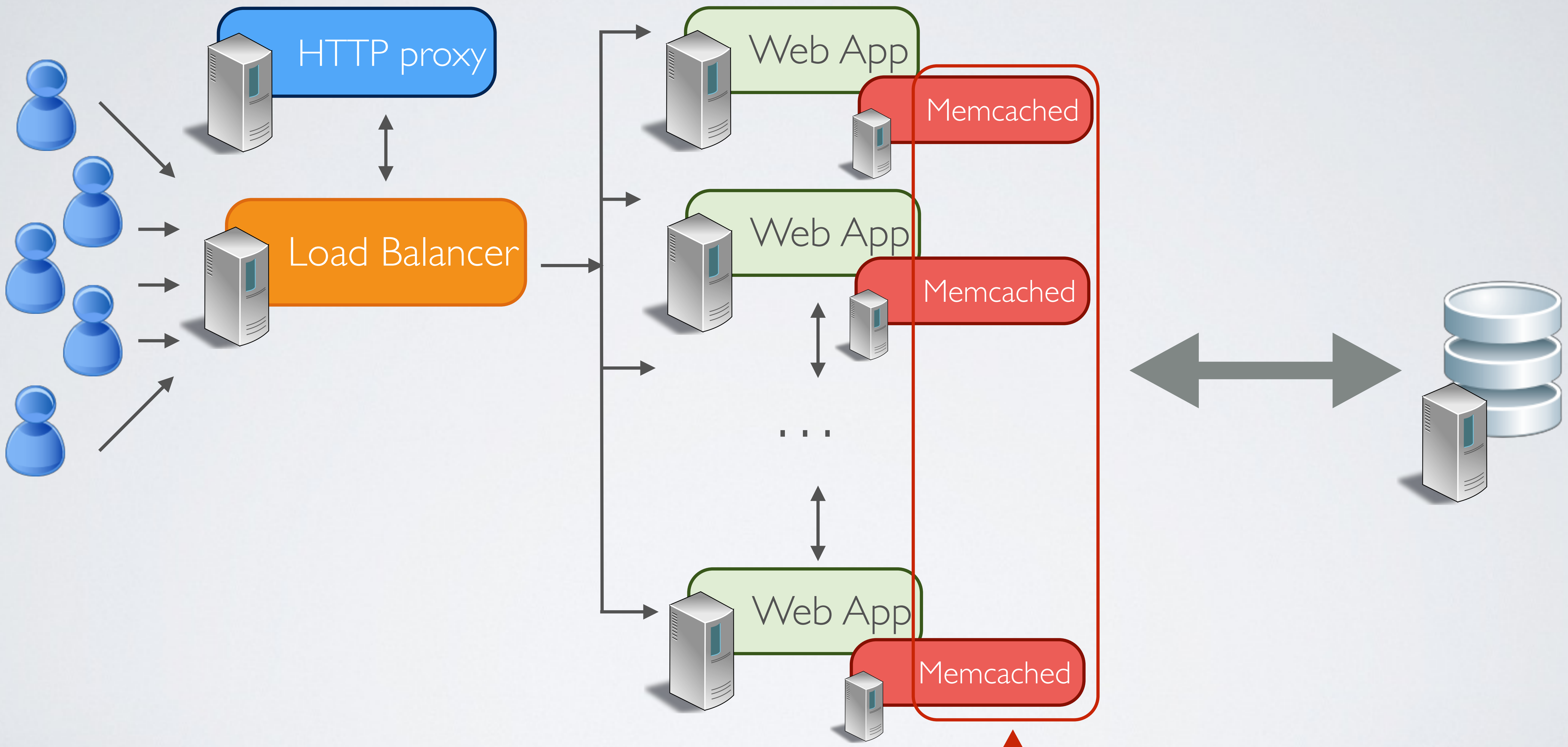
Solution:

- update the cache instead of clearing it after an insert
- a page view will never query the database

➡ Requires cache warming

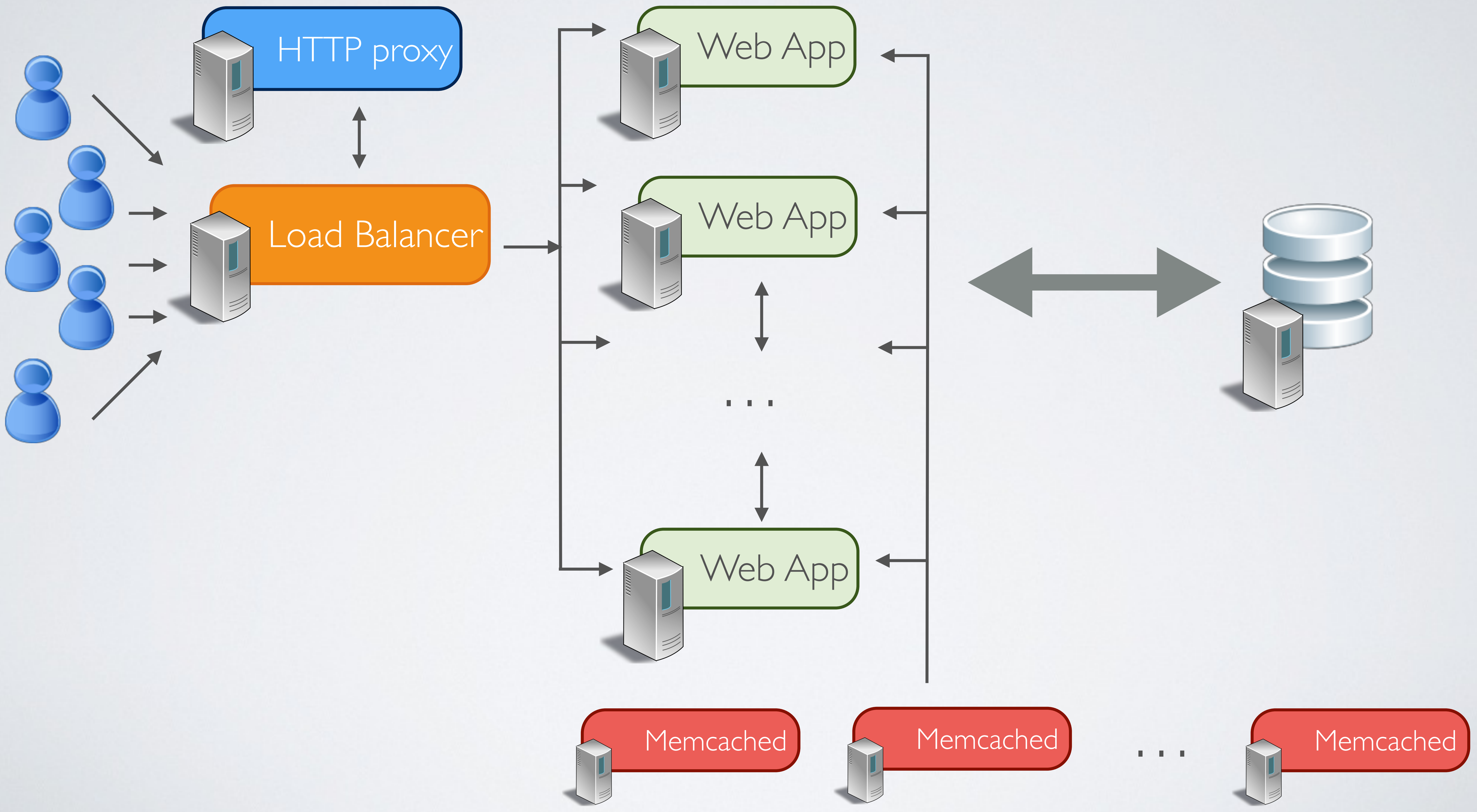
Scaling over multiple servers

Serving multiple apps with a load balancer

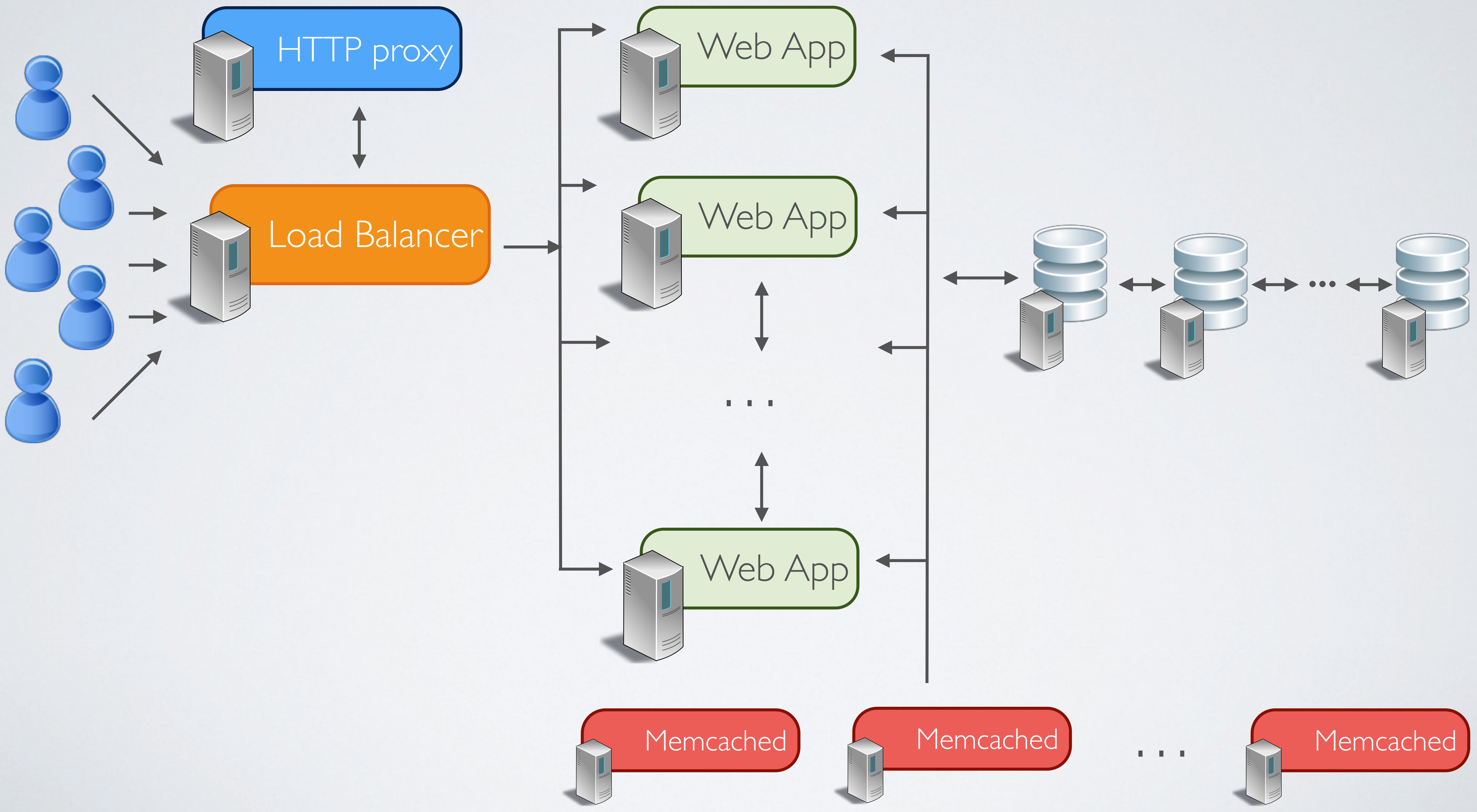


This is not an efficient cache

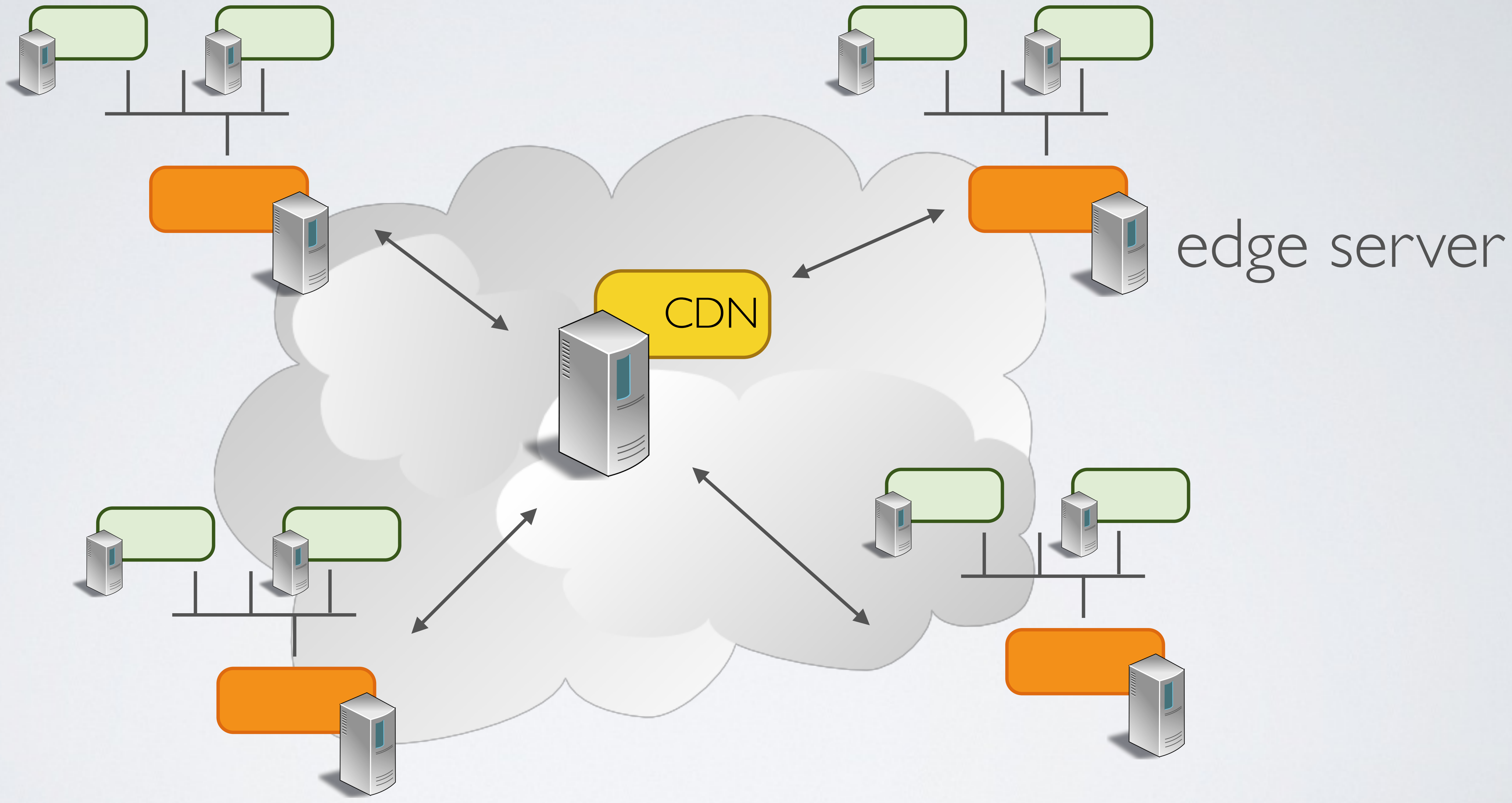
Distributed Shared Cache



Distributed Databases



CDN : Content Distribution Network



Example : Akamai, Cloudfare

High-Performance Software

Load Balancer	Nginx
Web Server	
HTTP proxy cache	
HTTP reverse proxy	
Memory Cache	Memcached
Container	Docker
Container Orchestration	Kubernetes