

cdn的设计原理

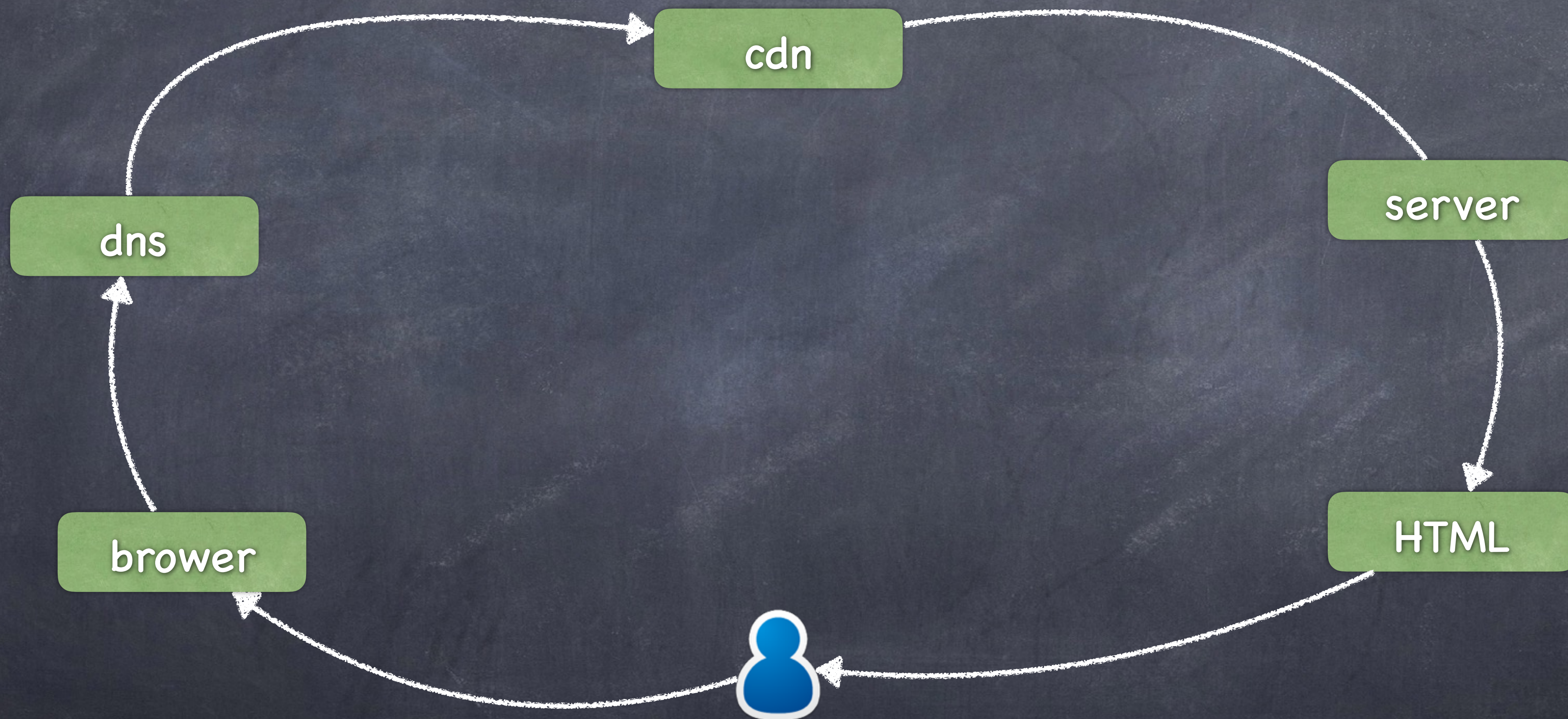
- xiaorui.cc

- 峰云就她了

introduce

- 什么是 CDN, 内容分发网络
- 为什么要用cdn ?
- cdn的关键组件
- cdn 内部实现原理, 架构拓扑及优化方法
- 源站层面的cdn架构及优化
- 网页层面的cdn架构及优化

涉及的内容



cdn基本原理

- 内容缓存到不同地区的缓存服务器
- 实现就近访问原则
- 通过dns view 和 load status调度到不同的边缘节点

cdn target

- 构建边缘节点, 解决最后“一公里”
- 智能调度 (负载均衡, 故障屏蔽, 就近访问)
- 智能路由 (寻找最优访问链路)
- 安全防护 (强大带宽, 边缘计算能力)

why use cdn ?

DNS

static A 2.2.2.2

* A 1.1.1.1

* A 2.2.2.2 ✗

90%流量 : static zone



client - QD

50 ms

html view

xiaorui.cc/a.jpg ✗

xiaorui.cc/b.jpg ✗

/c.jpg ✗

static.xiaorui.cc/a.jpg ✓

10 ms

handler request cost



cdn - QD

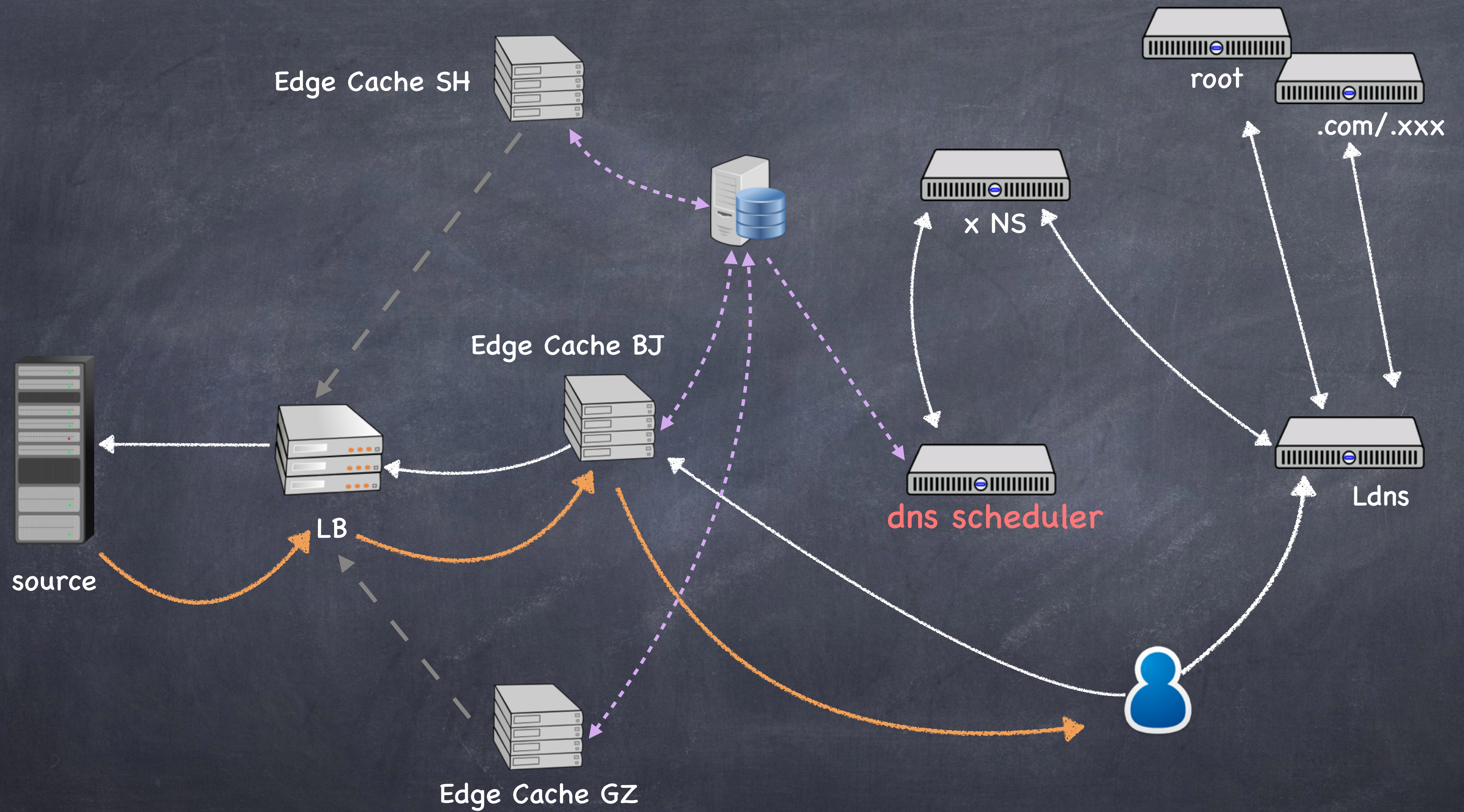
2.2.2.2

30 ms



source - BJ

1.1.1.1



“ Http Headers , Abort cache http protocol ”

http header

- Expires vs Cache-Control max-age
- 200 from cache vs 304
- when F5 vs ctrl + F5 , add args in request header
 - F5 → Cache-Control: max-age=0 ; If-Modified-Since. . .
 - Ctrl F5 → Cache-Control: no-cache Pragma: no-cache
- Last-Modified + If-Modified-Since **vs** Etag + If-None-Match

http header

- no-cache vs no-store

- in request header

- no-cache , not get cache data (CTRL + F5)

- no-store , None

- in response header

- no-cache , **Allow** cache action

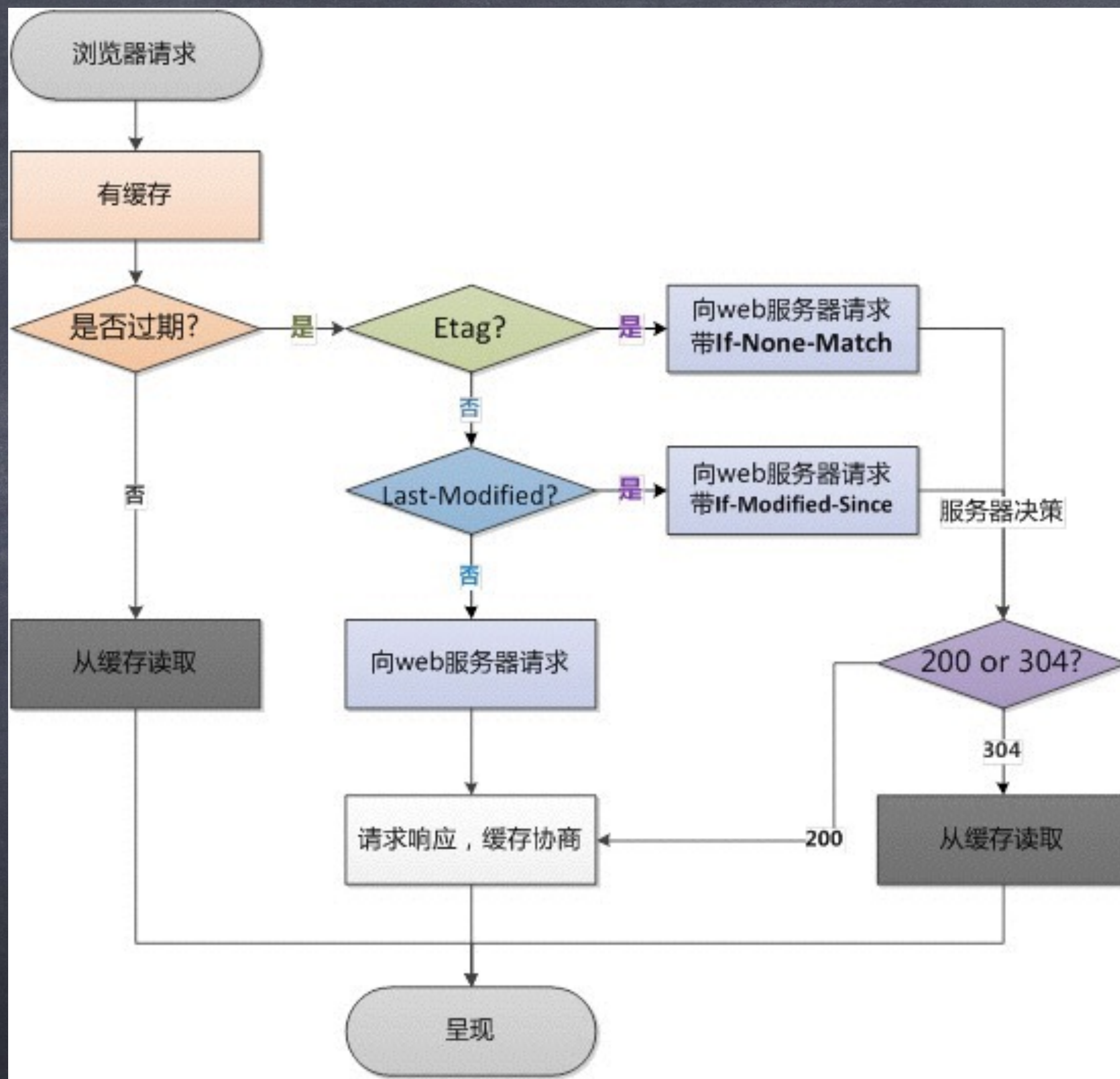
- chrome : request again , Check 304 every time.

- ie9/FF : request again , Not cache data

- no-store , **Prohibit** cache action ,get file from source, All node not cache .

http header

- X-Cache : HIT from xd33-98.sina.com.cn
- X-Forwarded-For : client_ip proxy1_ip proxy2_ip
- Via : cache42.l2nu16-1[0,200-0,H], cache6.l2nu16-1[8,0]
- Age : cache age
- Range : bytes=500-999



“ scheduler zone contains view dns and each
cache load ”

scheduler

- smart dns
 - view
 - ip db
 - edns
 - rule priority

scheduler

- 👁 collect

- 👁 可用性探测

- 👁 Host存活

- 👁 Service存活

- 👁 性能探测

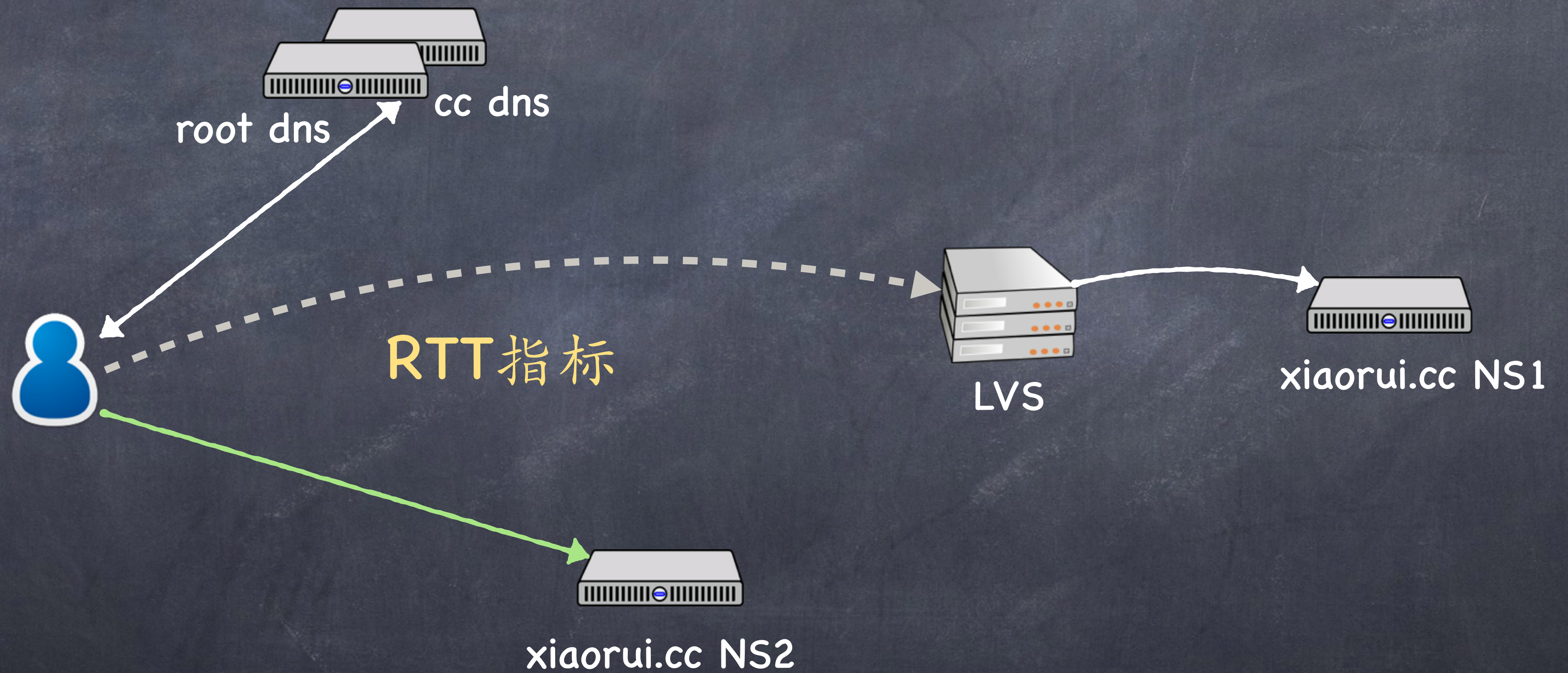
- 👁 流量

- 👁 cpu / mem

- 👁 disk iops

- 👁 服务注册

dns cluster



anycast dns cluster



北京 1.1.1.1



上海 1.1.1.1

对抗攻击，区域隔离！



青岛 1.1.1.1

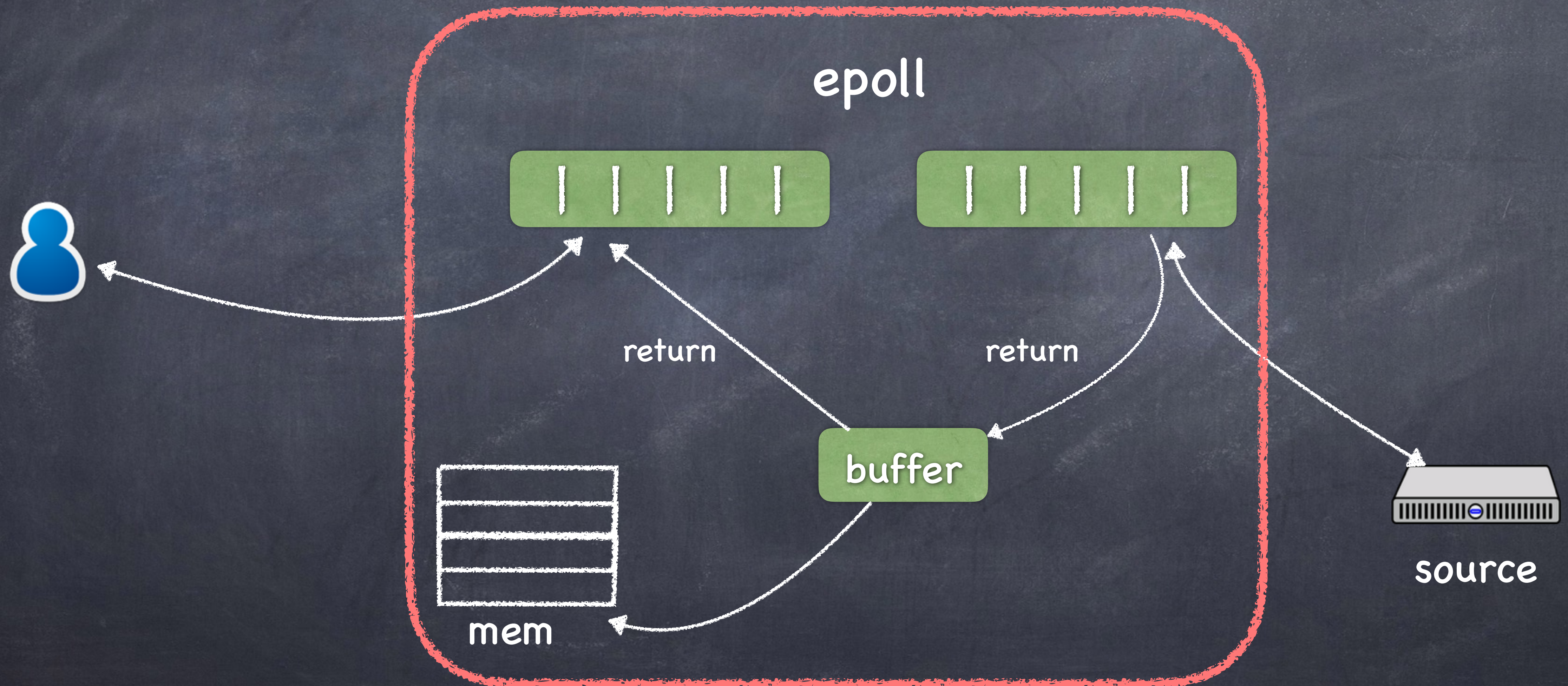
利用一个/多个 bgp as 号码在不同的地区广播相同的一个ip段
anycast就是不同的服务器用了相同的ip地址

“ cache server optimize”

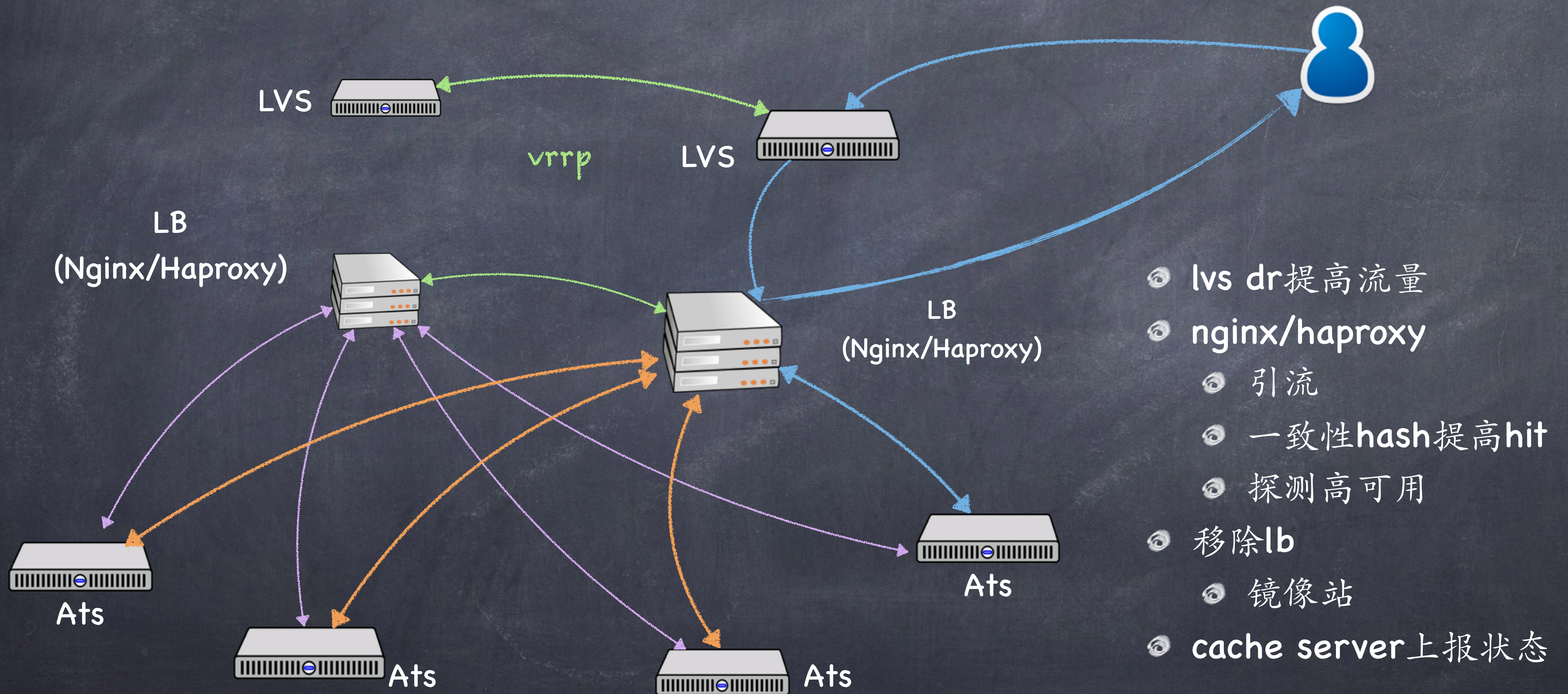
simple cdn diff

平台	存储	性能	共享存储	功能
squid	disk/mem	2.7单核 > 3.x多核	多级存储	acl, icp, rate等等
varnish	mem	极高	只能内存	基本的acl, purge
nginx	mem/disk	高	多级存储	功能多, 可module扩展
ats	mem/disk	很高	裸盘多级存储	功能强大, icp

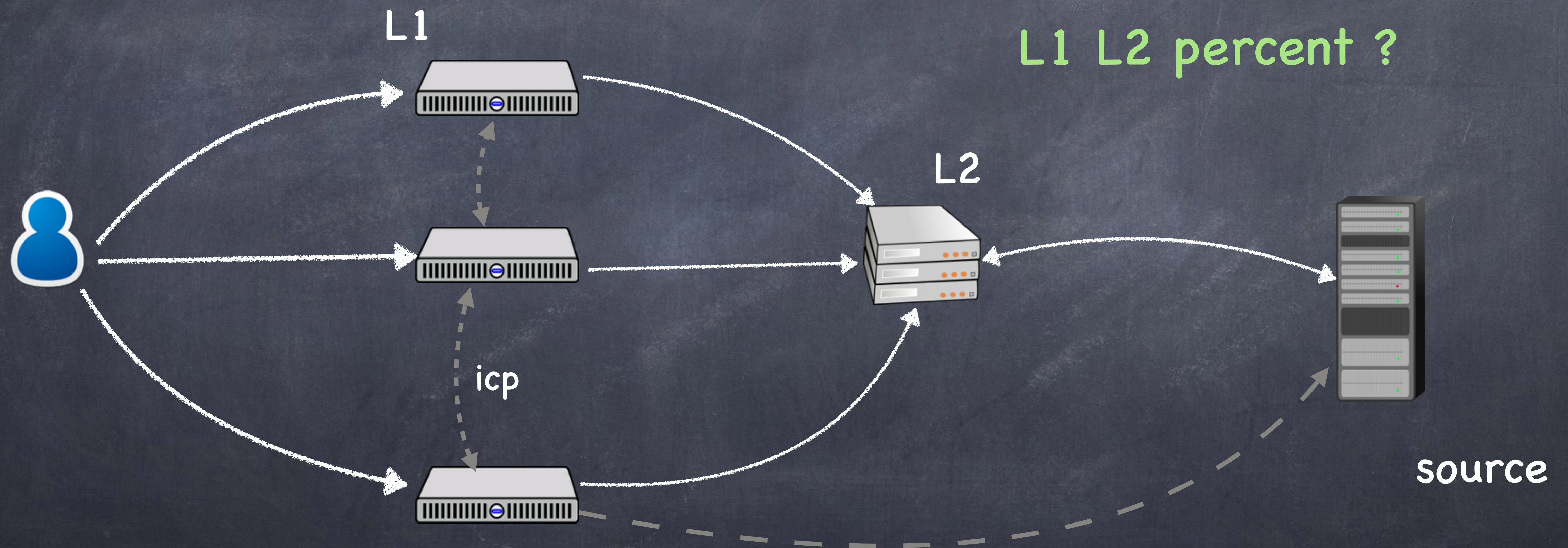
proxy network io



Cache Load Balance 选型



二级cache and icp



cdn secure

- + secure

- waf

- ddos

- 流量清洗

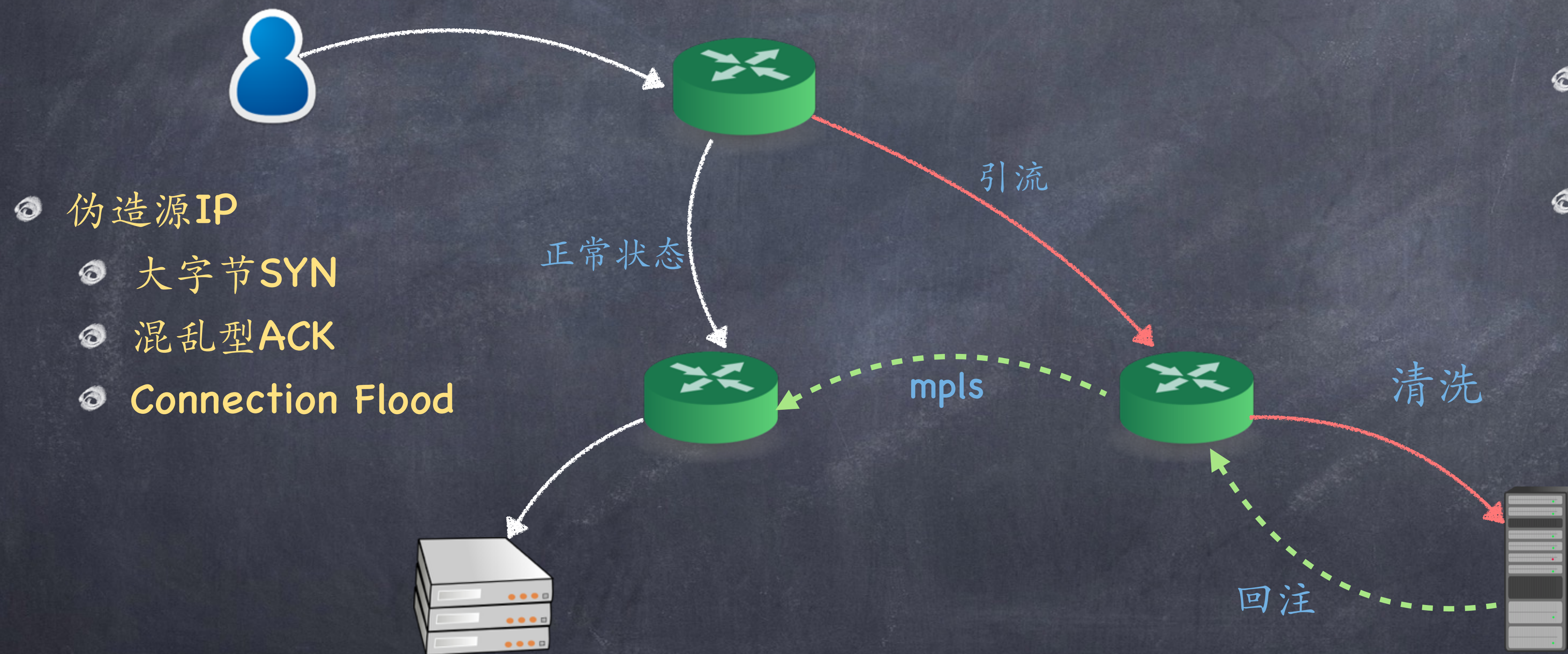
- cc

- limit rate or drop

- 验证码页面

- js insert cookie token , cdn diff token

ddos & cc



- 伪造源IP
- 大字节SYN
- 混乱型ACK
- Connection Flood

- SYN
 - 反查路由
 - success conn
 - proxy
 - 透传
- ACK
 - syn cookie
- ES
 - limit conn
 - active counter
- ip rate limit
- js input token
- cookie js 302

pull vs push

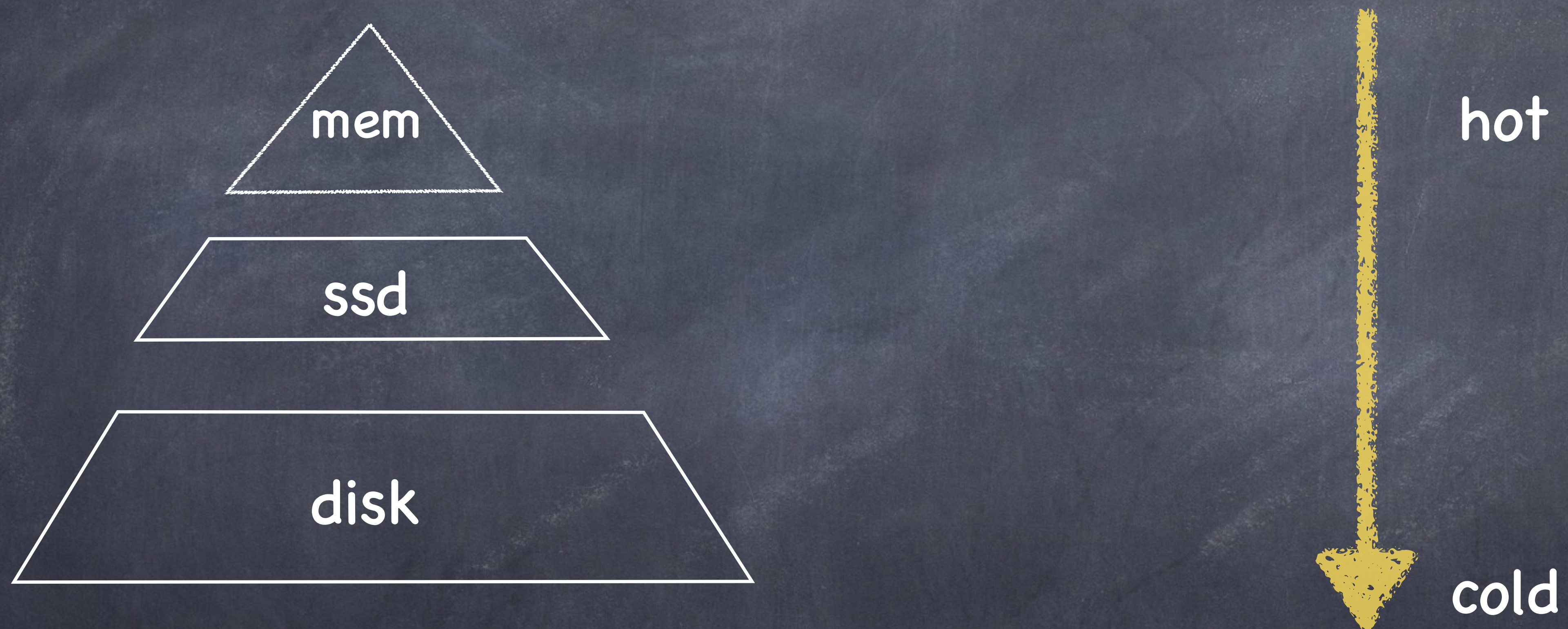
- pull

- ops submit urls ,then cdn requests the urls.

- push

- cdn push files to cdn store
- quickly push cache files with p2p
- use icp protocol in the same zone

多级cache

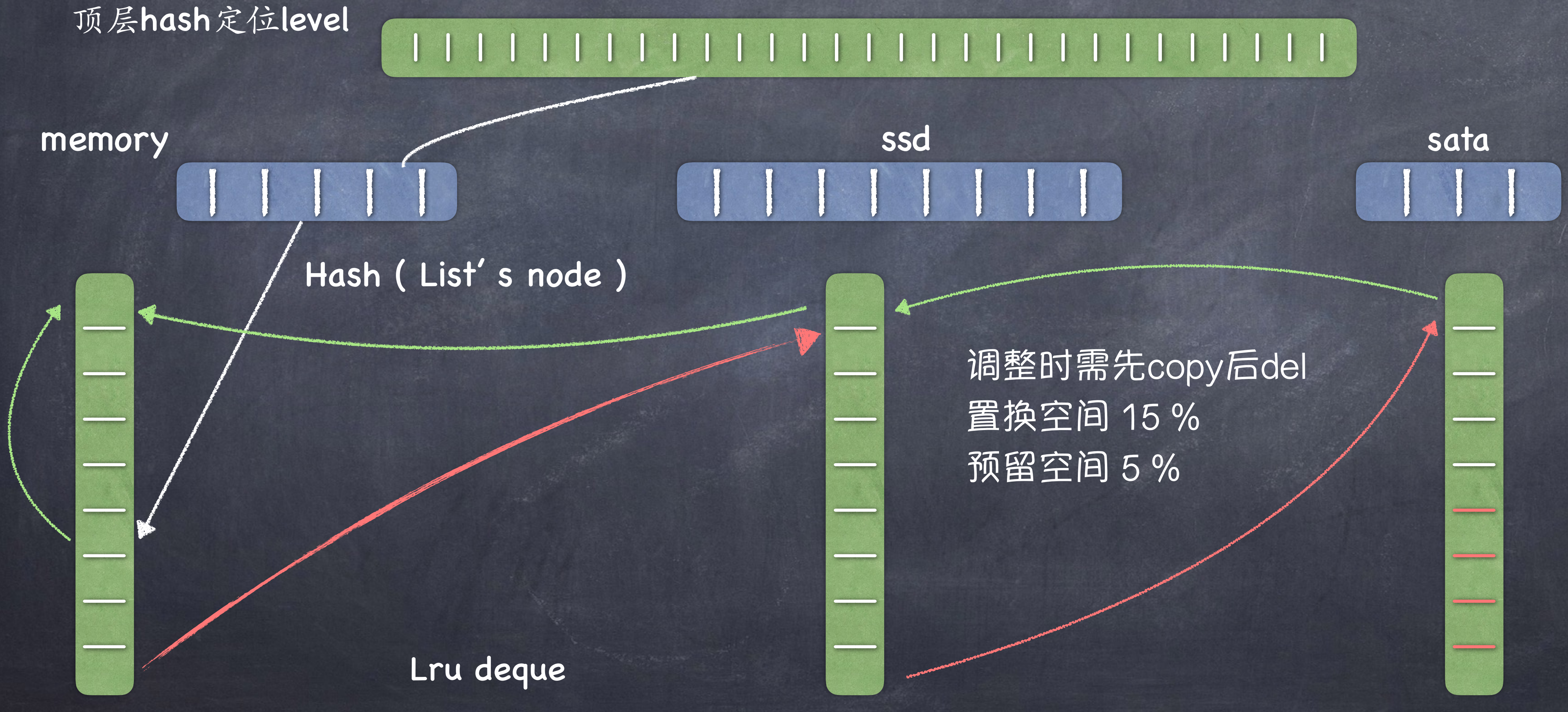


推荐百分比 mem: ssd: sata = 1: 10: 100

数据结构

- 顶层hash map判断该文件的level位置
- 每个level cache都有数据位置表及Lru表
- lru = double linked list + hash map
 - hash map存放linked node
- Lru 长度是由level 字节动态控制

数据结构



多级cache

- 👁 起初

- 👁 mem → ssd → disk

- 👁 使用Lru淘汰冷文件, 超过阈值后主动淘汰, 定时调节各level cache

- 👁 不使用raid, 如磁盘不可读, 摘掉

- 👁 cache server内置disk的调度一致性hash

- 👁 大文件直接到disk

- 👁 coss 小文件, aufs 大文件. 可同时使用

- 👁 裸盘的急速体验

扩展

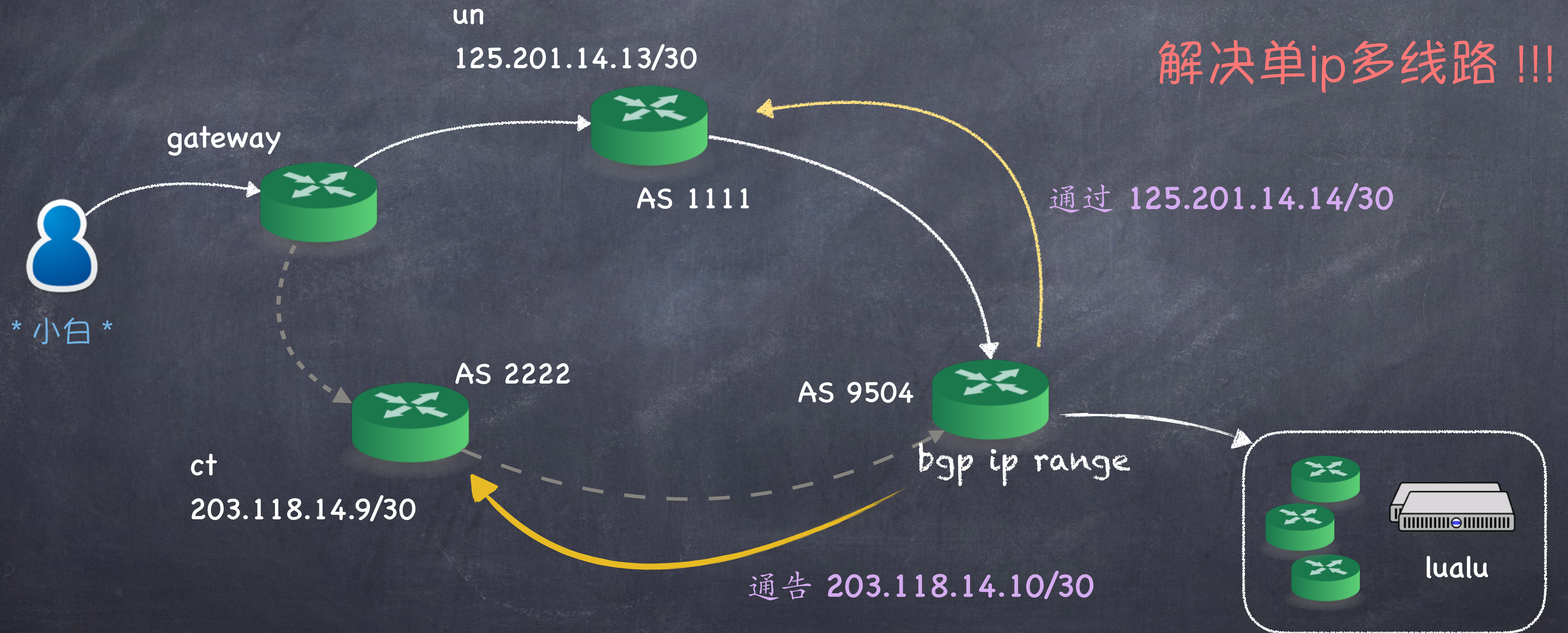
- purge
- 盗链 (refer, token)
- 限速
 - for source server
 - for client
- 文件合并及压缩

cdn 优化

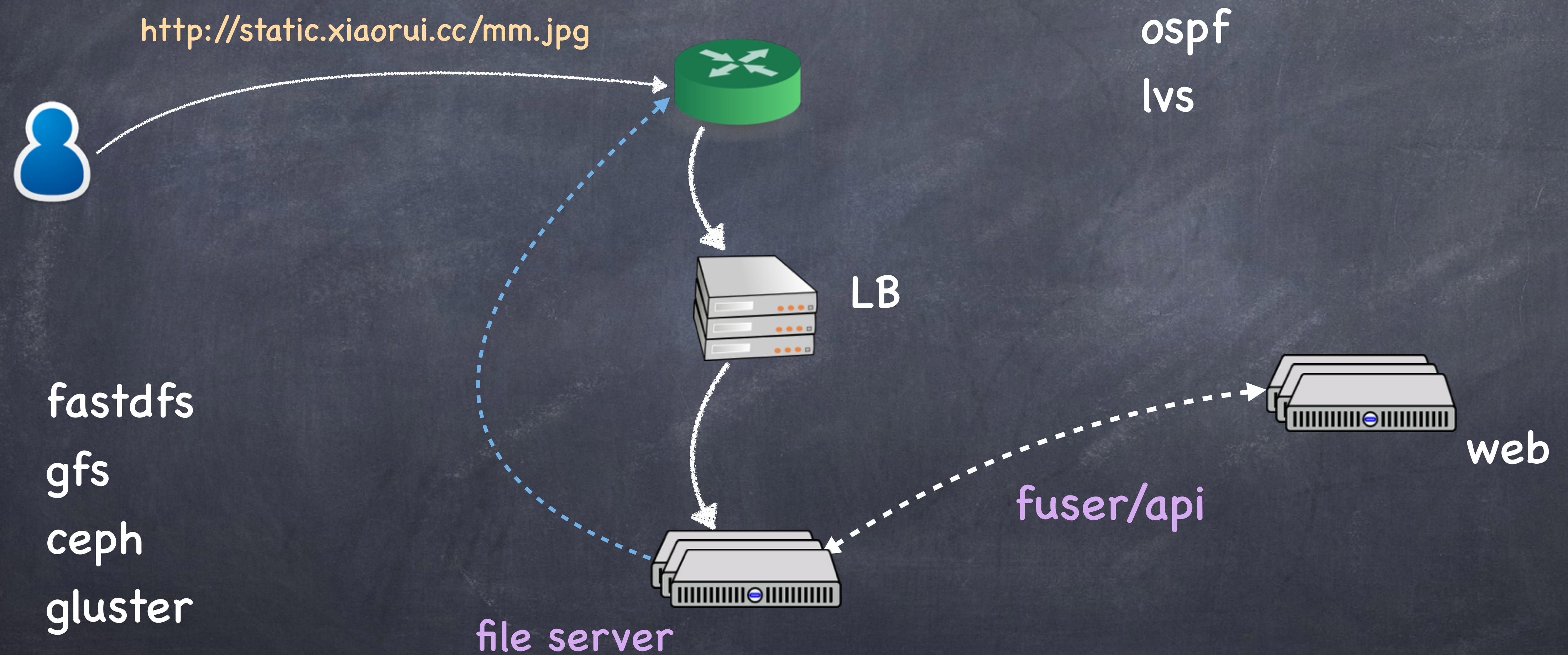
- 选择性的ignore (reload \ no-cache)
- 304不走磁盘
- 使用libaio (内核AIO)
- 视频分片
- cdn server → web server , spdy + tfo
- 万兆网卡是标配
- https装载卸载, ssl 加速卡 ?
- 使用trie树快速匹配, (purge, 黑名单, ip View)

“ source server frame optimize ”

simple bgp describe



source zone



“ html code optimize ”

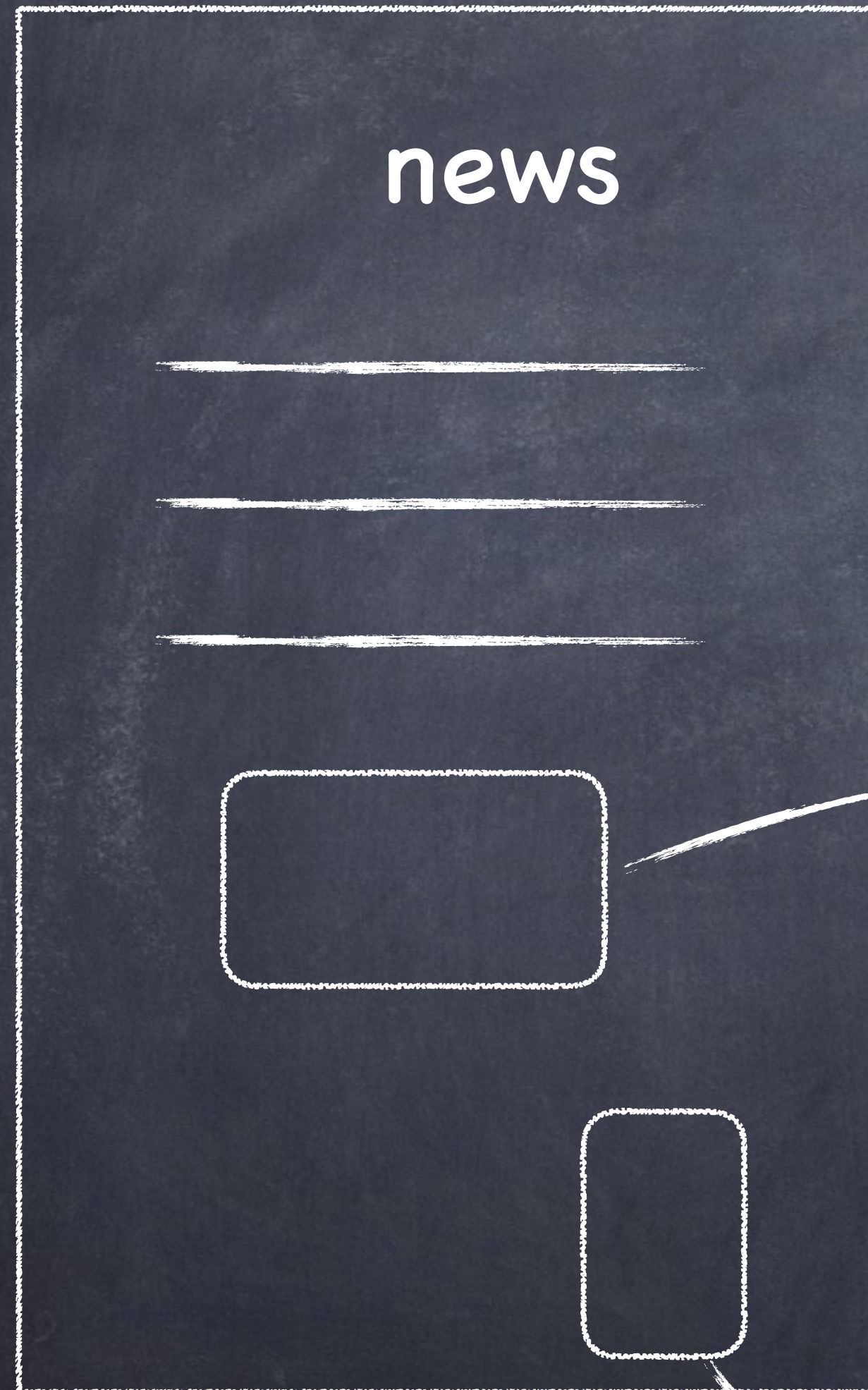
源站优化

- 动静分离
 - after end template + fore-end mvc
 - 优点
 - 并行开发调试
 - 服务化
 - 后端模板渲染及传输成本
 - 缺点
 - seo, seo, seo
- ESI Include vs 静态化

源站优化

- 切割域名
 - 提高**browser**并发
 - 提高可用性, 页面的静态文件不会全部都挂
 - 监听服务端的缓存热点压力
- **browser**限制同一域名下并发数
- 引用外联地址的作用及方法
 - domain hash
 - cookie free

ESI vs SSI vs CSI



- csi
- iframe, ajax ...
- ssi
- include file
- only source server
- esi
- pageage in edge cache

`<esi:include src="top_news.php" max-age="45"/>`

`<esi:include src="comment.php" max-age="45"/>`

“ debug cache server ”

dns调度测试

```
[ruifengyun@devops ~]$ dig @180.153.225.136 xiaorui.cc
```

```
...
```

```
:: ANSWER SECTION:
```

```
xiaorui.cc.      385  IN  CNAME  xiaorui.cc.w.kunlunca.com.
```

```
xiaorui.cc.w.kunlunca.com. 30  IN  A      122.228.74.183
```

```
[ruifengyun@devops ~]$ dig @114.114.114.114 xiaorui.cc
```

```
:: ANSWER SECTION:
```

```
xiaorui.cc.      180  IN  CNAME  xiaorui.cc.w.kunlunca.com.
```

```
xiaorui.cc.w.kunlunca.com. 180  IN  A      119.167.151.224
```

```
[ruifengyun@devops ~]$ dig @8.8.8.8 xiaorui.cc
```

```
:: ANSWER SECTION:
```

```
xiaorui.cc.      599  IN  CNAME  xiaorui.cc.w.kunlunca.com.
```

```
xiaorui.cc.w.kunlunca.com. 179  IN  A      222.161.210.45
```


cdn hit miss测试

```
[ruifengyun@devops ~]$ curl -I http://sports.sina.com.cn/china/
```

```
HTTP/1.1 200 OK
```

```
Server: nginx
```

```
Date: Tue, 21 Jun 2016 05:31:19 GMT
```

```
Content-Type: text/html
```

```
Last-Modified: Tue, 21 Jun 2016 04:34:29 GMT
```

```
Vary: Accept-Encoding
```

```
Expires: Tue, 21 Jun 2016 05:32:19 GMT
```

```
Cache-Control: max-age=60
```

```
X-Powered-By: schi_v1.02
```

```
X-Cache: HIT from ctc.gz.1cf2.42.spool.sina.com.cn
```

```
ETag: "57451990-481"
```

```
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```

```
...
```

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```


cdn hit miss测试

```
[ruifengyun@devops ~]$ curl -I xiaorui.cc
```

HTTP/1.1 200 OK

Server: Tengine

Content-Type: text/html; charset=UTF-8

Content-Length: 105749

Connection: keep-alive

Vary: Accept-Encoding

Date: Tue, 21 Jun 2016 05:26:40 GMT

X-Powered-By: PHP/5.3.3

Cache-Control: max-age=3, must-revalidate

WP-Super-Cache: Served supercache file from PHP

Via: cache24.l2nu16-1[0,200-0,H], cache20.l2nu16-1[1,0], kunlun8.cn239[0,200-0,H],
kunlun10.cn239[0,0]

Age: 2504

X-Cache: **HIT TCP_MEM_HIT dirn:9:536240464**

EagleId: 7a8de38a14664893048527282e

常见问题

- 👁 切细static资源域名
- 👁 ttl Ldns强制延长, A记录主机宕机了, how ?
 - 👁 httpdns
- 👁 新增的节点, 需跑热
- 👁 被劫持到isp cache, how ?
- 👁 链路劫持, https
- 👁 more...

“Q & A”

– xiaorui.cc