

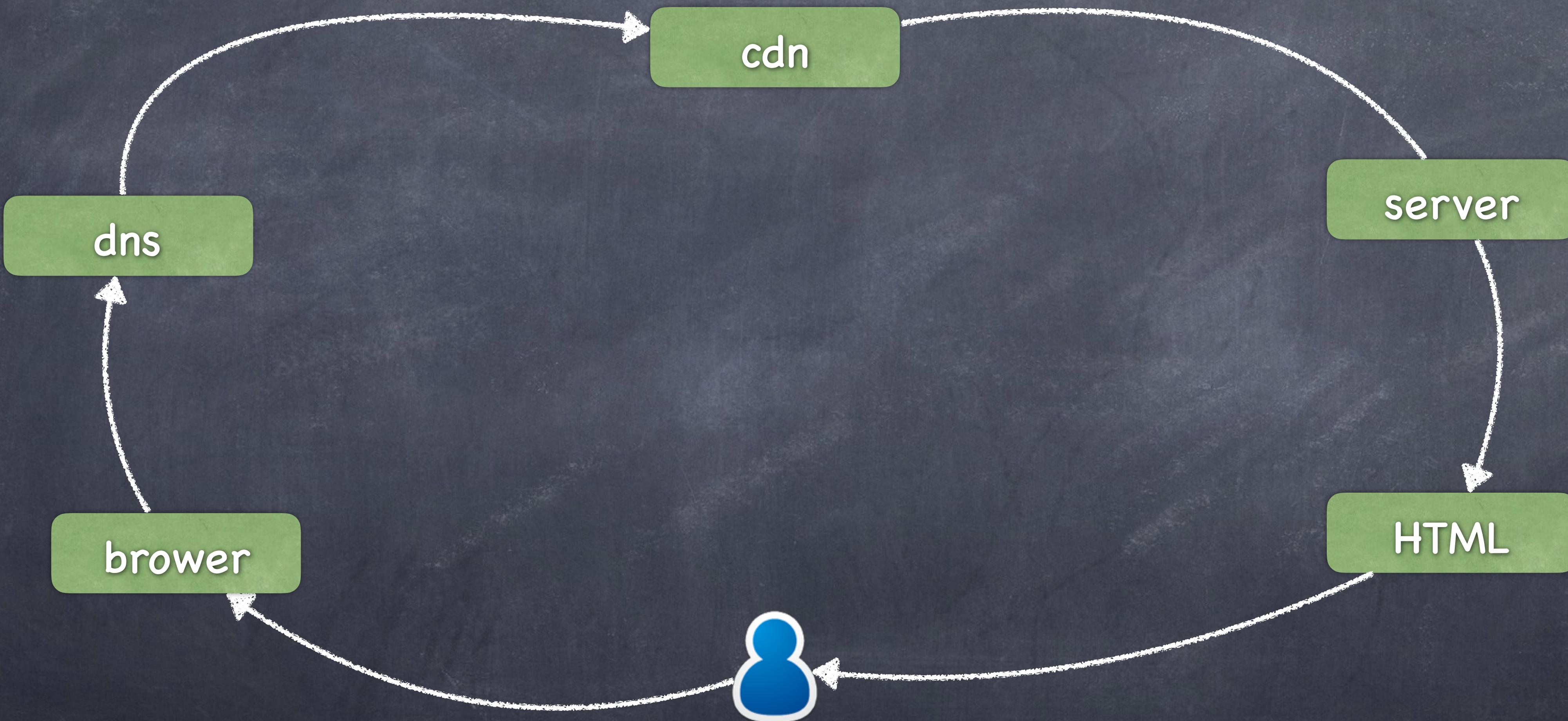
# cdn的设计原理

- [xiaorui.cc](http://xiaorui.cc)
- 峰云就她了

# introduce

- ① 什么是 CDN, 内容分发网络
- ② 为什么要用cdn ?
- ③ cdn的关键组件
- ④ cdn 内部实现原理, 架构拓扑及优化方法
- ⑤ 源站层面的cdn架构及优化
- ⑥ 网页层面的cdn架构及优化

# 涉及的内容



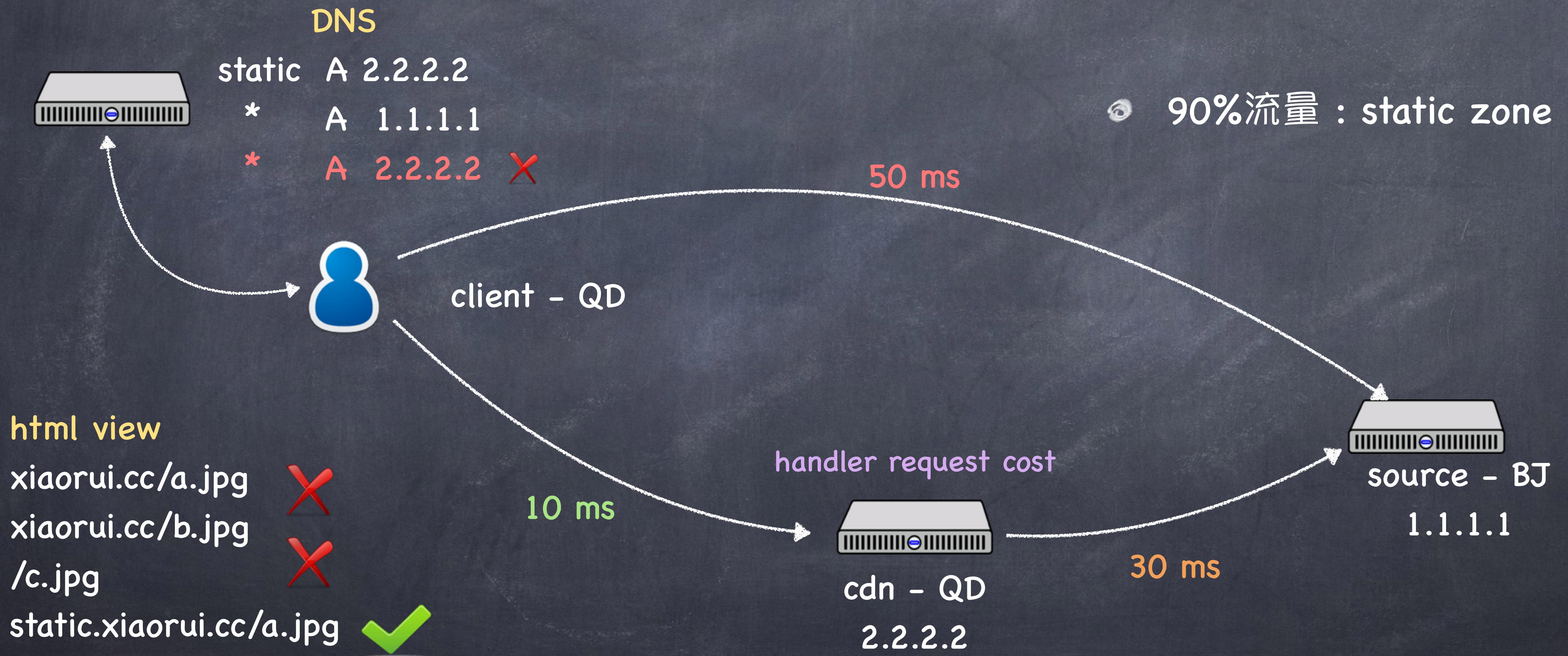
# cdn 基本原理

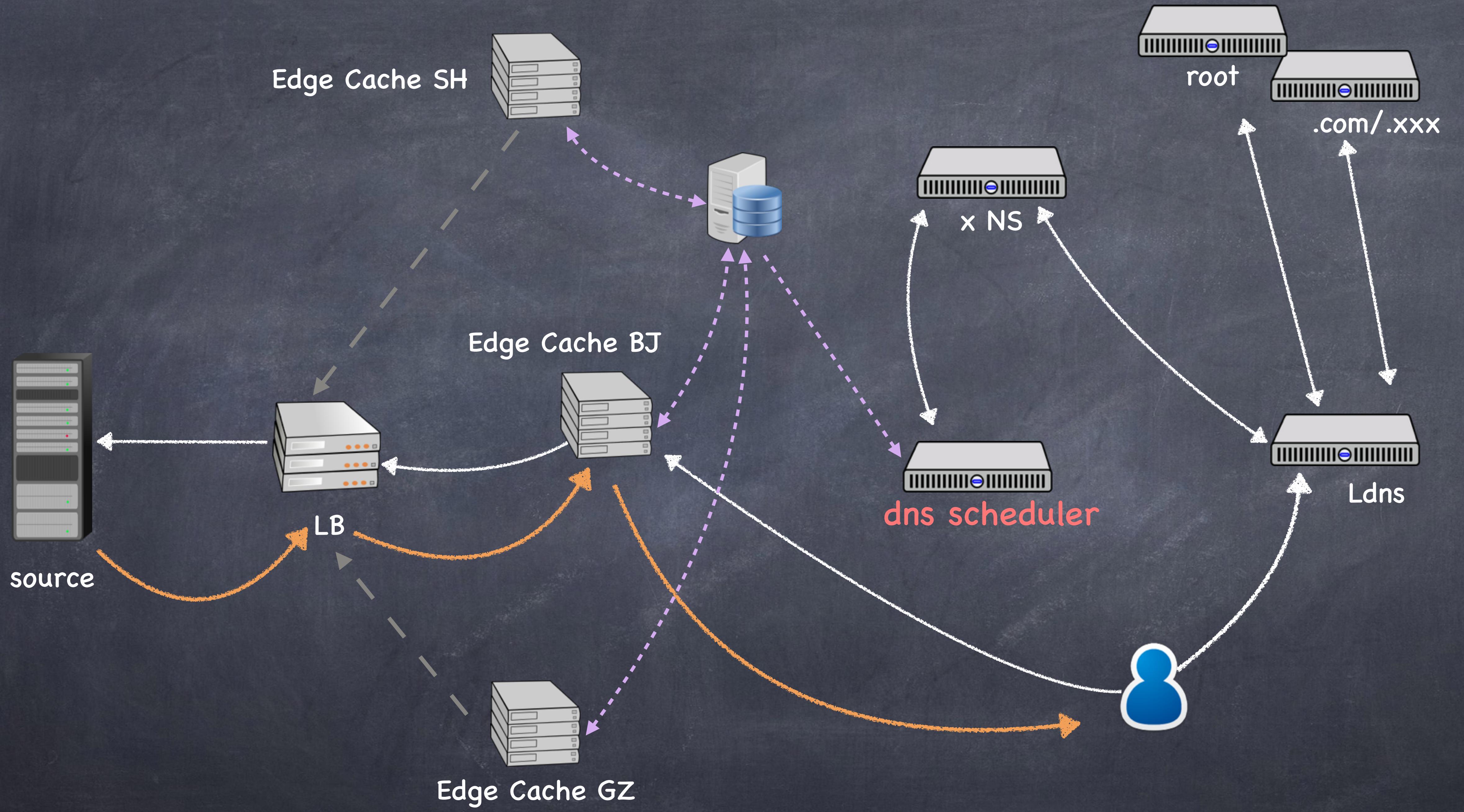
- ◎ 内容缓存到不同地区的缓存服务器
- ◎ 实现就近访问原则
- ◎ 通过**dns view** 和 **load status**调度到不同的边缘节点

# 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 ?





“ Http Headers , Abort cache http protocol”

# http header

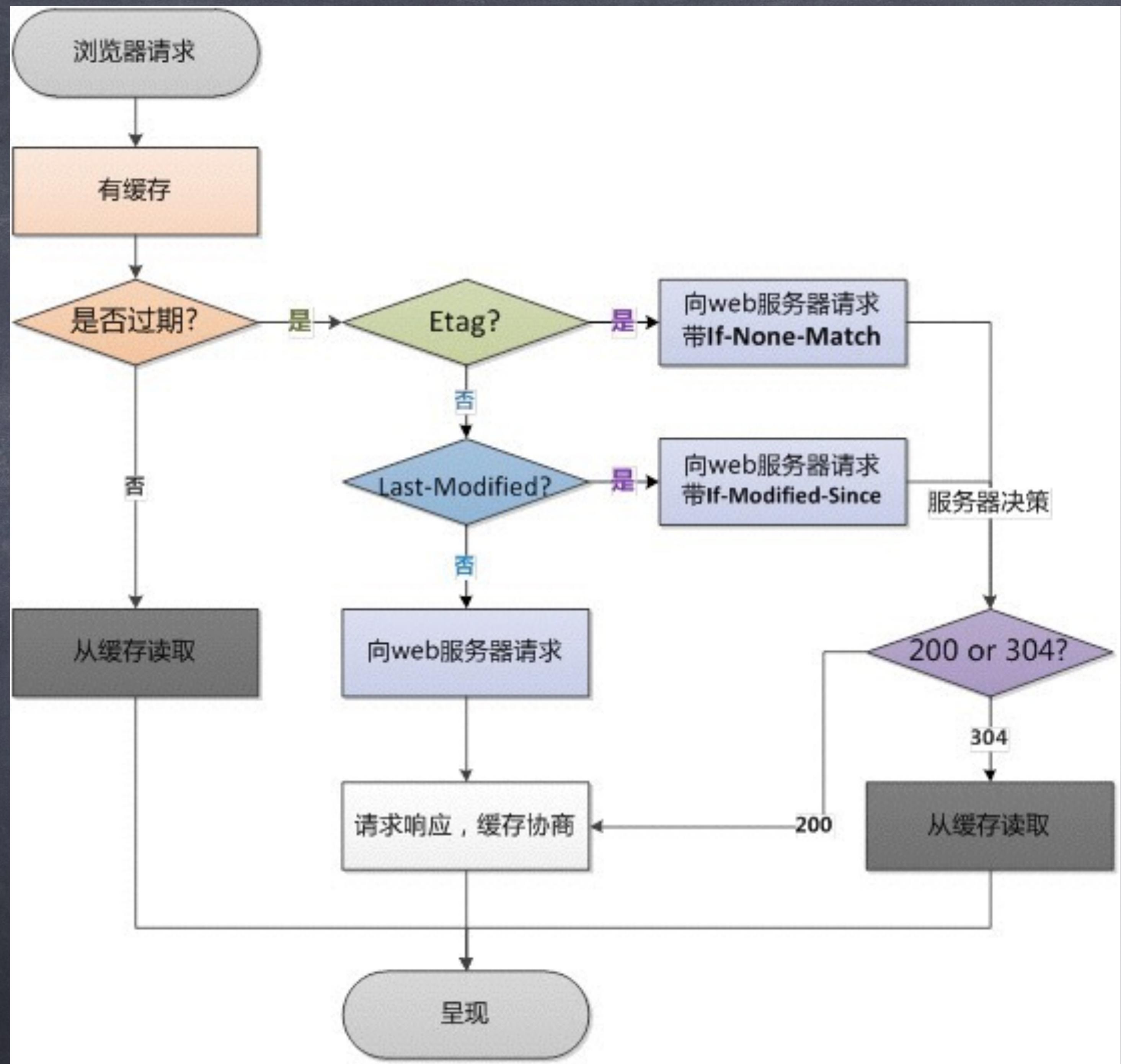
- ⦿ Expires vs Cache-Control max-age
- ⦿ 200 from cache vs 304
- ⦿ when F5 vs ctrl + F5 , add args in request header
  - ⦿ F5 → Cache-Control: max-age=0 ; If-Modified-Since. . .
  - ⦿ Ctrl F5 → Cache-Control: no-cache Pragma: no-cache
- ⦿ Last-Modified + If-Modified-Since **vs** Etag + If-None-Match

# 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

- ④ X-Cache : HIT from xd33-98.sina.com.cn
- ④ X-Forwarded-For : client\_ip proxy1\_ip proxy2\_ip
- ④ Via : cache42.l2nu16-1[0,200-0,H], cache6.l2nu16-1[8,0]
- ④ Age : cache age
- ④ Range : bytes=500-999



“ schduler zone contains view dns and each  
cache load ”

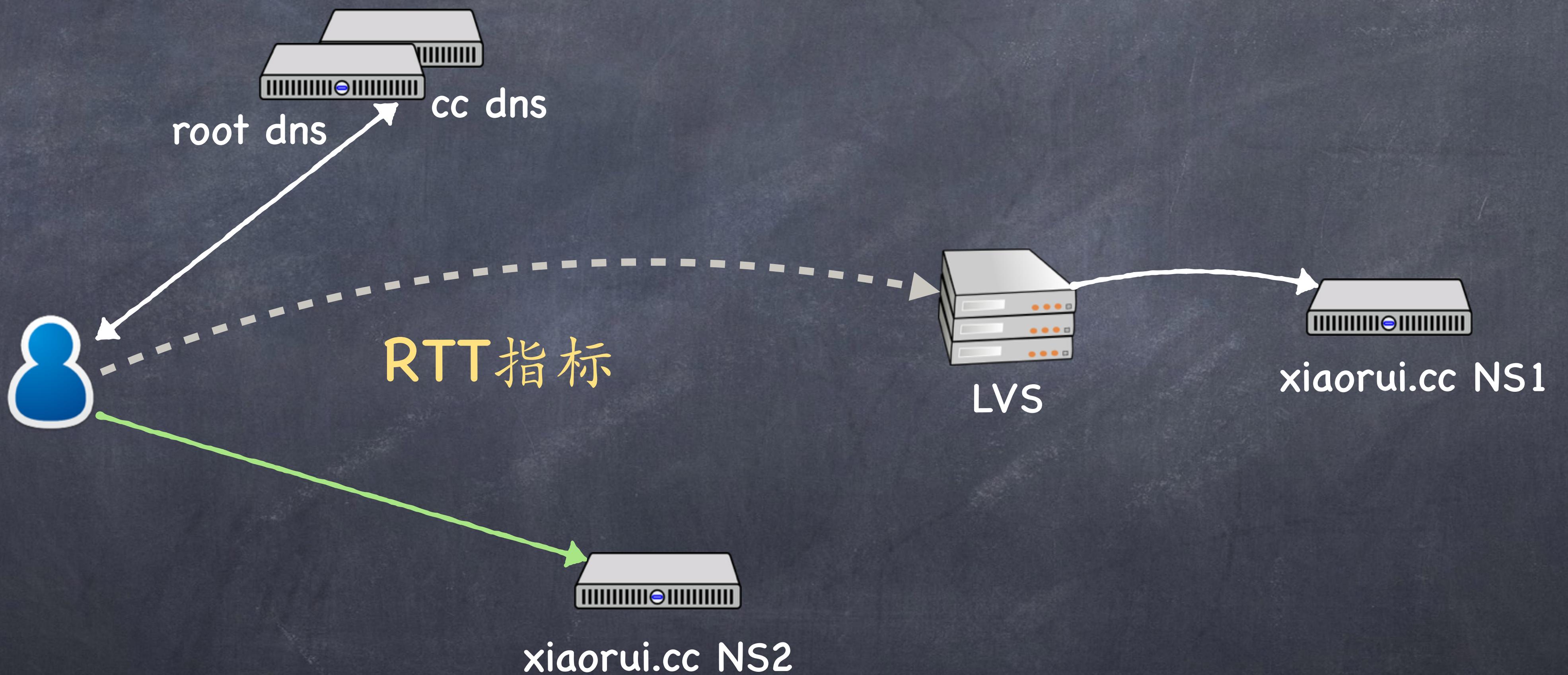
# scheduler

- ⌚ 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

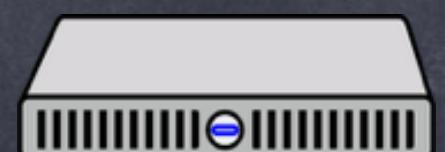


北京 1.1.1.1



上海 1.1.1.1

对坑攻击，区域隔离！



青岛 1.1.1.1

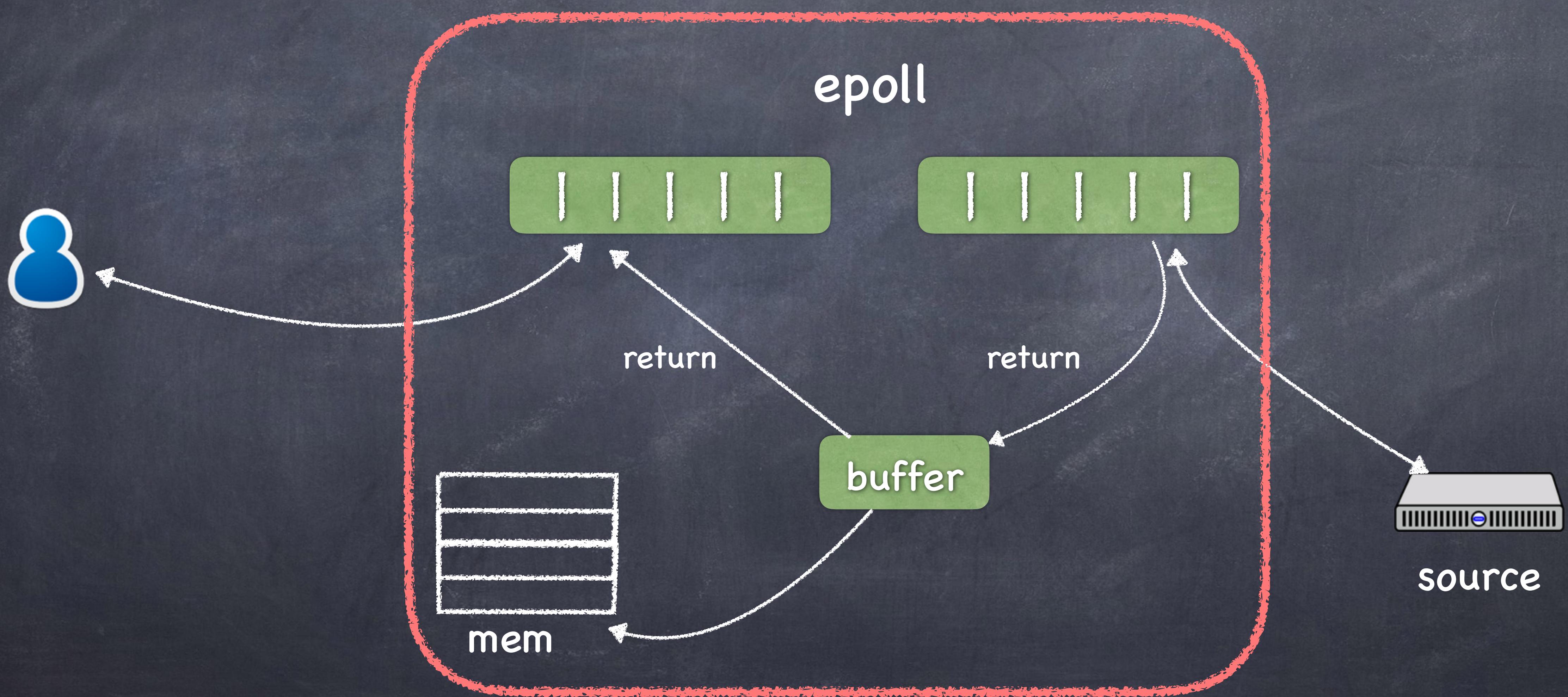
利用一个/多个 bgp as 号码在不同的地区广播相同的一个ip段  
anycast就是不同的服务器用了相同的ip地址

“ cache server optimize”

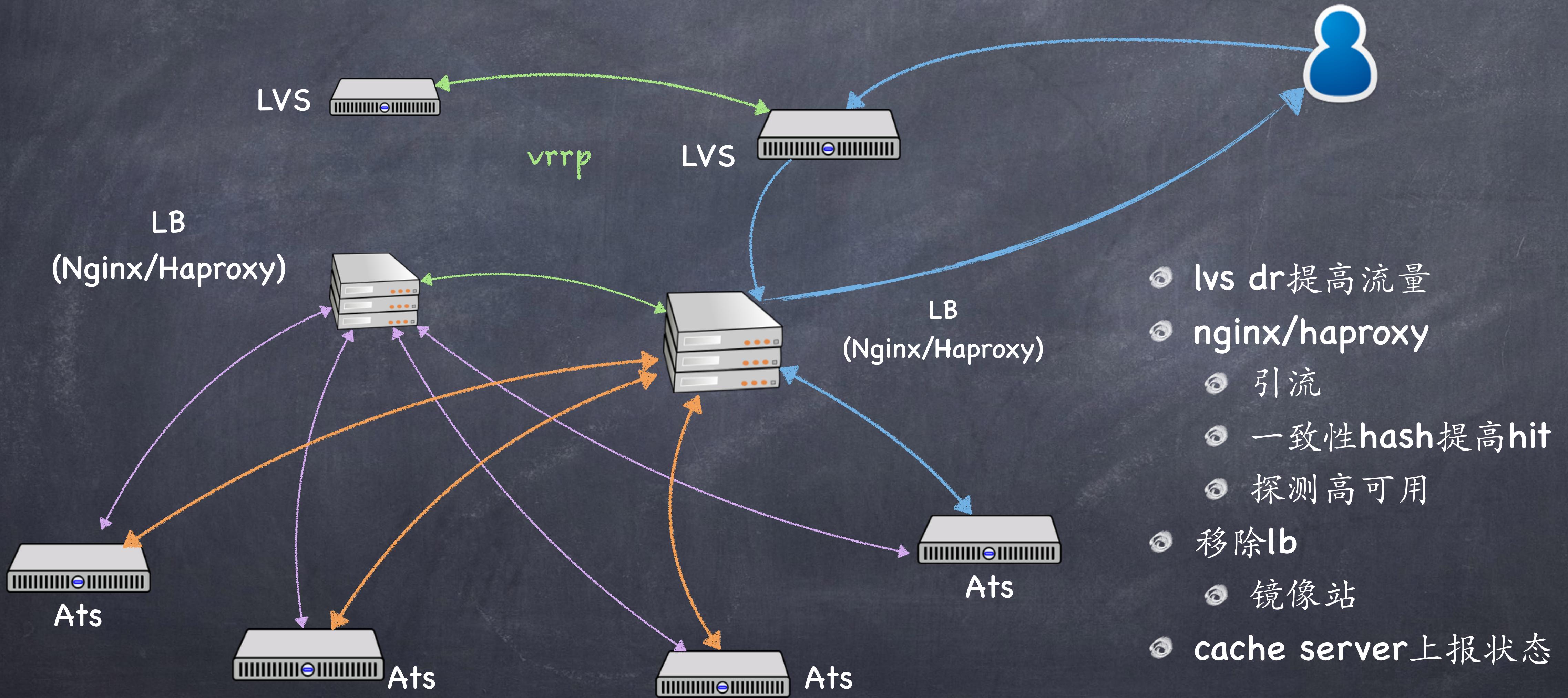
# simple cdn diff

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
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

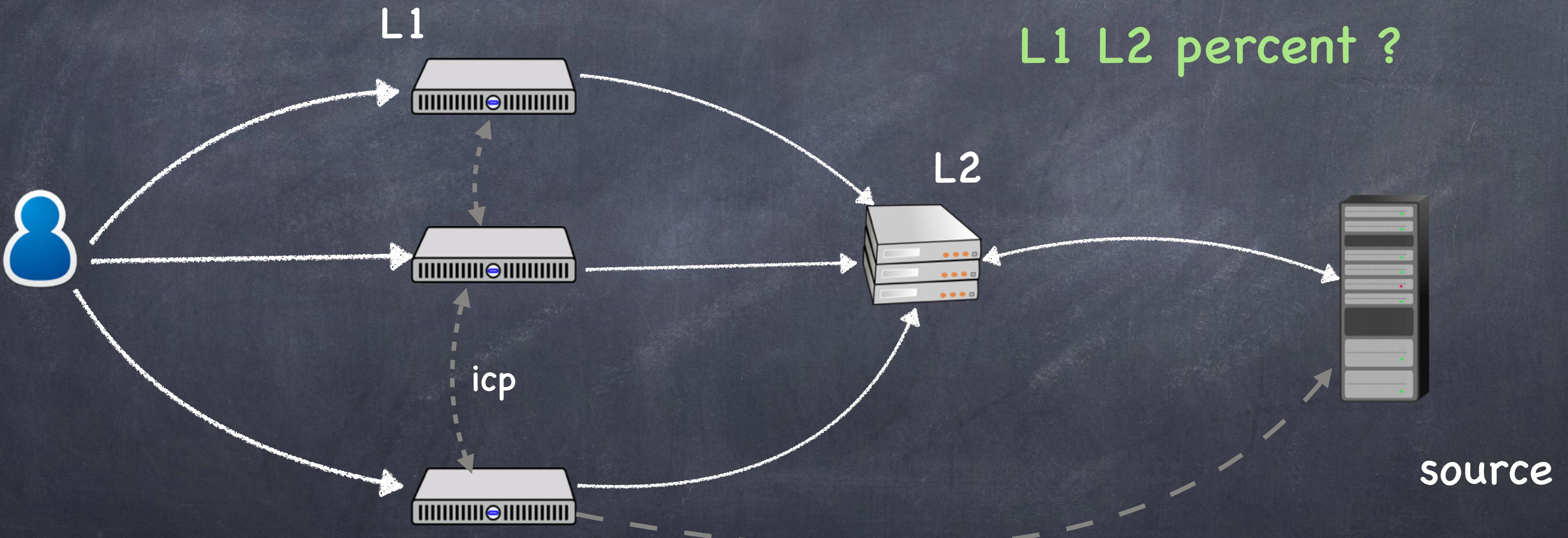
# proxy network io



# Cache Load Balance 选型



# 二级cache and icp

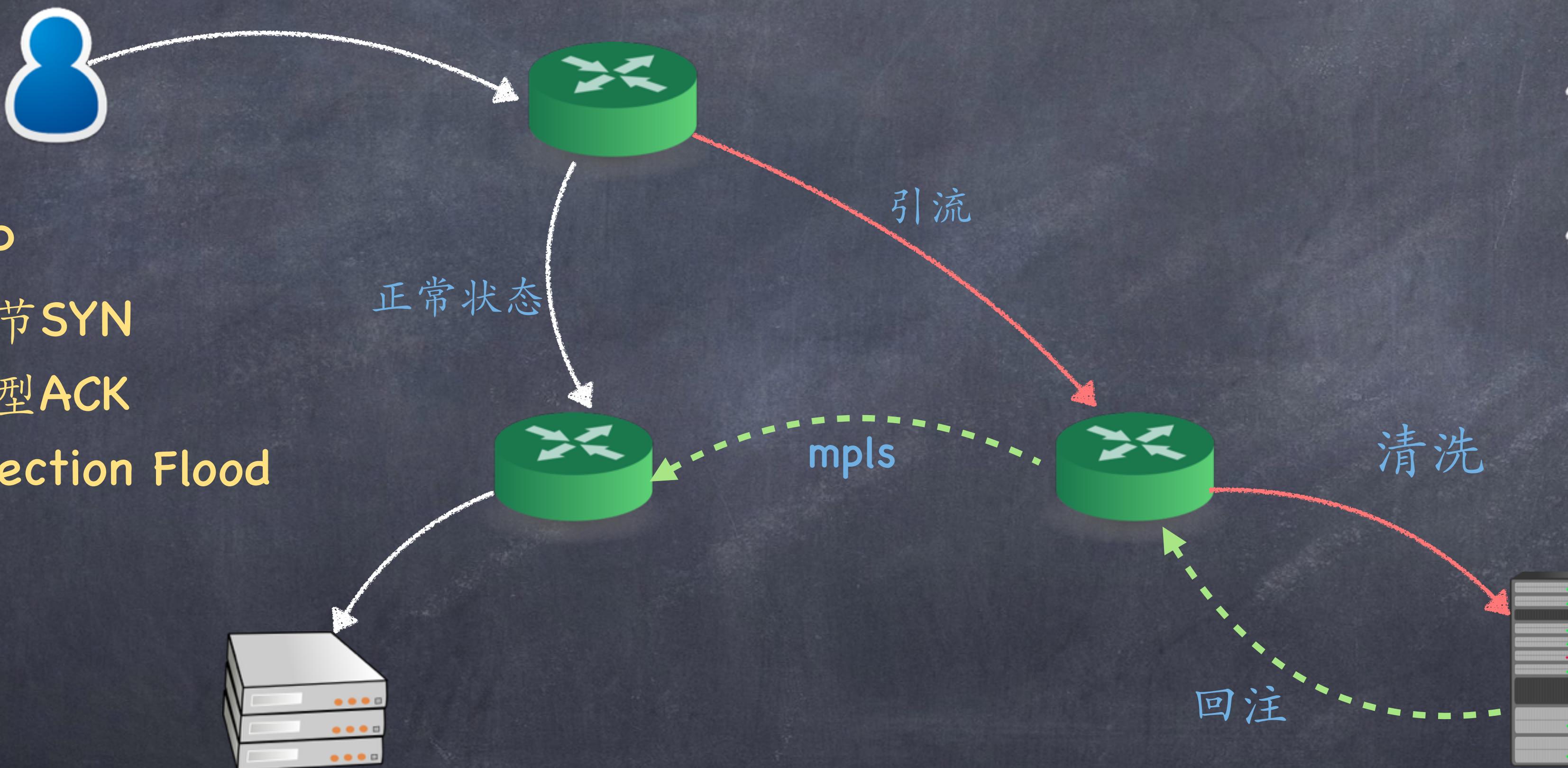


# cdn secure

- + 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

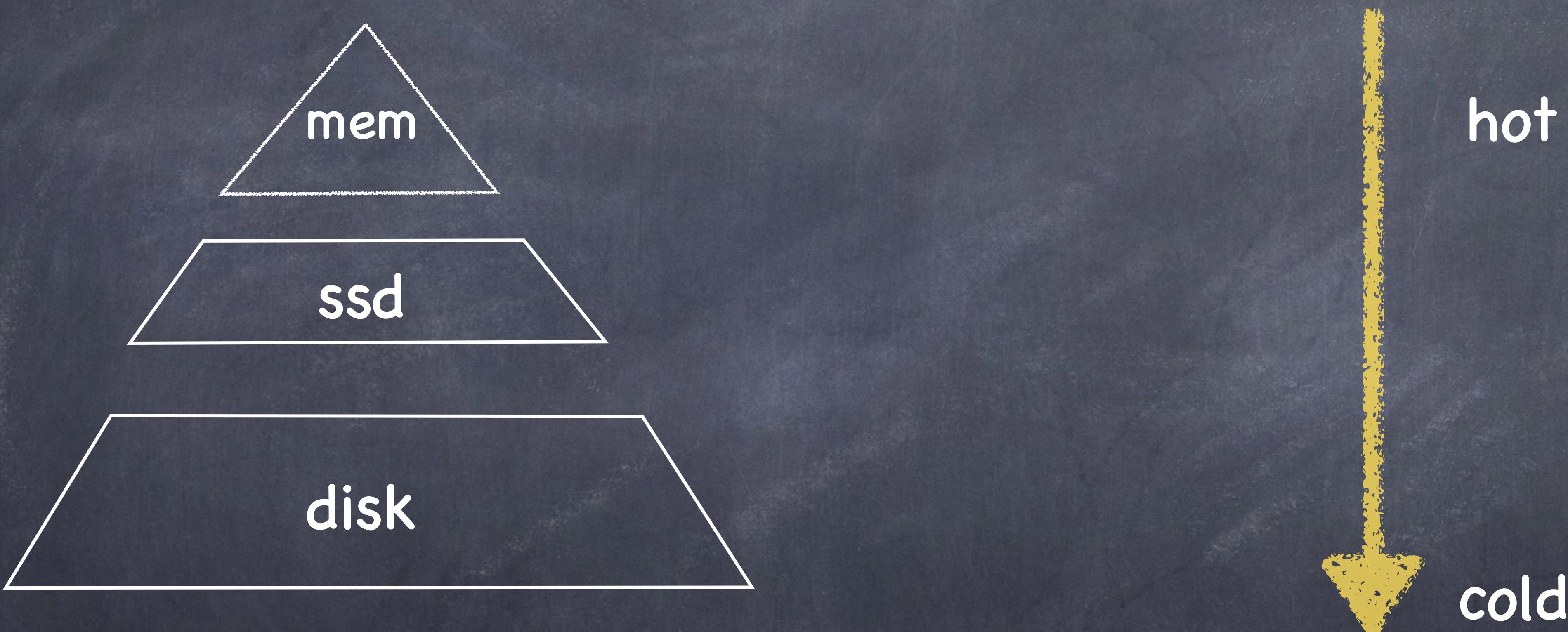


- SYN
- 反查路由
- success conn
- proxy
- 透传
- ACK
- syn cookie
- ES
- limit conn
- active counter
- ip rate limit
- js input token
- cookie js 302

# pull vs push

- ④ pull
  - ④ ops submit urls ,then cdn requests the urls.
- ④ push
  - ④ cdn push files to cdn store
  - ④ quickly push cache files with p2p
  - ④ use icp protocol in the same zone

# 多级cache



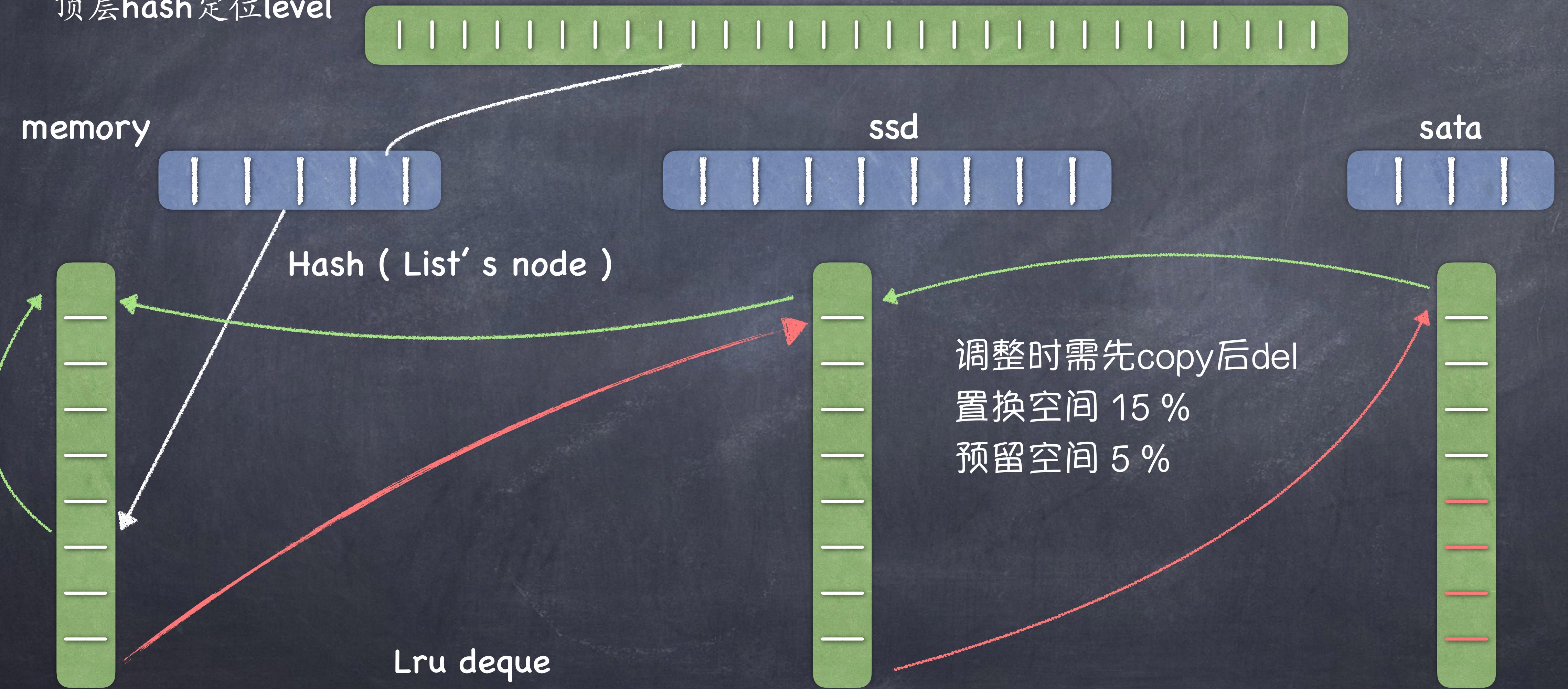
推荐百分比 mem: ssd: sata = 1: 10: 100

# 数据结构

- ① 顶层hash map判断该文件的level位置
- ② 每个level cache都有数据位置表及Lru表
- ③ lru = double linked list + hash map
  - ④ hash map存放linked node
- ⑤ Lru 长度是由level 字节动态控制

# 数据结构

顶层hash定位level



# 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

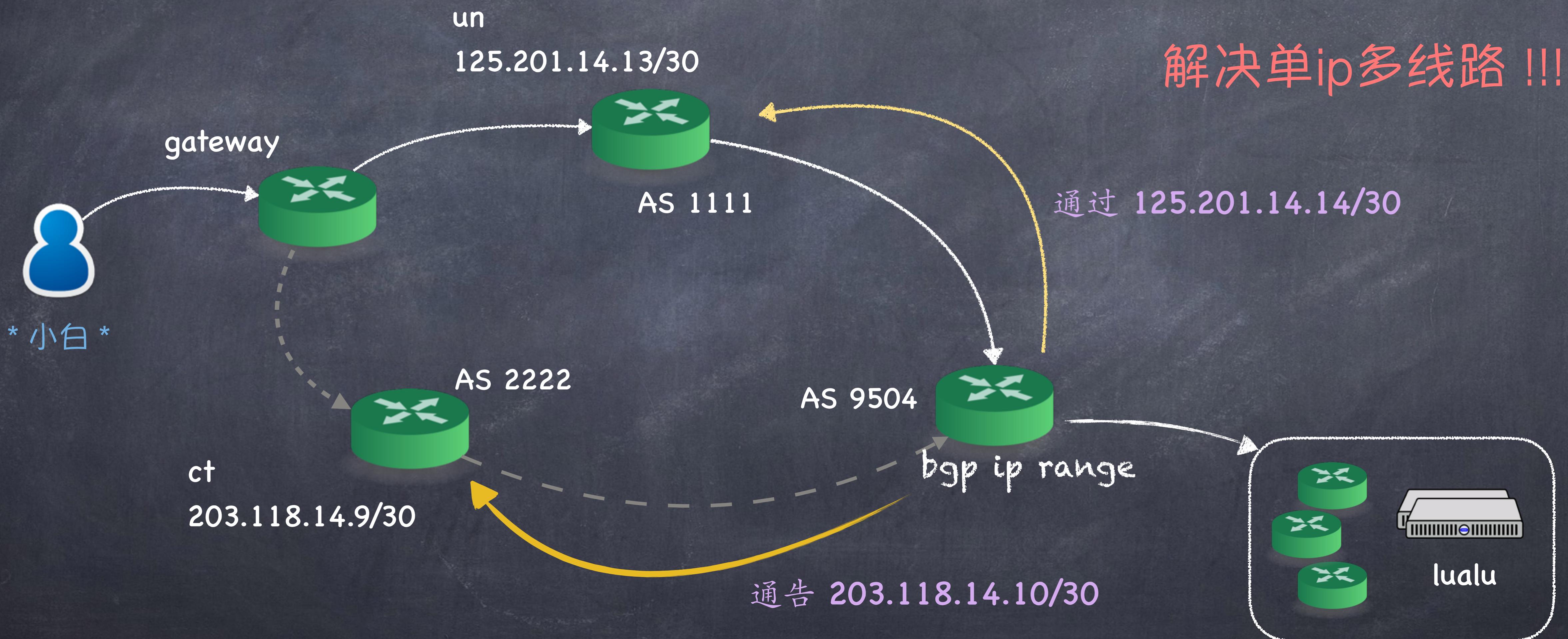
- ④ purge
- ④ 盗链 (refer, token)
- ④ 限速
- ④ for source server
- ④ for client
- ④ 文件合并及压缩

# cdn 优化

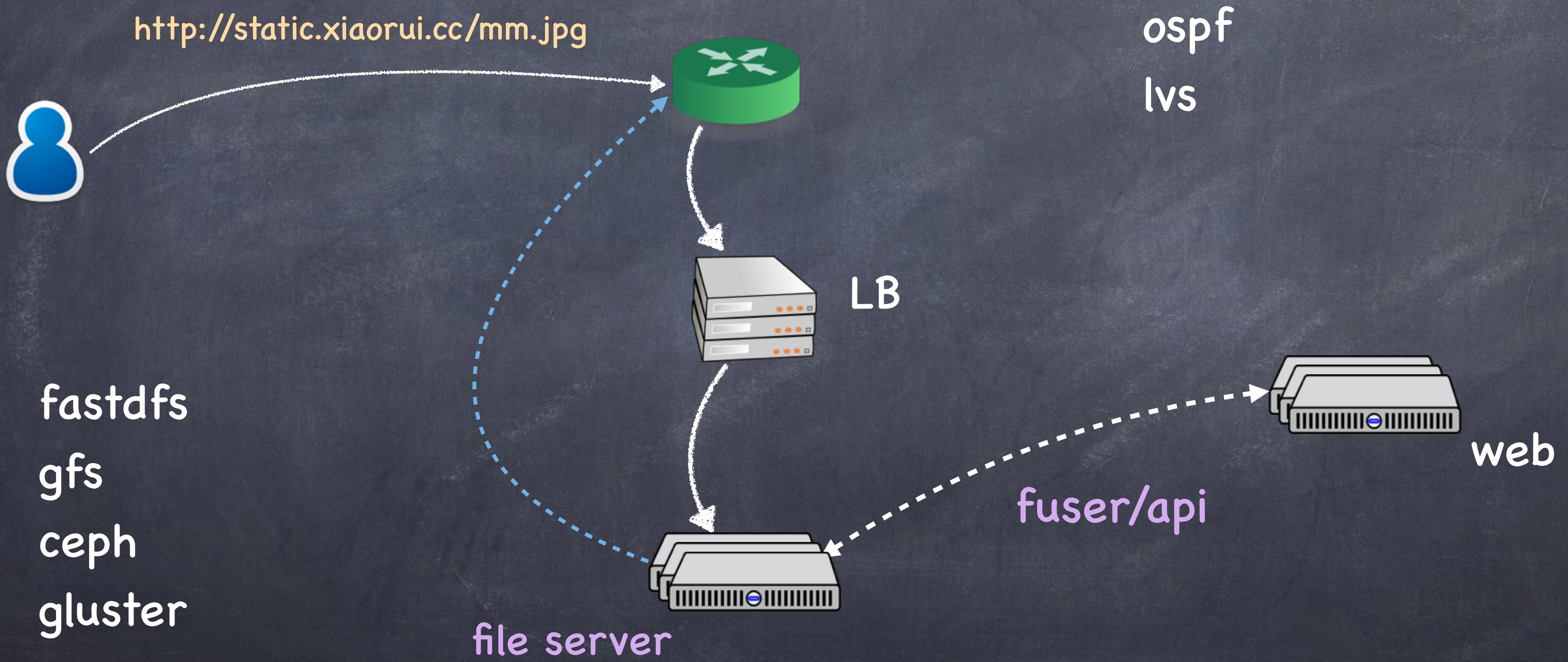
- ◎ 选择性的ignore (reload \ no-cache)
- ◎ 304不走磁盘
- ◎ 使用libaio (内核AIO)
- ◎ 视频分片
- ◎ cdn server —> web server , spdy + tfo
- ◎ 万兆网卡是标配
- ◎ https装载卸载, ssl 加速卡 ?
- ◎ 使用trie树快速匹配, (purge, 黑名单, ip View)

“ source server frame optimize ”

# simple bgp describe



# source zone



“ html code optimize ”

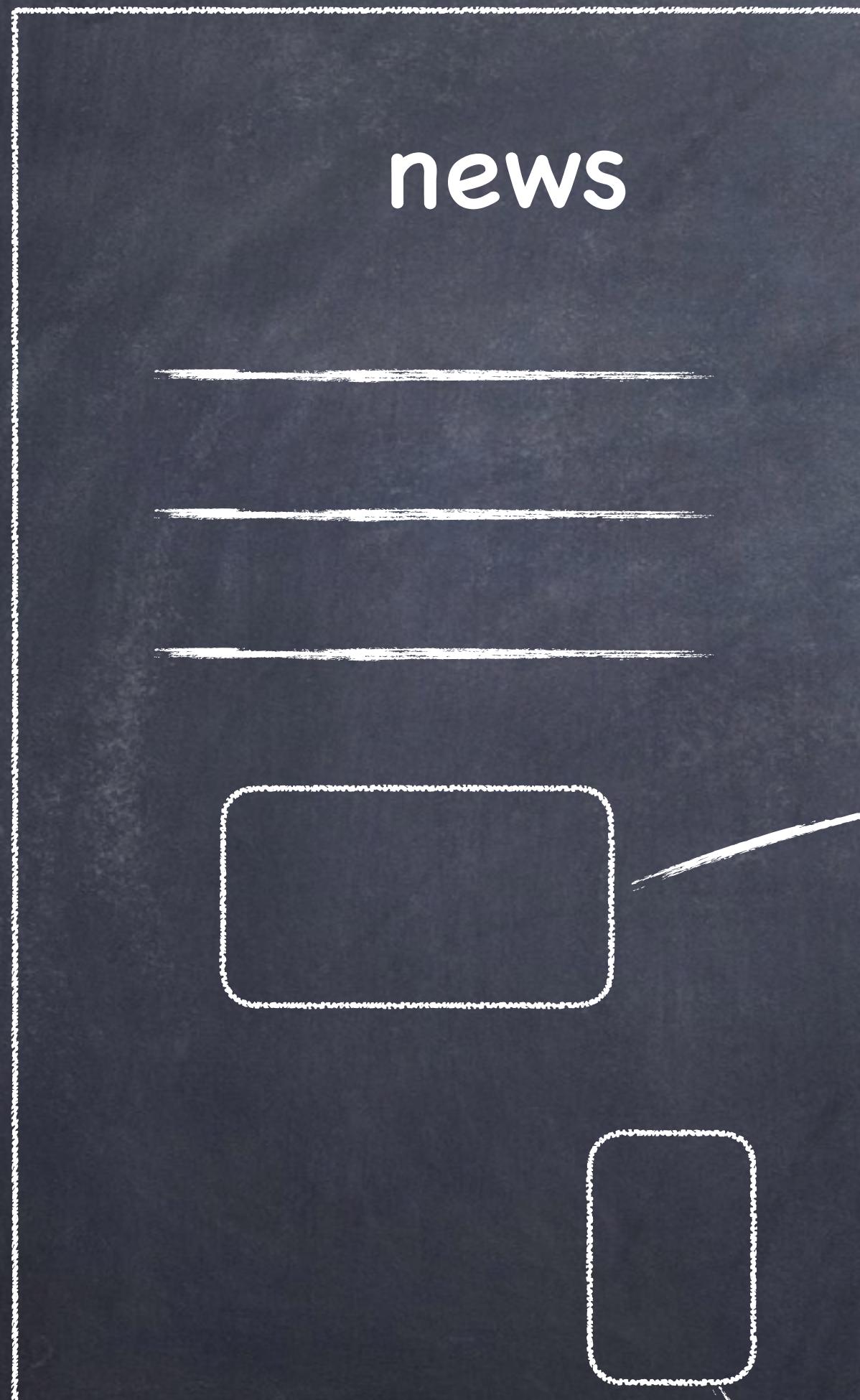
# 源站优化

- ⑥ 动静分离
  - ⑥ after end template + fore-end mvc
  - ⑥ 优点
    - ⑥ 并行开发调试
    - ⑥ 服务化
    - ⑥ 后端模板渲染及传输成本
  - ⑥ 缺点
    - ⑥ seo, seo, seo
  - ⑥ ESI Include vs 静态化

# 源站优化

- ◎ 切割域名
  - ◎ 提高**brower**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
- 
- ◎ **brower**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

“ 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"
```

```
[ruifengyun@devops ~ ]$ curl -I http://sports.sina.com.cn/china/  
...  
X-Powered-By: schi_v1.02  
X-Cache: MISS from ctc.gz.1cf2.38.spool.sina.com.cn
```

# 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"
```

```
[ruifengyun@devops ~ ]$ curl -I http://sports.sina.com.cn/china/  
...  
X-Powered-By: schi_v1.02  
X-Cache: MISS from ctc.gz.1cf2.38.spool.sina.com.cn
```

# 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

- ④ 切细static资源域名
- ④ ttl Ldns强制延长, A记录主机宕机了, how ?
  - ④ httpdns
- ④ 新增的节点, 需跑热
- ④ 被劫持到isp cache, how ?
- ④ 链路劫持, https
- ④ more...

# “Q & A”

- [xiaorui.cc](http://xiaorui.cc)