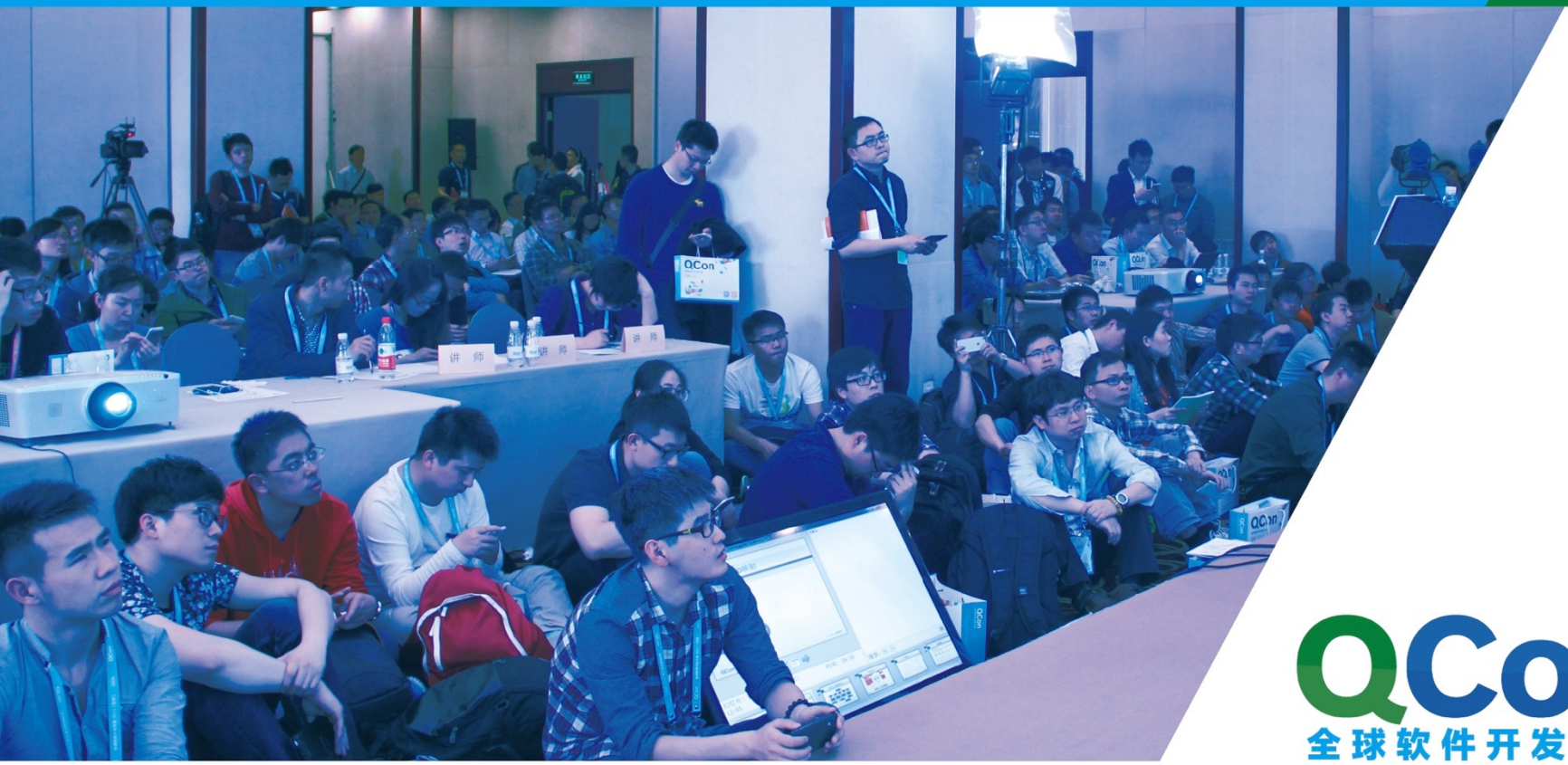
QCon全球软件开发大会

International Software Development Conference

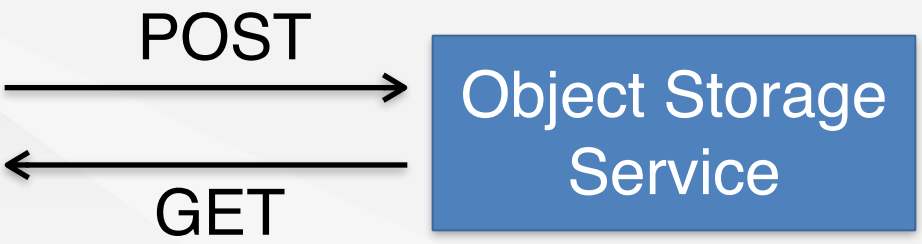


QCon
全球软件开发大会

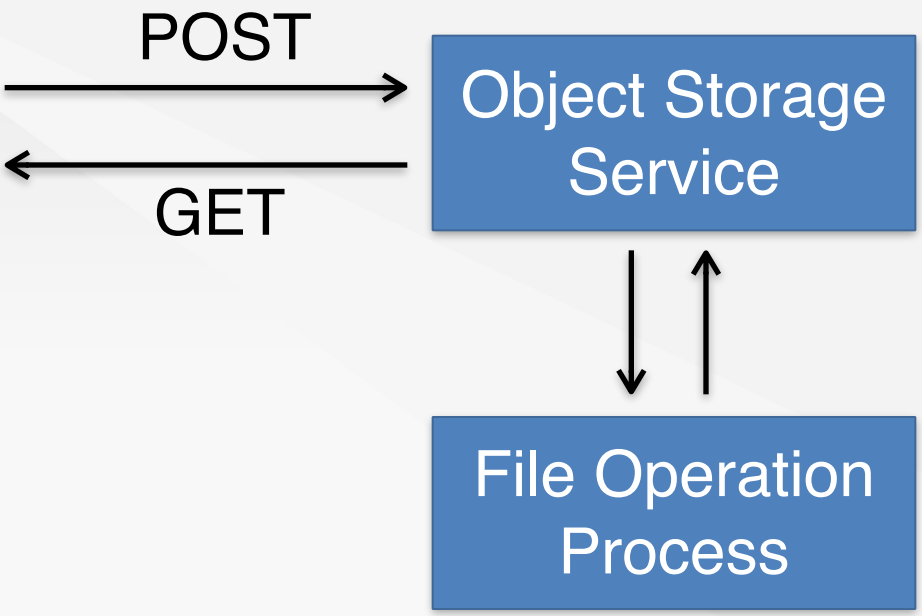
基于连接与组合的微服务架构剖析

xuli@qiniu.com

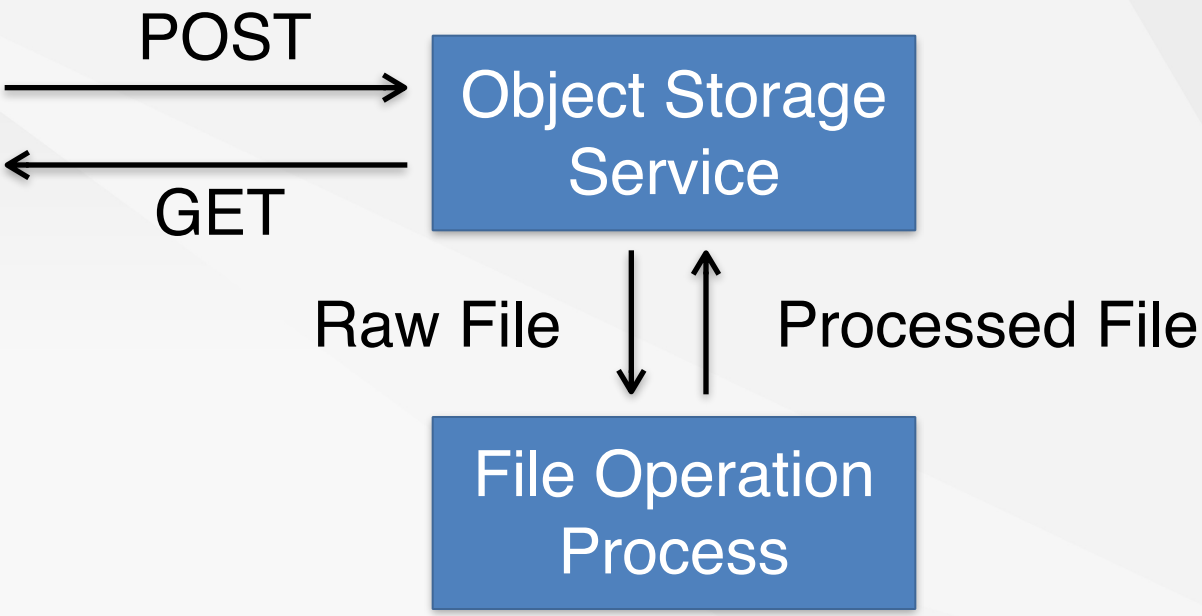
Qiniu 1.0



Qiniu 2.0



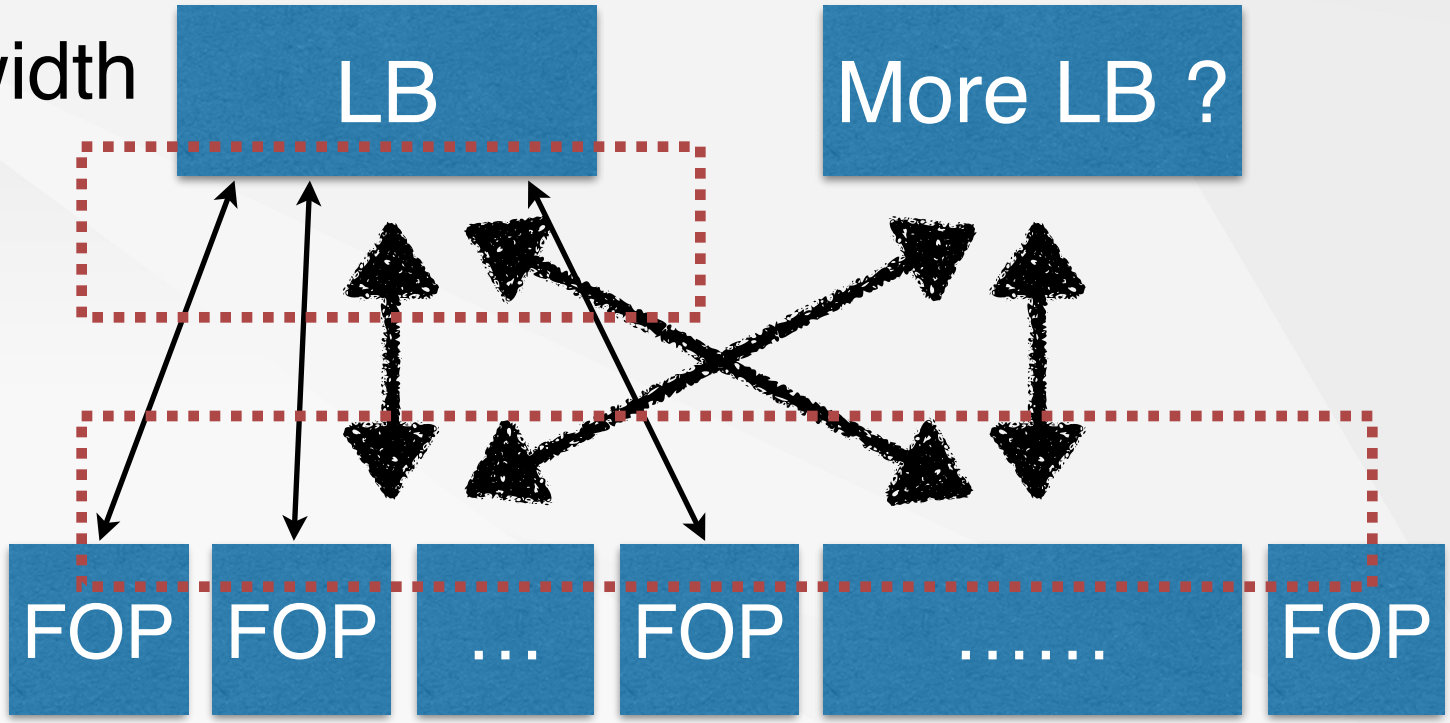
Qiniu 2.0 / FOP



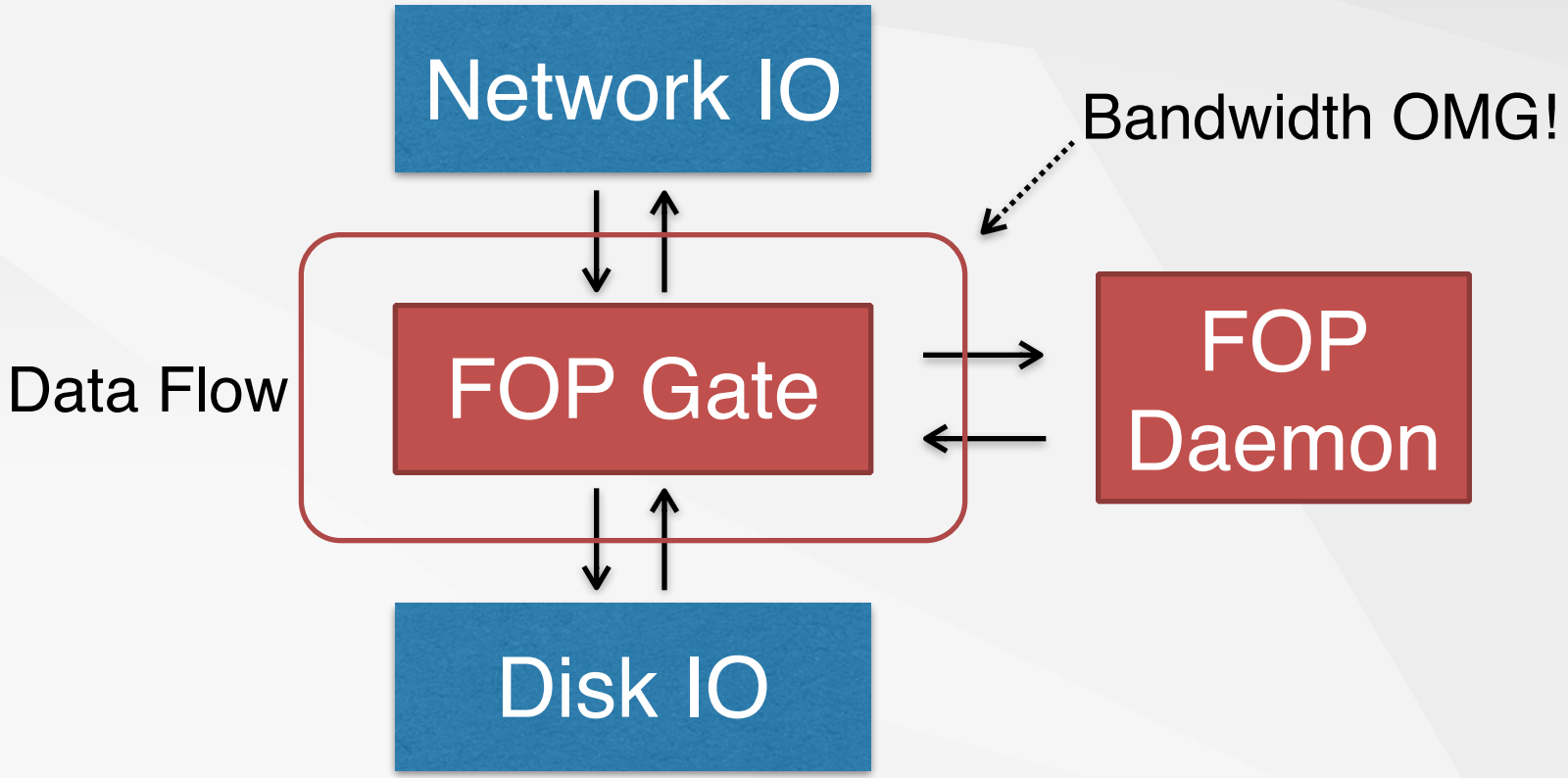
FOP (File Operation Process)

early FOP

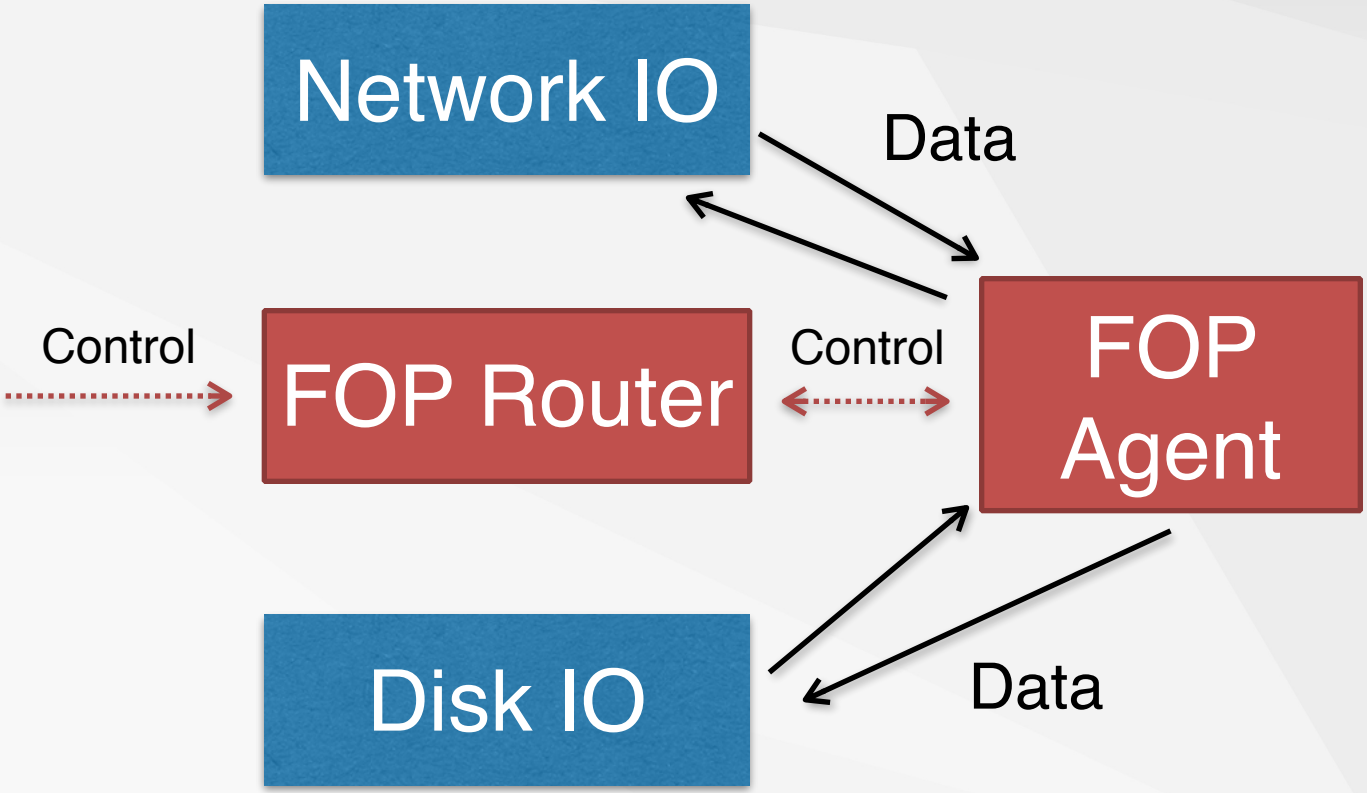
Bandwidth



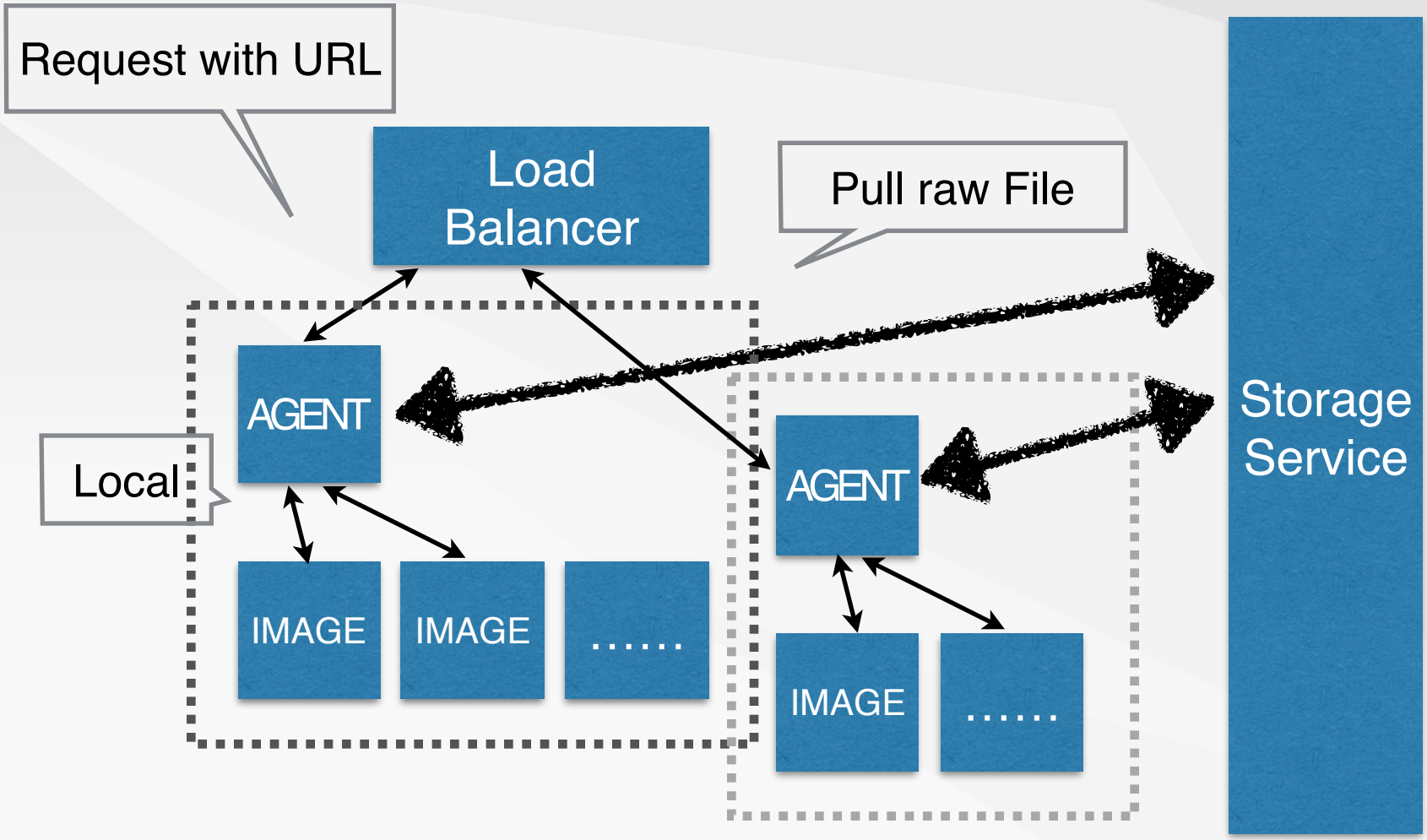
early FOP Bottlenecks

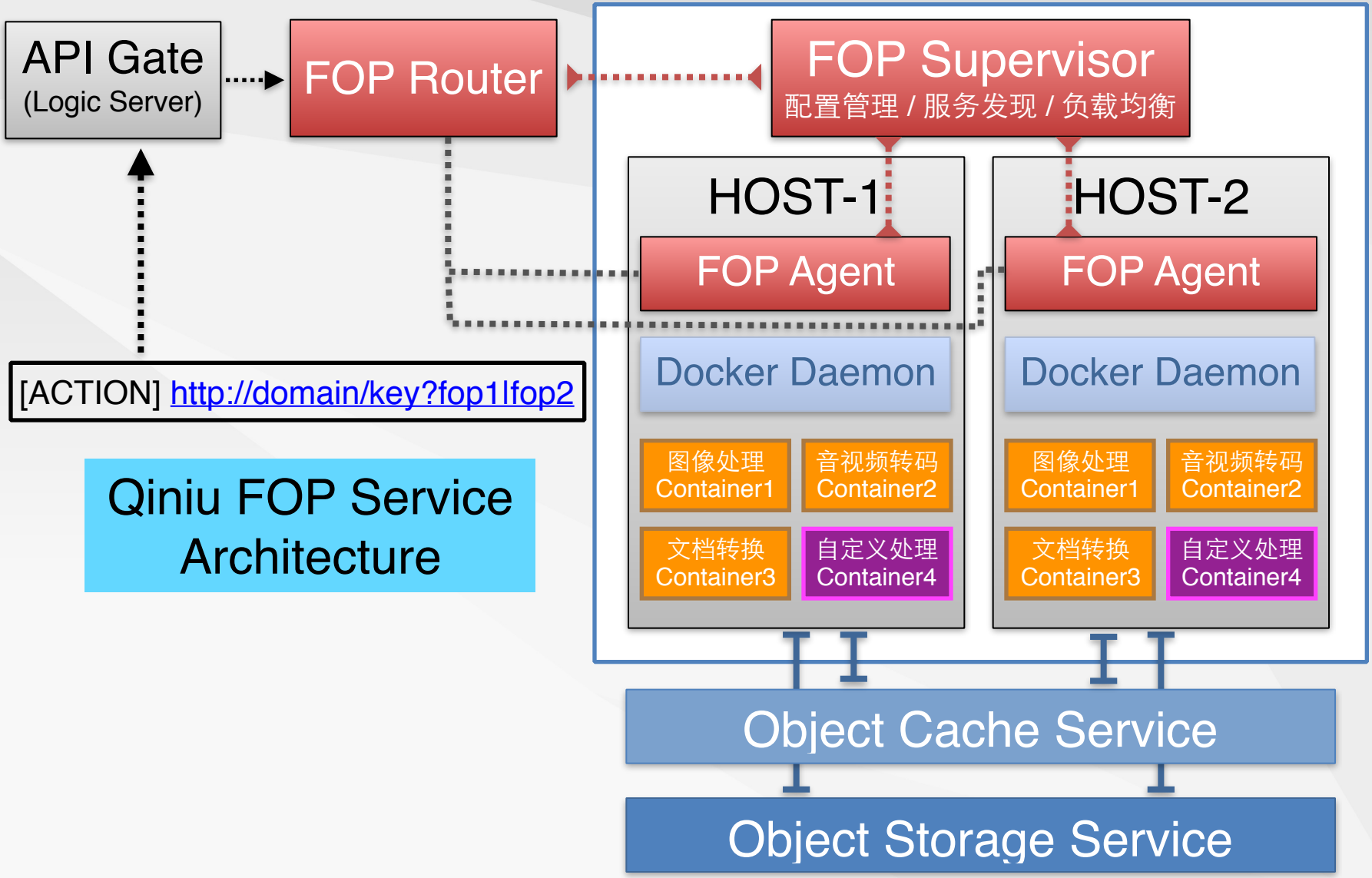


early FOP Bottlenecks Fix

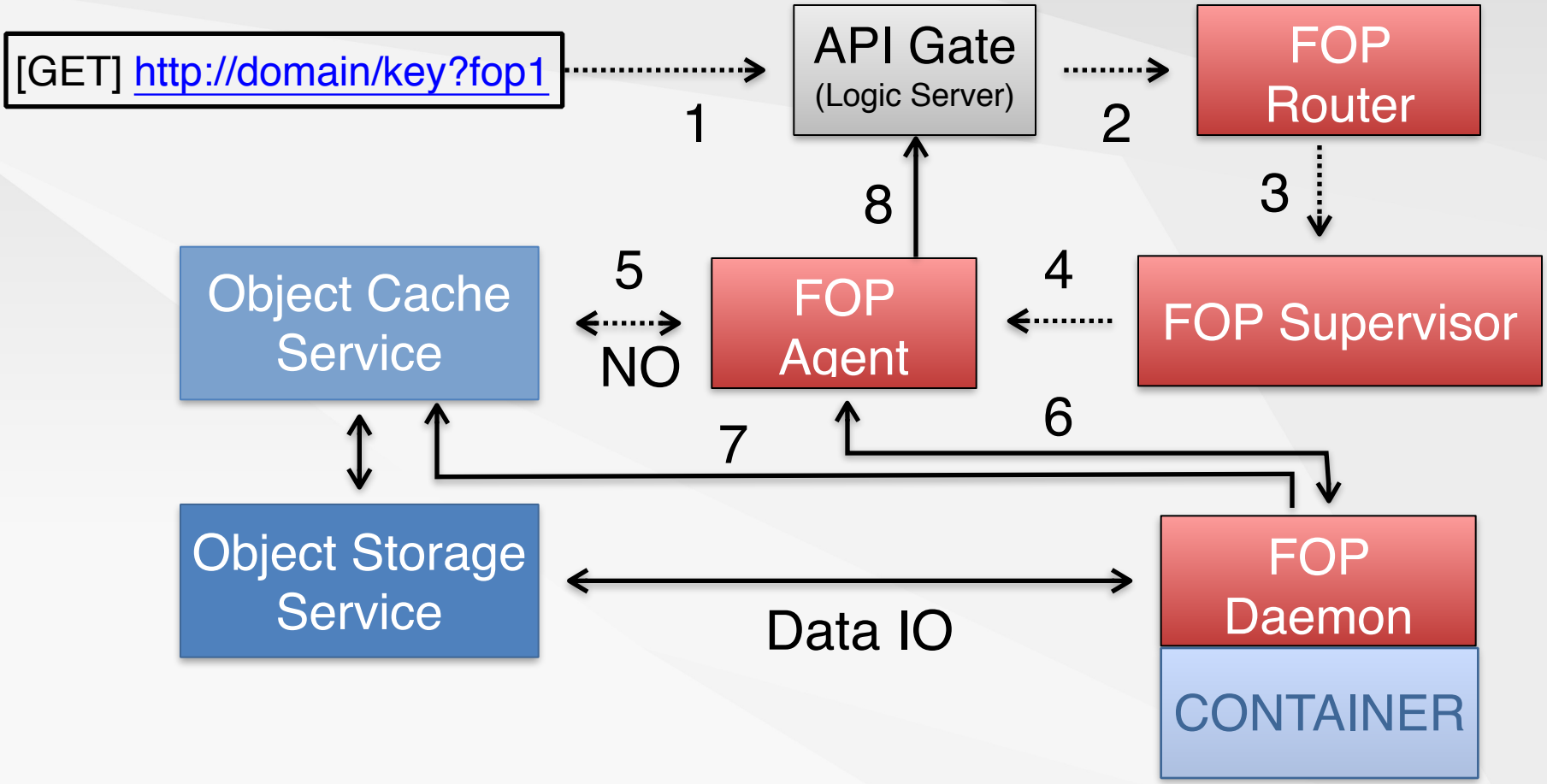


“nanoservices”




API Gate
(Logic Server)
FOP Router
FOP Supervisor
配置管理 / 服务发现 / 负载均衡
HOST-1
HOST-2
FOP Agent
FOP Agent
Docker Daemon
Docker Daemon
图像处理
Container1
音视频转码
Container2
文档转换
Container3
自定义处理
Container4
图像处理
Container1
音视频转码
Container2
文档转换
Container3
自定义处理
Container4
[ACTION] http://domain/key?fop1|fop2
Qiniu FOP Service
Architecture
Object Cache Service
Object Storage Service

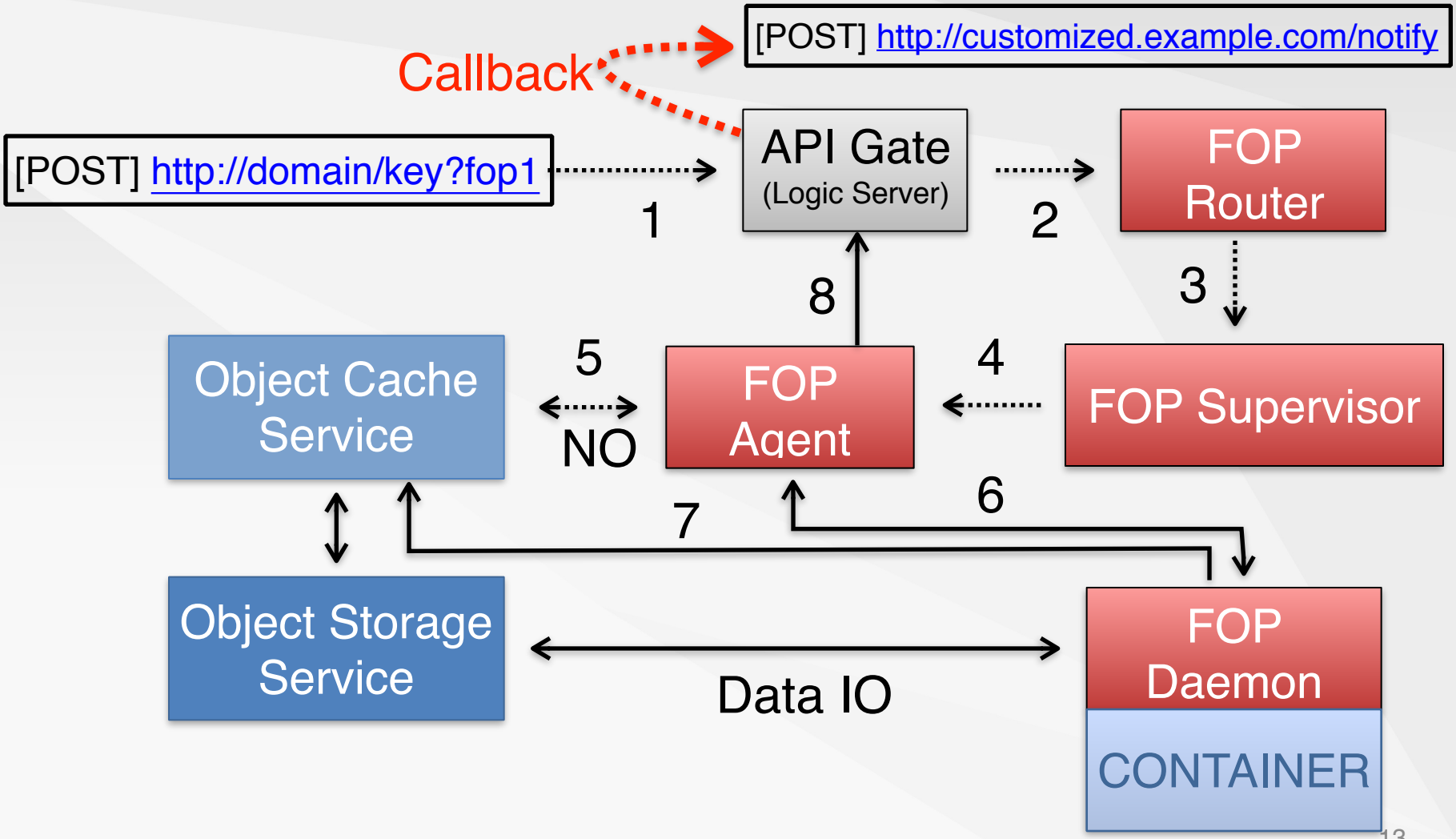
How FOP Works?



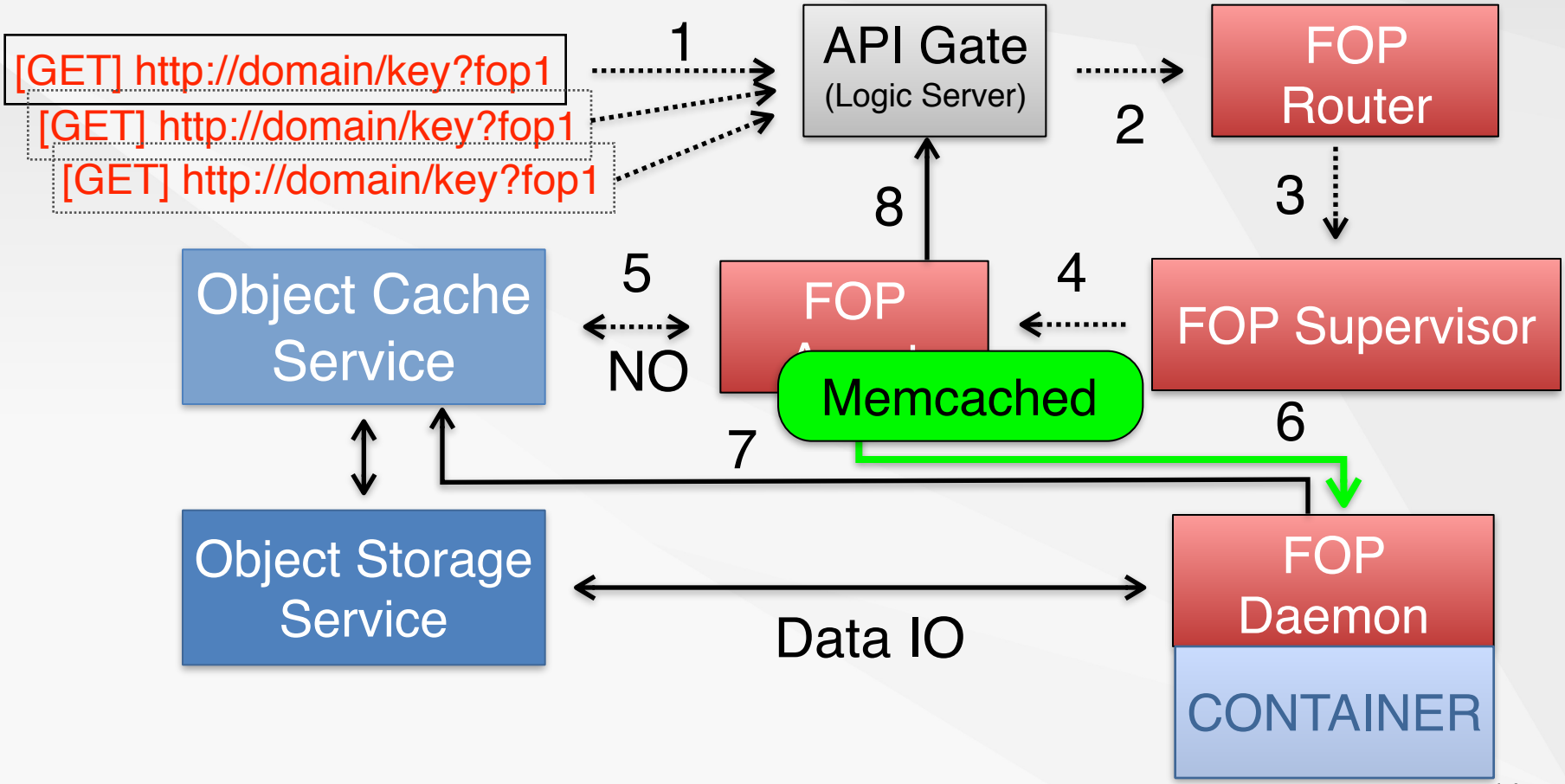
Questions

» FOP 离线计算怎么做?
» 同一个 FOP 并发请求怎么办?
» 多个 FOP 组合，工作流如何处理?
» FOP 程序（IMAGE）可以自定义吗?

How FOP Offline Works?



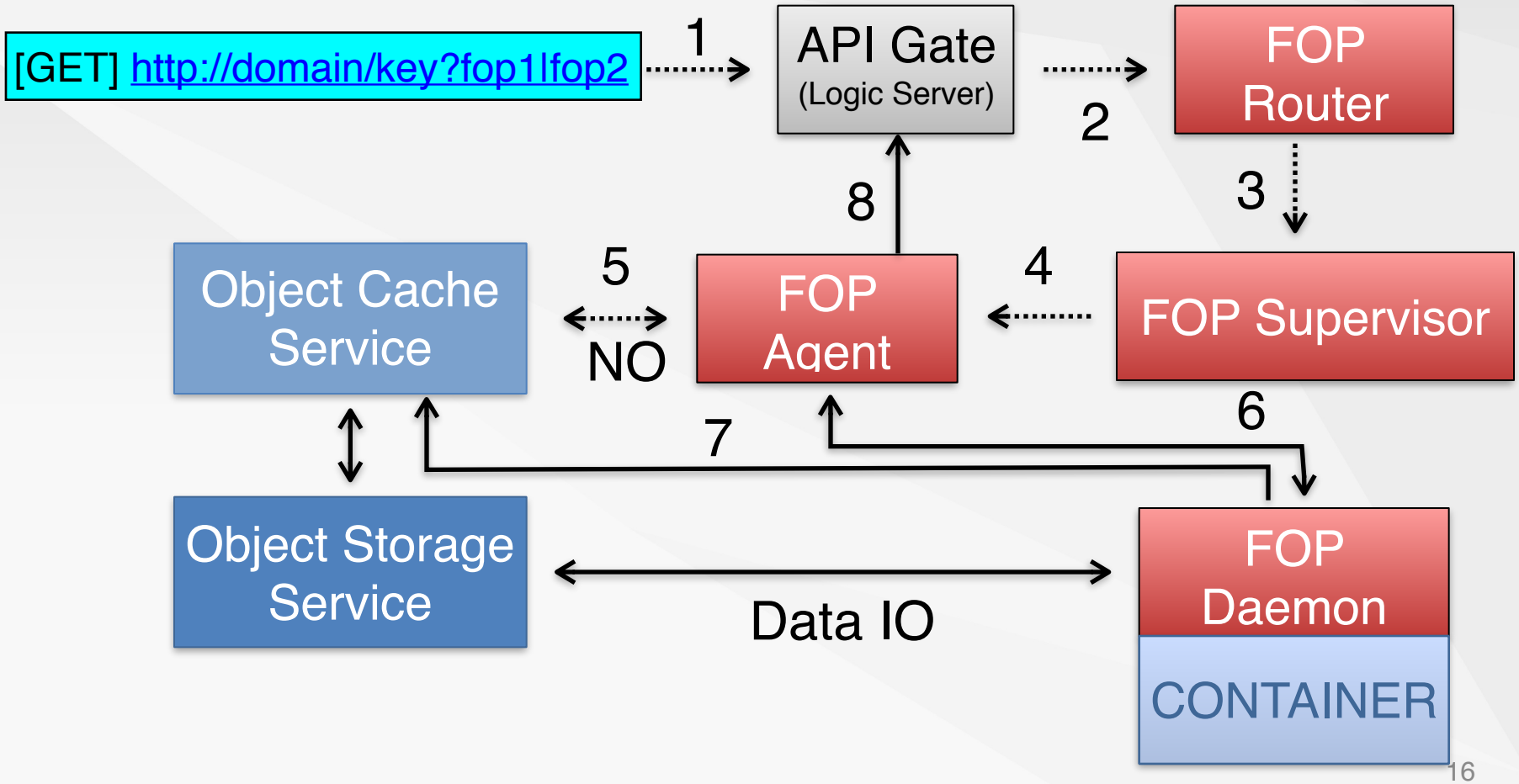
How FOP Concurrency Works?



Waiting for results

```
done := make(chan Result, 1)
go func() {
    ...
    done <- Result{}
}()
...
select {
case result := <-done:
    do(result)
case <- time.After(3 * time.Second):
    fmt.Println("timeout")
}
```

How Multi-FOP Works?



What is Multi-FOPs?

[ACTION] http://domain/key?fop1|fop2|fop3|...

从 Unix 谈起

- Unix 的连接和组合
  - app1 params1 | app2 params2
- App 接口
  - 输入： stdin, params
  - 输出： stdout
  - 协议： text (data stream)
- Pipeline
  - 将一个 app 的输出(stdout) 转为另一个 app 的输入 (stdin)

论 awk 编程与 Unix 管道艺术

200 GET ...
500 POST ...
200 GET ...
500 GET ...

HTTP CODE COUNTING

```
awk '{h[$1]++} END {for(k in h) print h[k], k}' test.log
```

```
cut -d' ' -f1 test.log | sort | uniq -c
```

Unix Pipelines

awk - pattern-directed scanning and processing language

cut -- cut out selected portions of each line of a file

sort - sort lines of text files

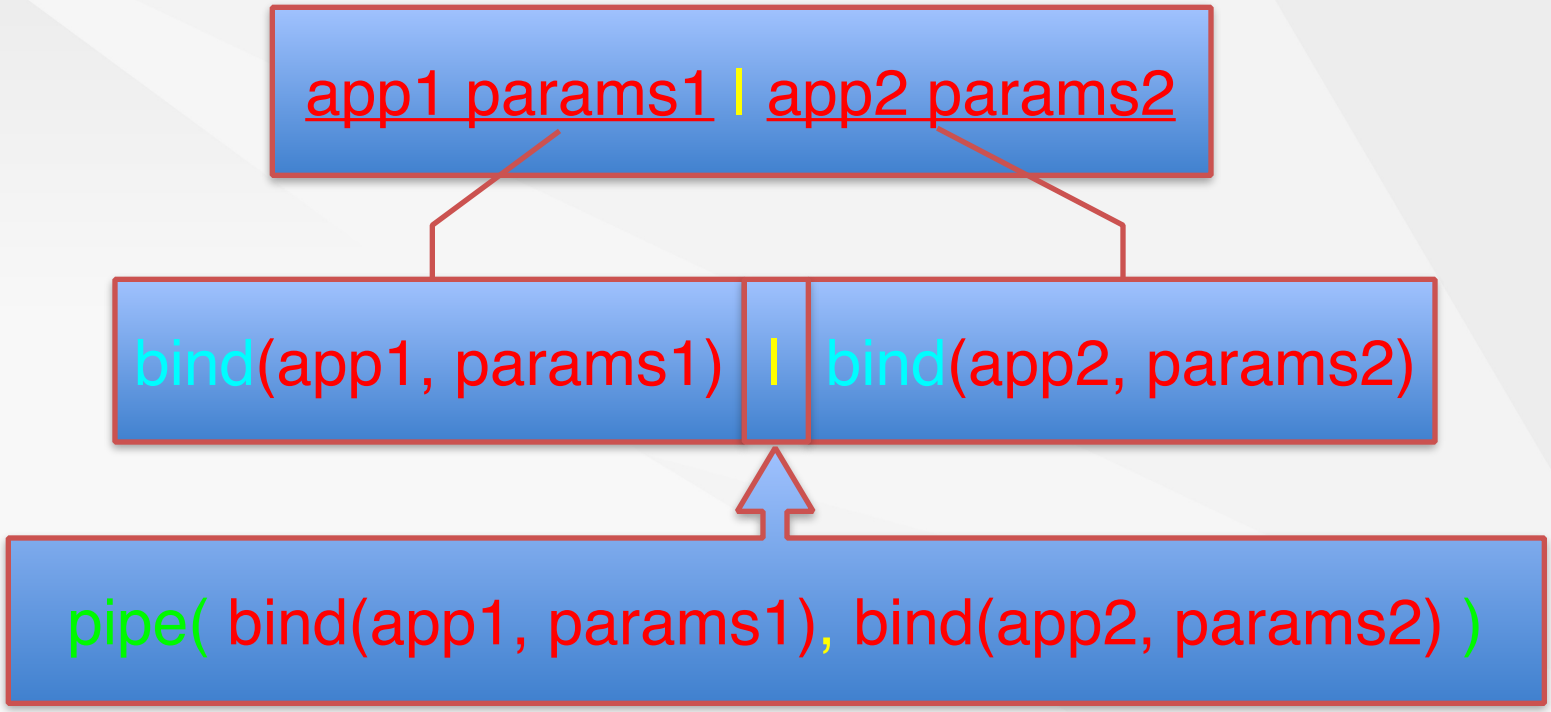
uniq -- report or filter out repeated lines in a file

Pipeline 关键点

- 多个 app 是并行执行的
  - 上游每产生一段output，会立即交由下游处理。
- app 间的协议是松散耦合的
  - 上游 app 的 ouput 是 xml 还是 json，下游 app 需要知晓，但是属于一种松散的耦合关系，并无任何强制的约束。

Go 对 Unix Pipeline 的仿真

- App
  - func(in io.Reader, out io.Writer, args []string)



Go 对 Unix Pipeline 的仿真

```
func bind(
    app func(in io.Reader, out io.Writer, args []string),
    args []string
) func(in io.Reader, out io.Writer) {

    return func(in io.Reader, out io.Writer) {
        app(in, out, args)
    }
}
```

Go 对 Unix Pipeline 的仿真

```
func pipe(
    app1 func(in io.Reader, out io.Writer),
    app2 func(in io.Reader, out io.Writer)
) func(in io.Reader, out io.Writer) {

    return func(in io.Reader, out io.Writer) {
        pr, pw := io.Pipe()
        defer pw.Close()
        go func() {
            defer pr.Close()
            app2(pr, out)
        }()
        app1(in, pw)
    }
}
```

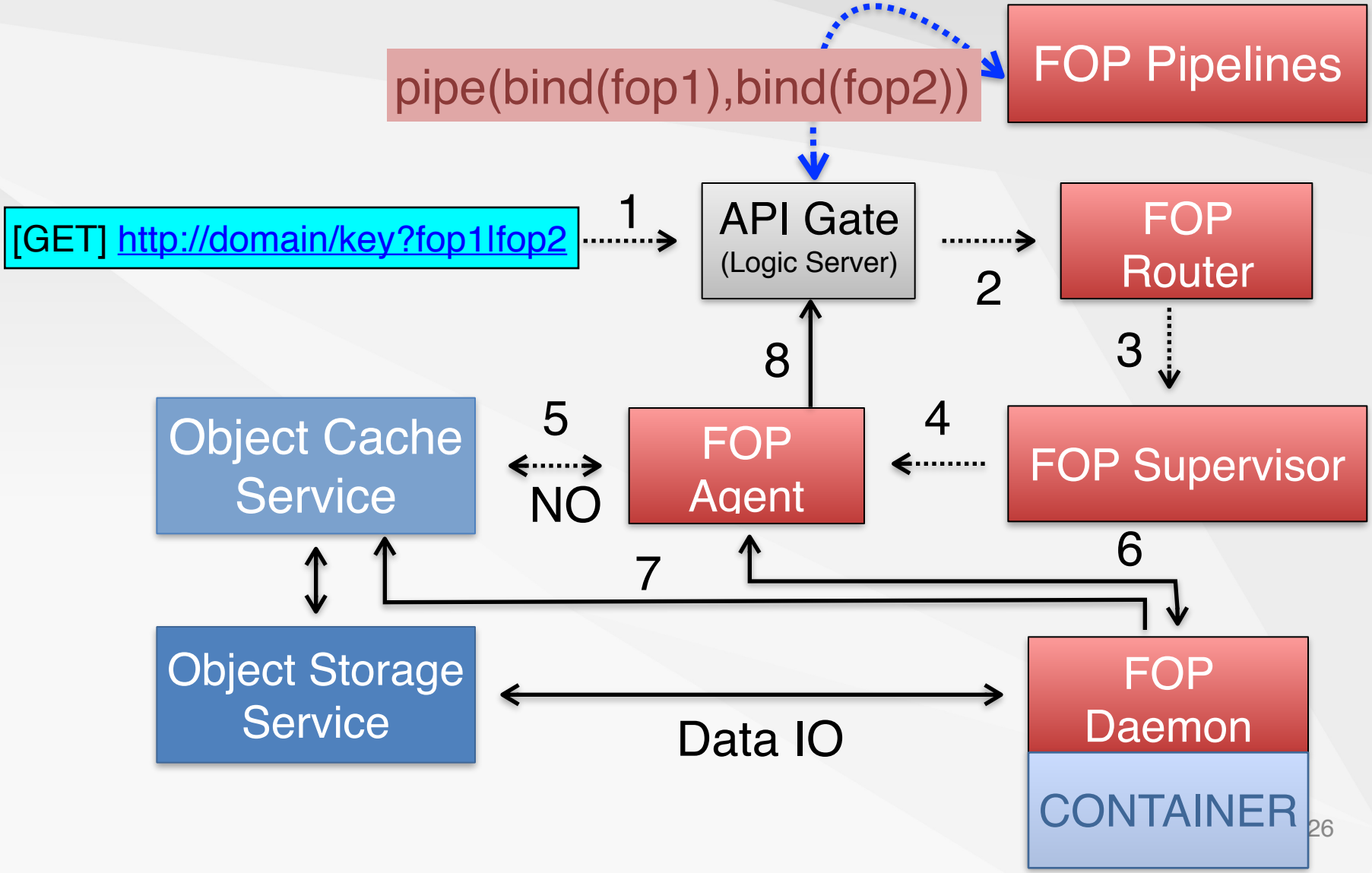
Go 对 Unix Pipeline(s) 的仿真

```
func pipe(apps ...func(in io.Reader, out io.Writer)) func(in io.Reader, out io.Writer) {

        if len(apps) == 0 { return nil }
        app := apps[0]
        for i := 1; i < len(apps); i++ {
                app1, app2 := app, apps[i]
                app = func(in io.Reader, out io.Writer) {
                        pr, pw := io.Pipe()
                        defer pw.Close()
                        go func() {
                                defer pr.Close()
                                app2(pr, out)
                        }()
                        app1(in, pw)
                }
        }
        return app
}
```

难以想象的优雅!

Multi-FOP Works



FOP 程序可以自定义吗?

- Pipelined FOP services
- User-defined FOP service (Docker)

自定义数据处理 UFOP

- UFOP：“用户自定义的数据处理进程”
- 基于 Docker
- 面向对象存储做就近计算处理
- UFOP 程序可以是自行部署，也可以选用七牛 UFOP 公共平台上已有的服务程序。
- Docker 为部署自定义 Image 提供了可能性

UFOP 案例

https://hd.qiniu.com/nrop2015/

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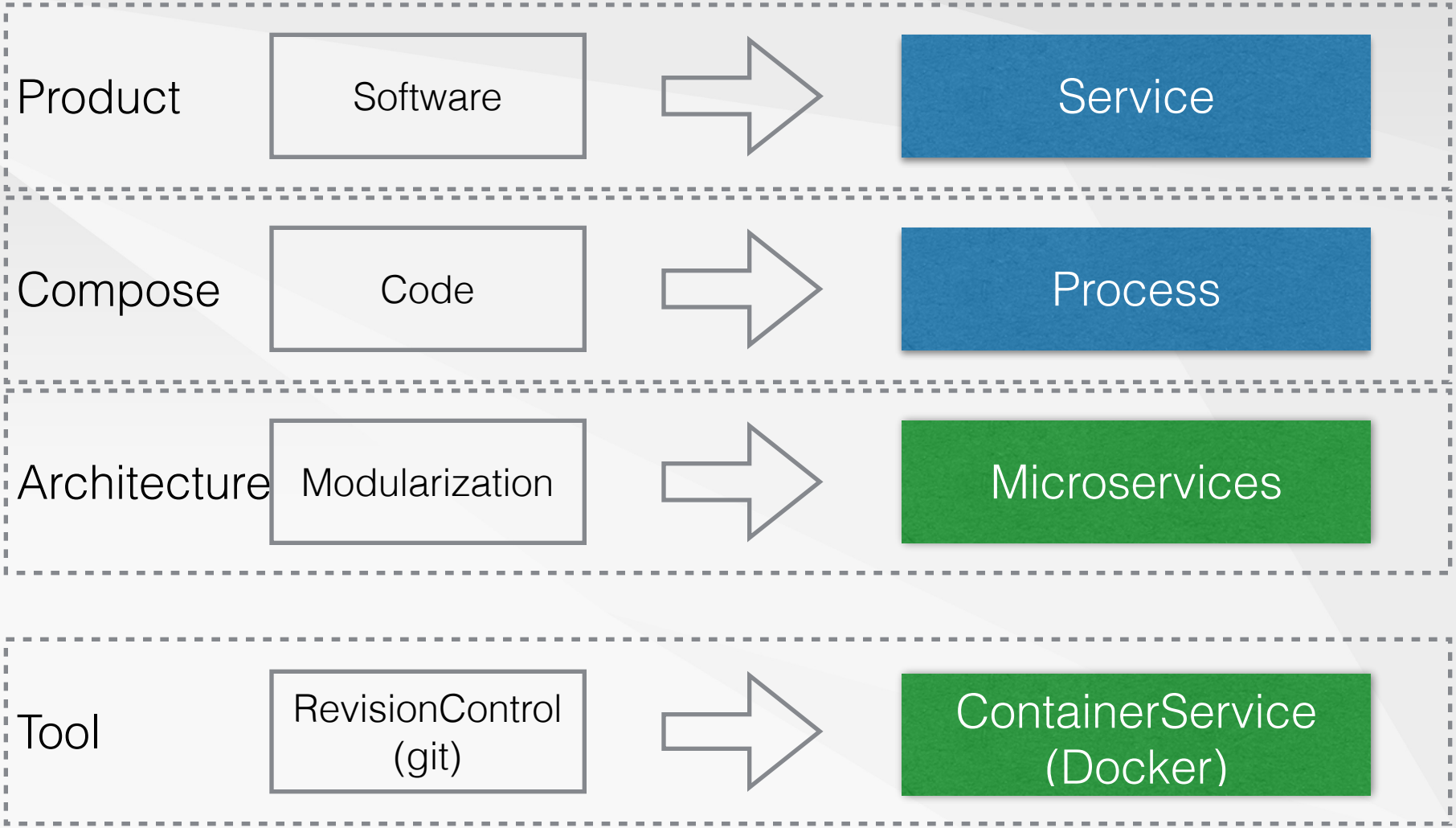
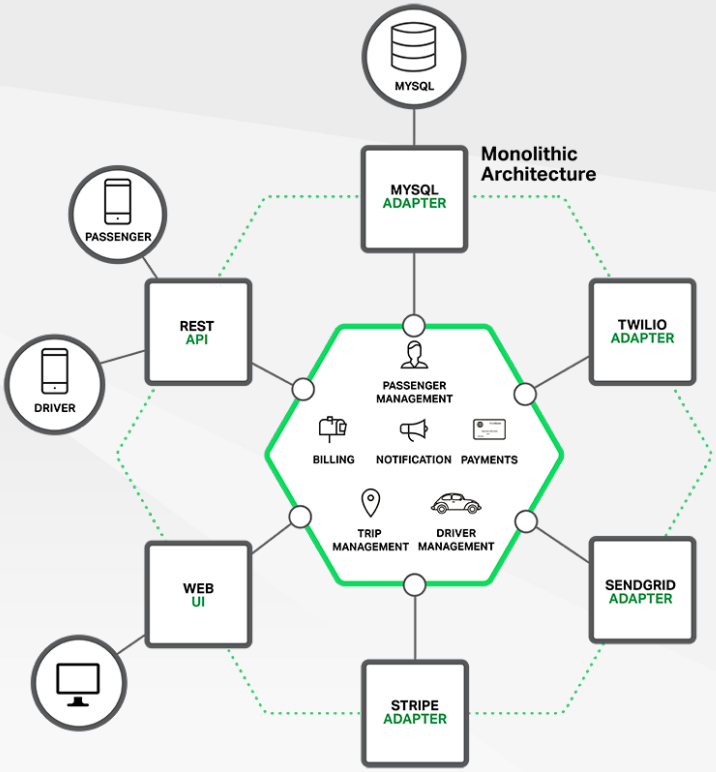
UFOP 不可以做什么

- 不可以作为网站主机。因为 UFOP 没有 IP:PORT，只能通过 URL?ufop_api_args 形式调用。其中 ufop_api_args 由 UFOP 程序自定义。
- 只要数据存在七牛，针对该数据的各种特征计算处理，都可以使用 UFOP 实现。
- UFOP 也可与 七牛云 平台上的其他 FOP 无缝集成，管道链式处理: fop1 | fop2 | app3 | appN | …

Why Docker

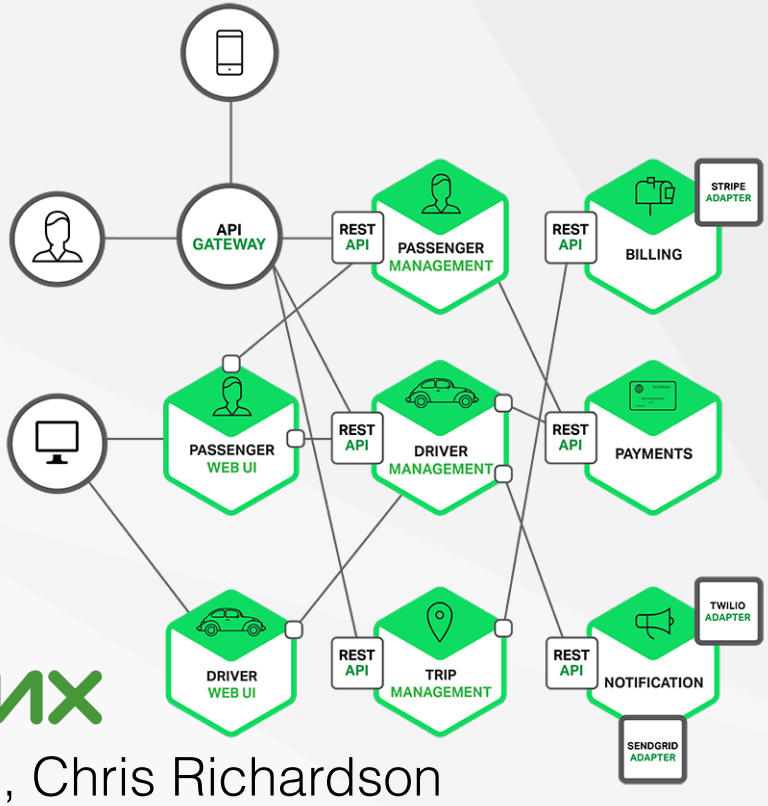

Product
Software
Service
Compose
Code
Process
Architecture
Modularization
Microservices
Tool
RevisionControl
(git)
ContainerService
(Docker)

软件架构变迁



Monolithic Application

Microservices



NGINX

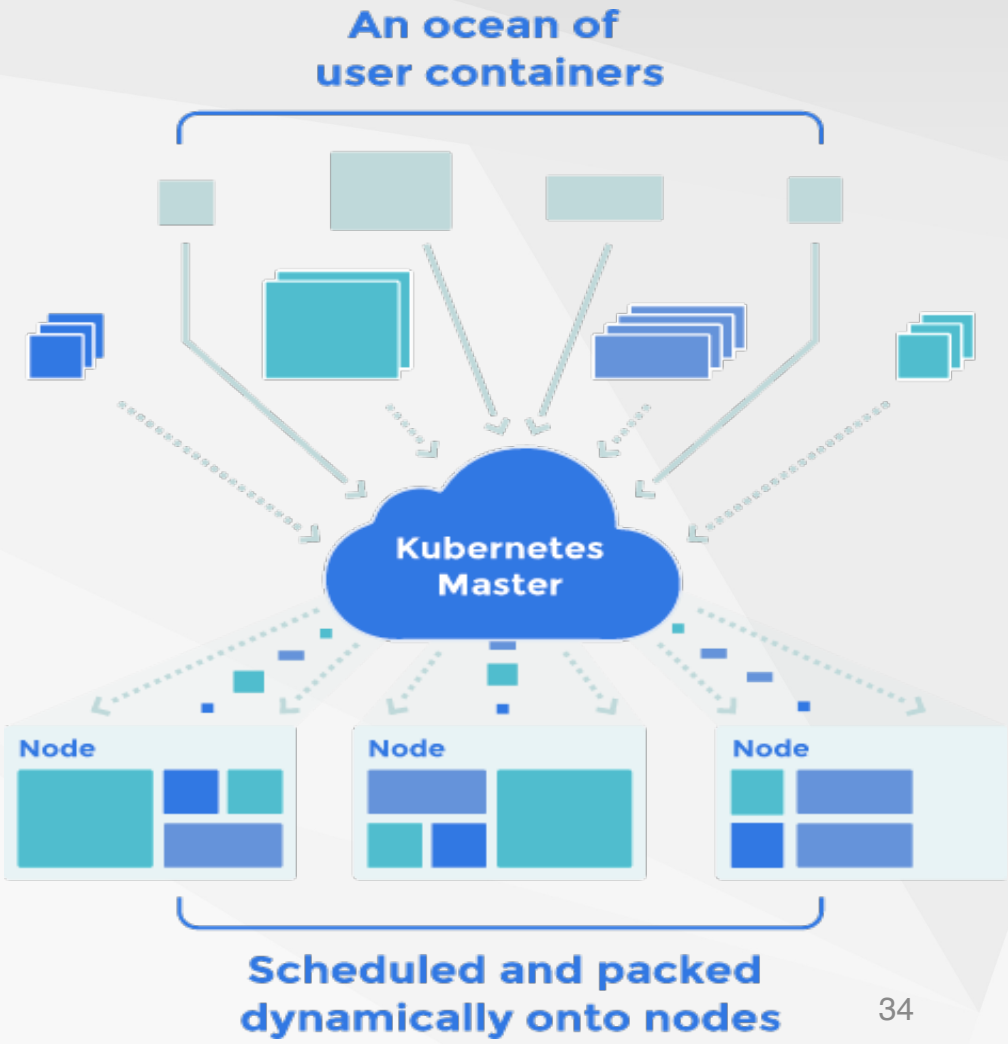
– Introduction to Microservices, Chris Richardson

Why not Docker

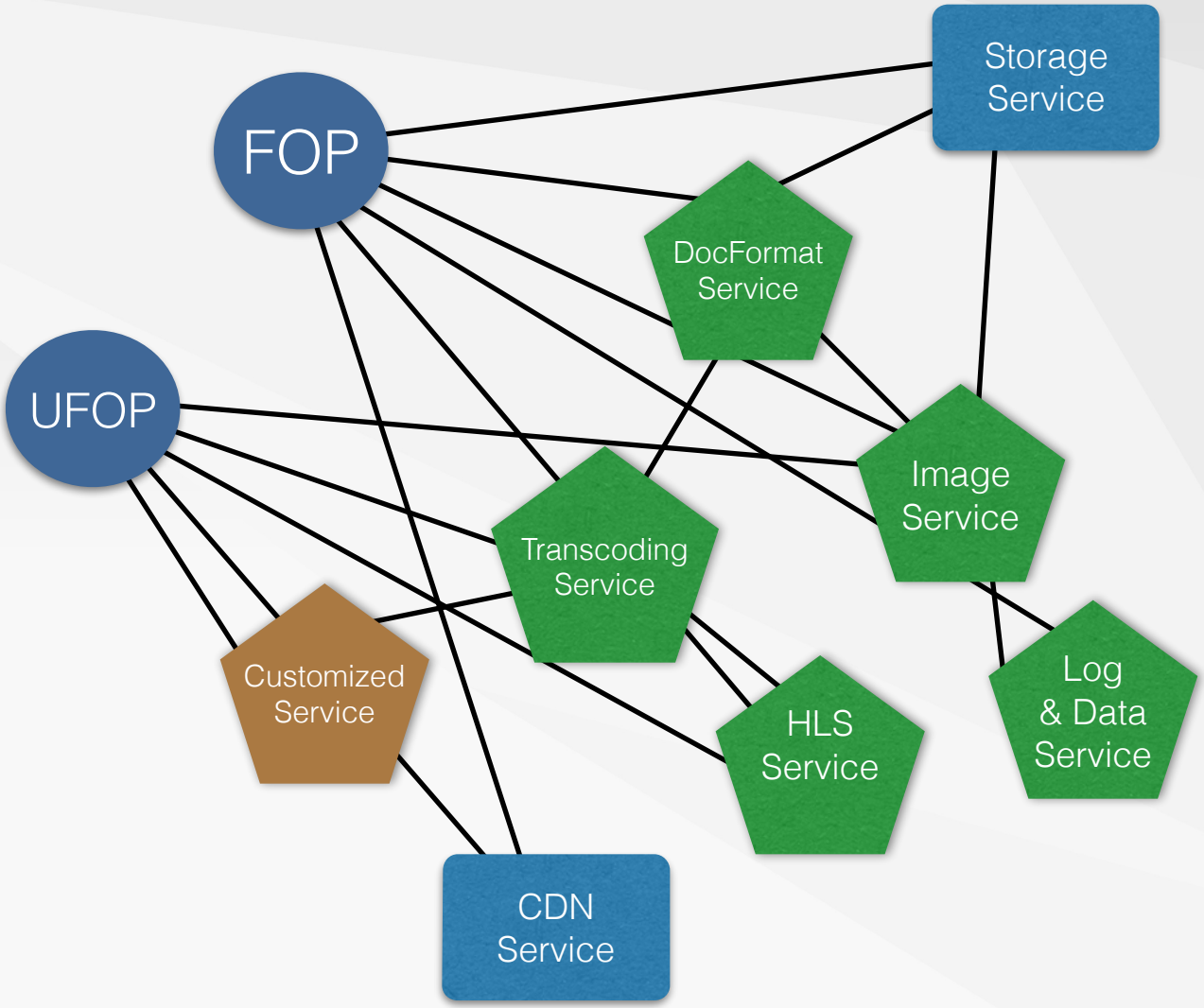
- 容器技术提供的隔离性，物理边界机制和微服务的理念是契合的。
- 拆细/封装了环境和实现。不同的技术，不需要知道里面是怎样的，只关心接口。
- 然而还不够，没有解决服务运维问题。是以出现官方的工具链。
- 没有运维的解决方案，如同空中楼阁。
- Kubernetes, 谷歌去年公开的容器编排系统。领先十年，omega/borg 论文分量。
- 旨在解决容器运维问题。定义状态，而非关心过程。
- 其他问题：存储、网络 硬伤。

Kubernetes

- Master
- Minion(Kubelet)
- Pods
- Replication Controller
- Labels
- Service - Proxy



FOP as-nanoservices



THANKS