

基于kubernetes的企业级容器云

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促进软件开发领域知识与创新的传播



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2017年7月7-8日 深圳·华侨城洲际酒店

咨询热线：010-89880682



全球软件开发大会 [上海站]

2017年10月19-21日

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+ 大纲

- 背景和挑战
- 企业级容器云设计与思考
- 让一切自动化
- 监控与日志
- Showcase
- 那些坑，那些事

+ 背景和挑战

- IT环境比较复杂
- 集中运维模式，人少活多
- 应用类型比较复杂
- 缺少标准和规范

+ 背景和挑战

• 内部系统演进



01

脚本化

每个项目自维护
难以规范和升级



02

工具化

抽象成工具
模板化
一键化
零散，不成体系



03

平台化

多个工具集成
最佳搭配
合力作战



+ 背景和挑战

• 挑战

依然不够自动化
服务割裂，申请流程
人工参与的半自动化

资源使用率低
底层资源使用率低



规范落地困难

系统分散，难以统一

自服务平台

高效协作，加速迭代

+ 背景和挑战

• 容器之道



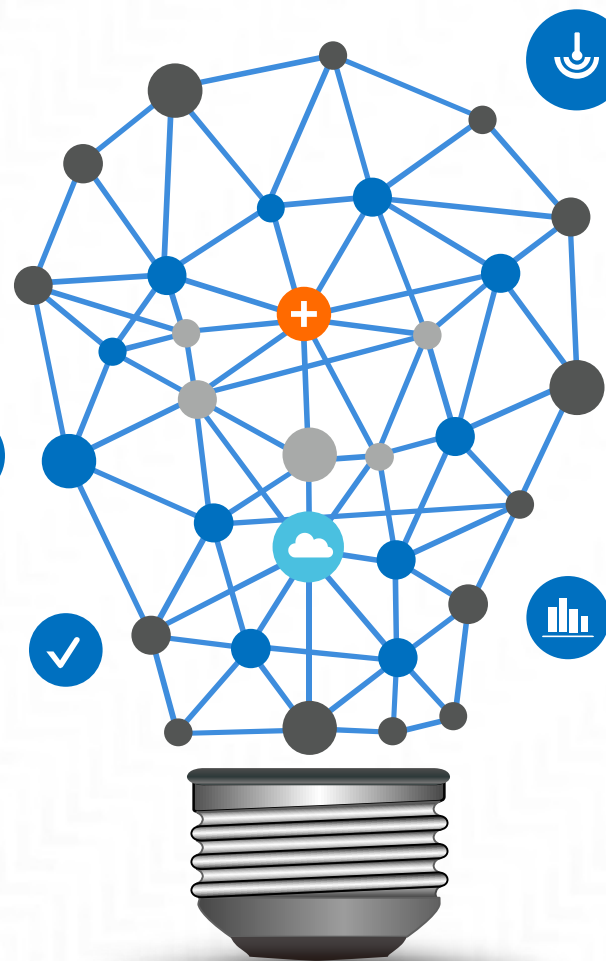
+ 企业级容器云设计与思考

• 设计思路

从成本方面衡量
资源利用率，人力成本，投入产出比



从长远技术方向考虑
未来方向，新技术潮流，公司战略



从需求出发
需求驱动，勿求大而全，没有银弹



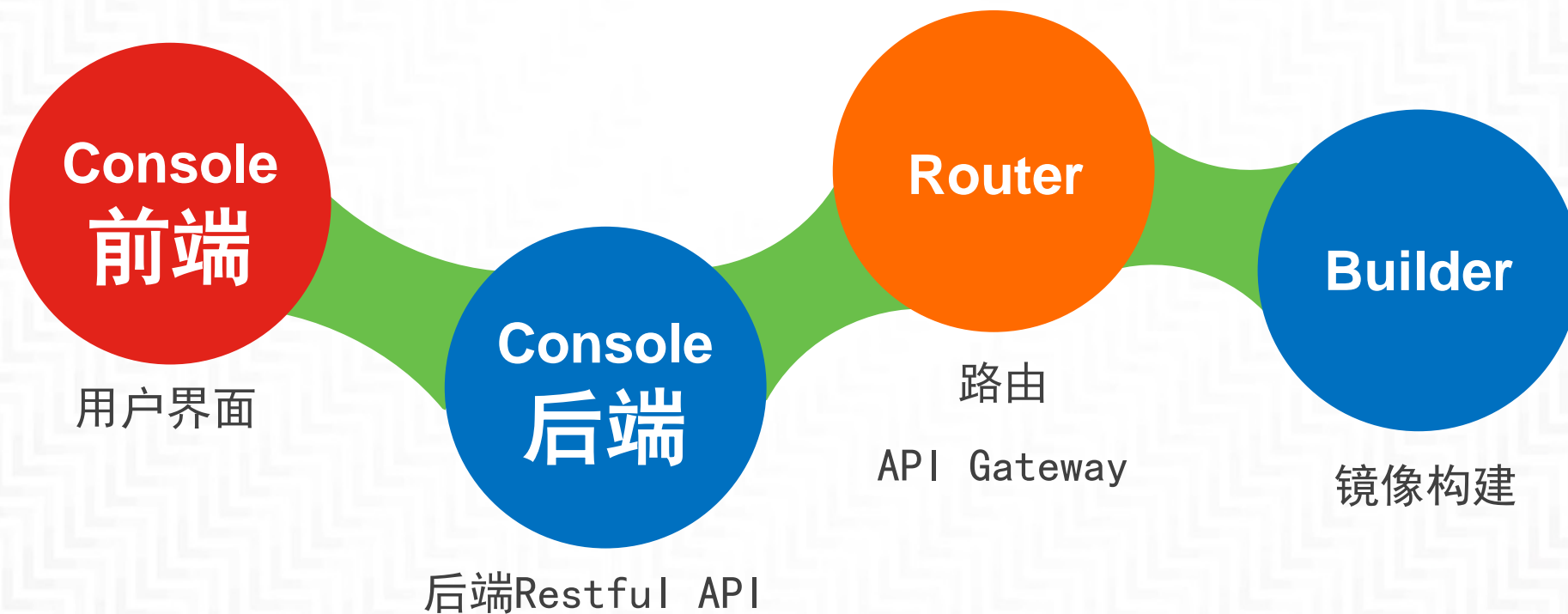
从用户的角度思考
简单，学习成本低，改变成本小



从技术的角度评估
高效，稳定，可扩展

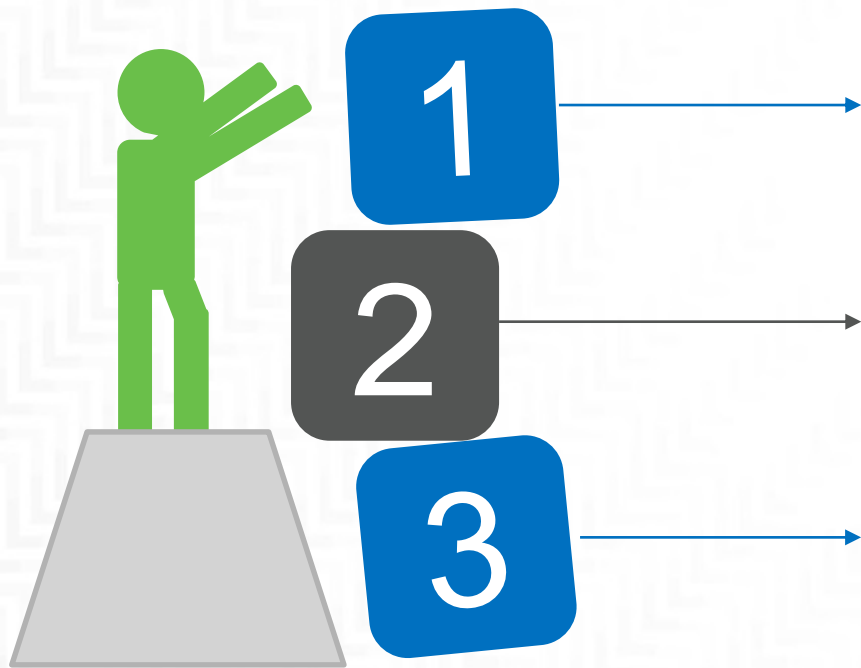
+ 企业级容器云设计与思考

- 技术的抉择



+ 容器云设计--多集群支持的容器云

- What?
 - 多个K8S容器云集群统一管理
- Why?



跨数据中心

技术和管理难度大

混合基础架构

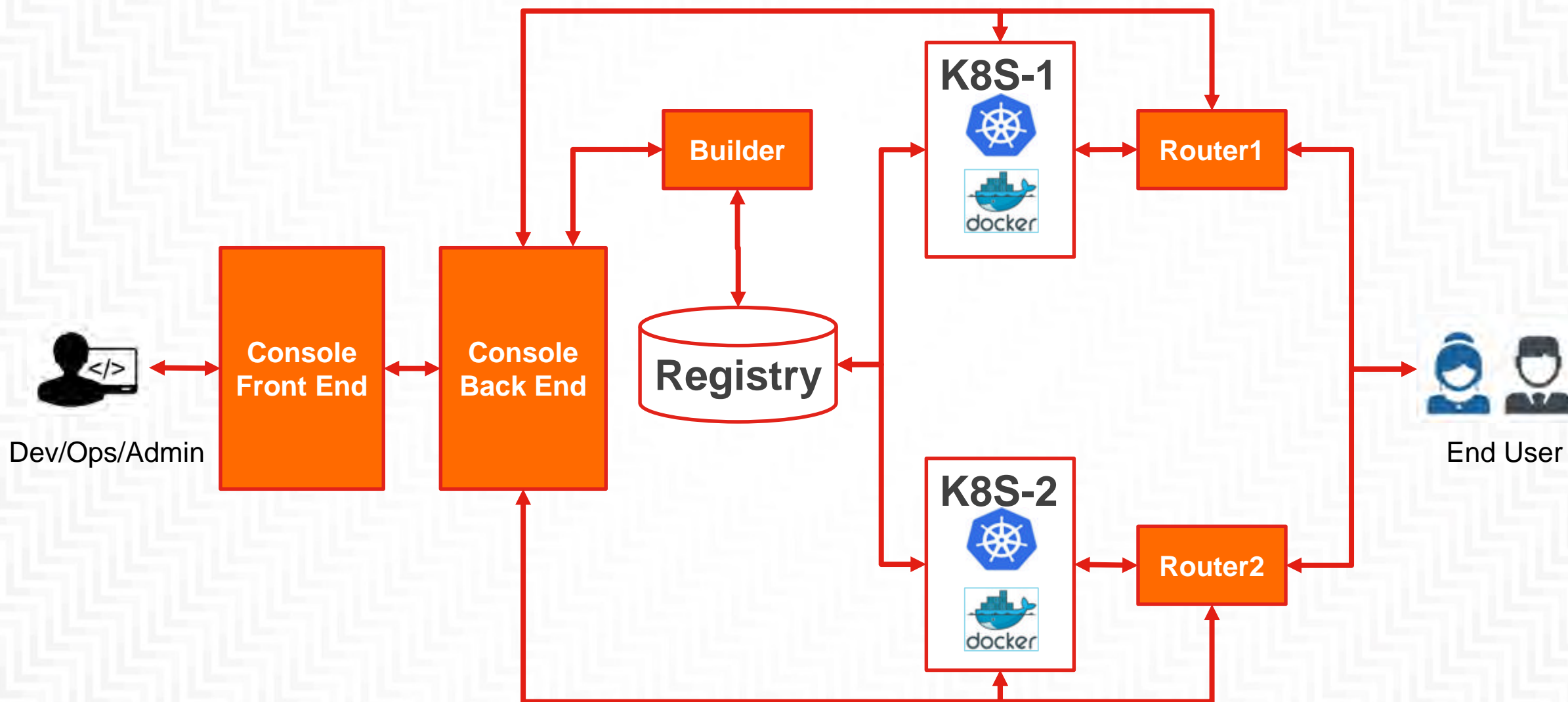
物理机, VMWare, OpenStack, AWS, Azure

统一用户体验

多集群统一管理, 无需切换平台系统

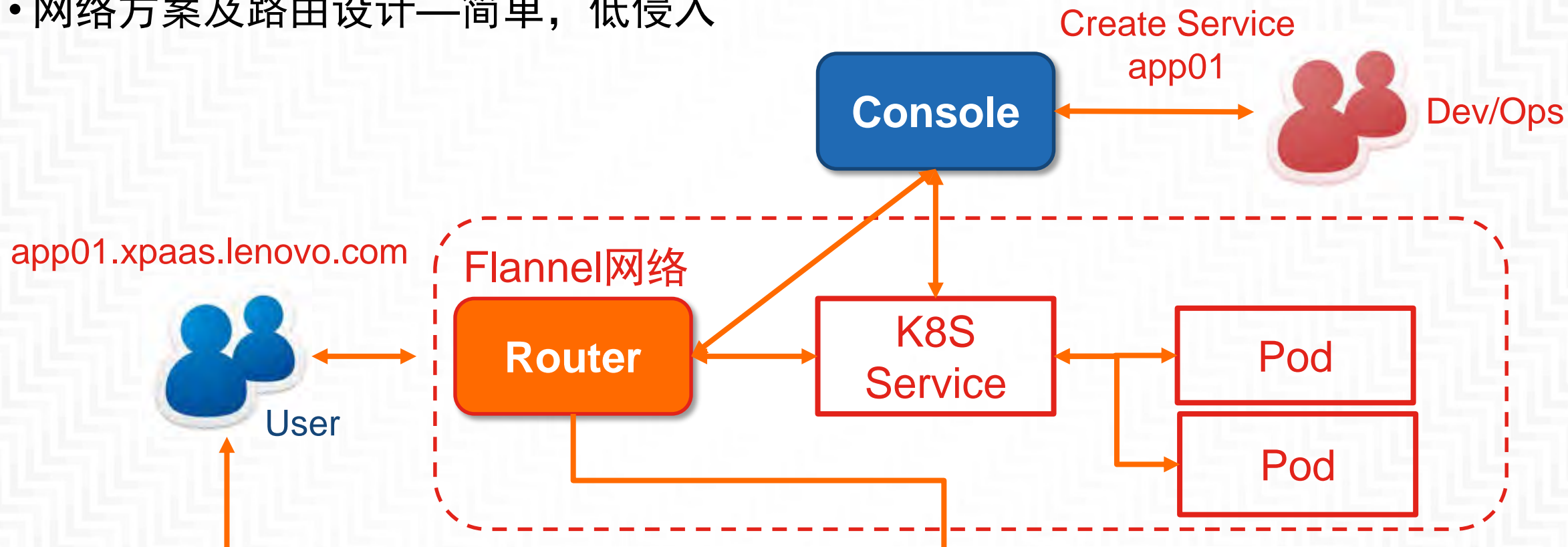
+ 容器云设计--多集群支持的容器云

- 多集群，一平台



+ 容器云设计—网络和路由

- 网络方案及路由设计—简单，低侵入

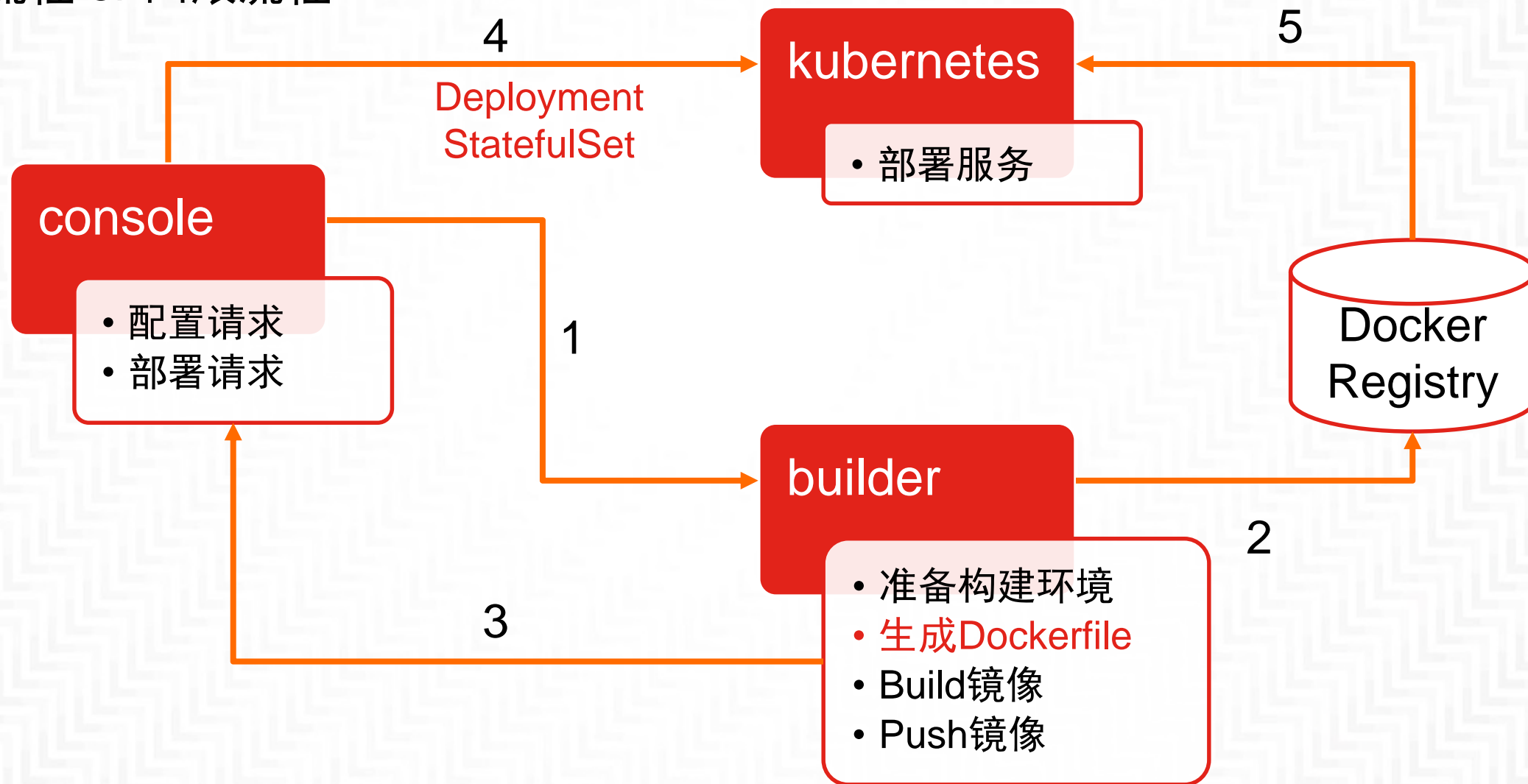


***.xpaas.lenovo.com Router IP**

Service Name	K8S Cluster IP
app01.xpaas.lenovo.com	172.19.228.1
app02.xpaas.lenovo.com	172.19.228.2
...	...

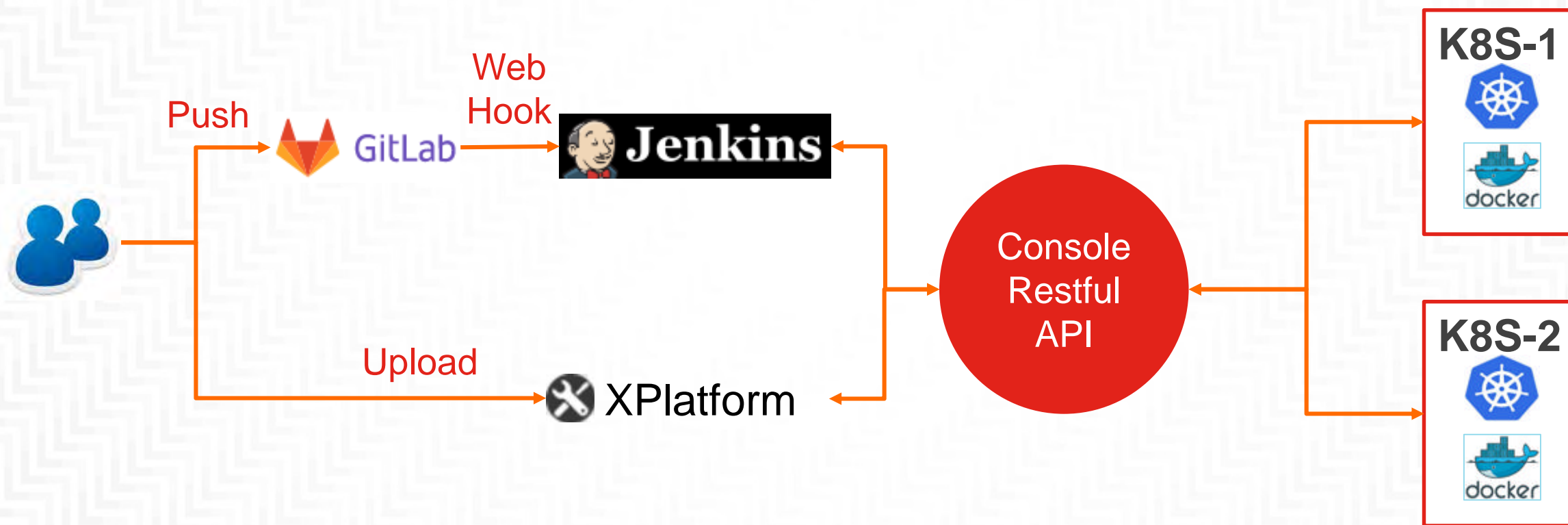
+ 容器云设计—部署和回滚

• 部署流程 or 回滚流程



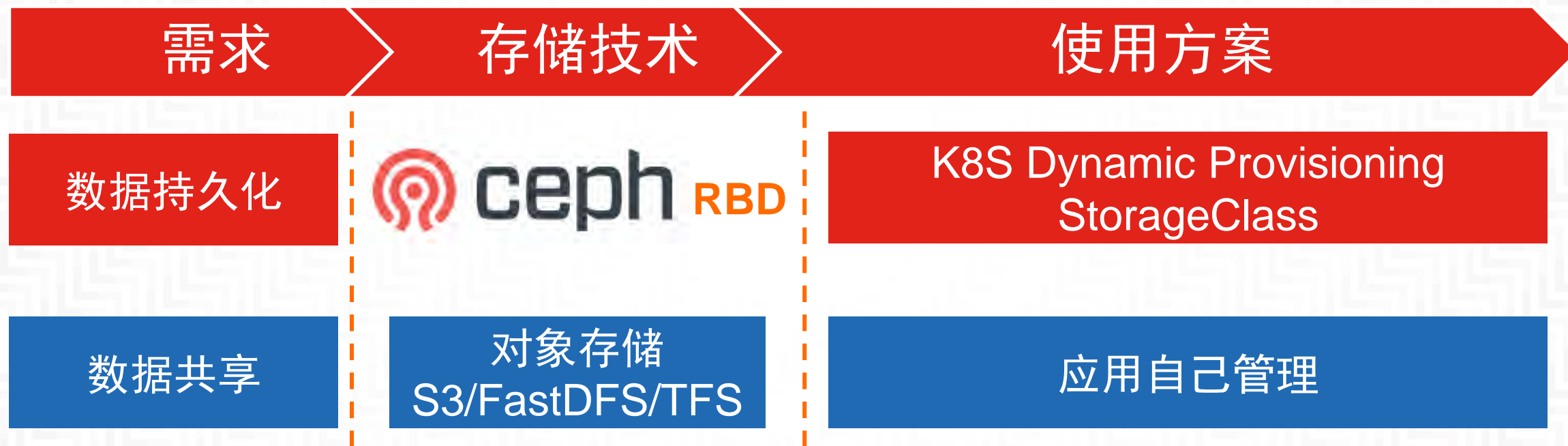
+ 容器云设计-- DevOps的支持

- 常用DevOps工具的支持，快速融入现有开发体系



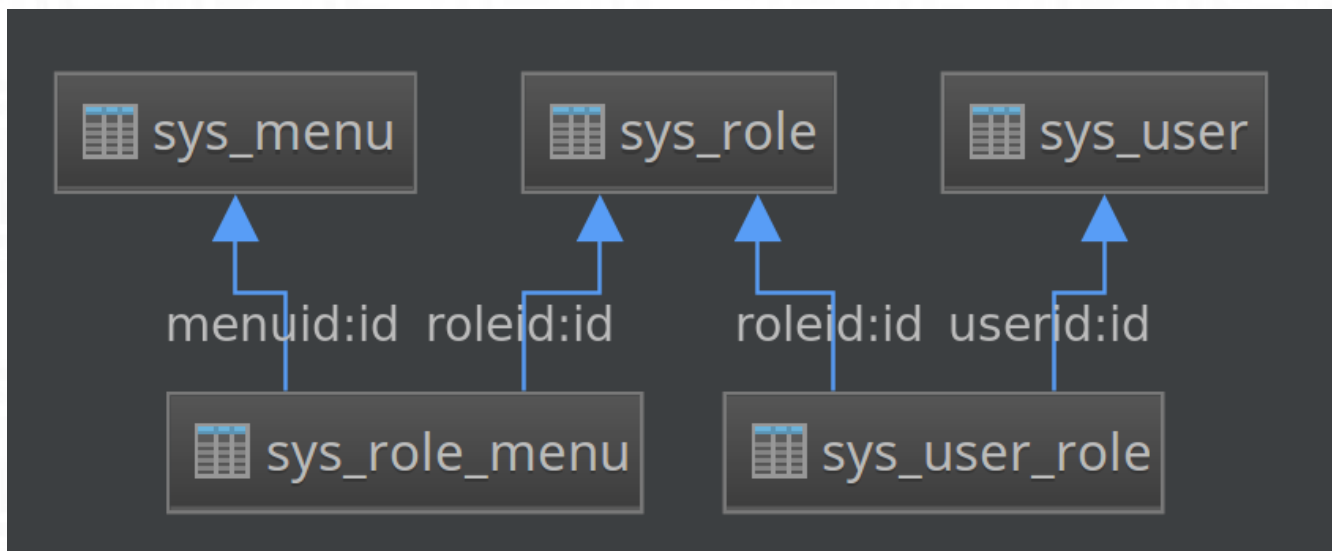
+ 容器云设计- 存储方案

- 存储方案选择，主要给服务组件提供服务，如MySQL， Redis等



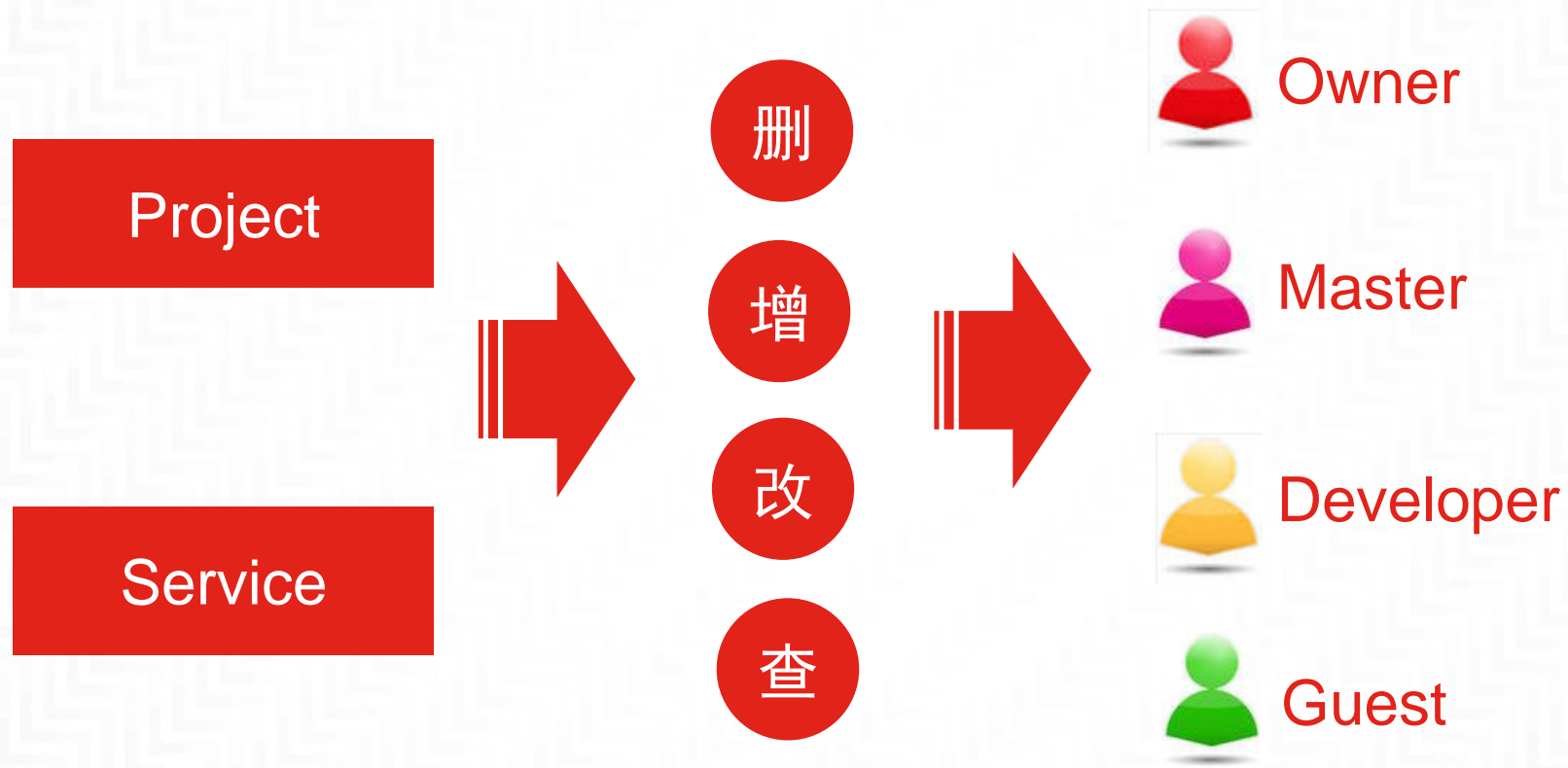
+ 容器云设计-- 企业权限设计

- 功能权限：允许或拒绝用户使用系统提供的某个功能



+ 容器云设计-- 企业权限设计

- 业务权限/数据权限：允许或拒绝用户进行某个数据的增删改查操作



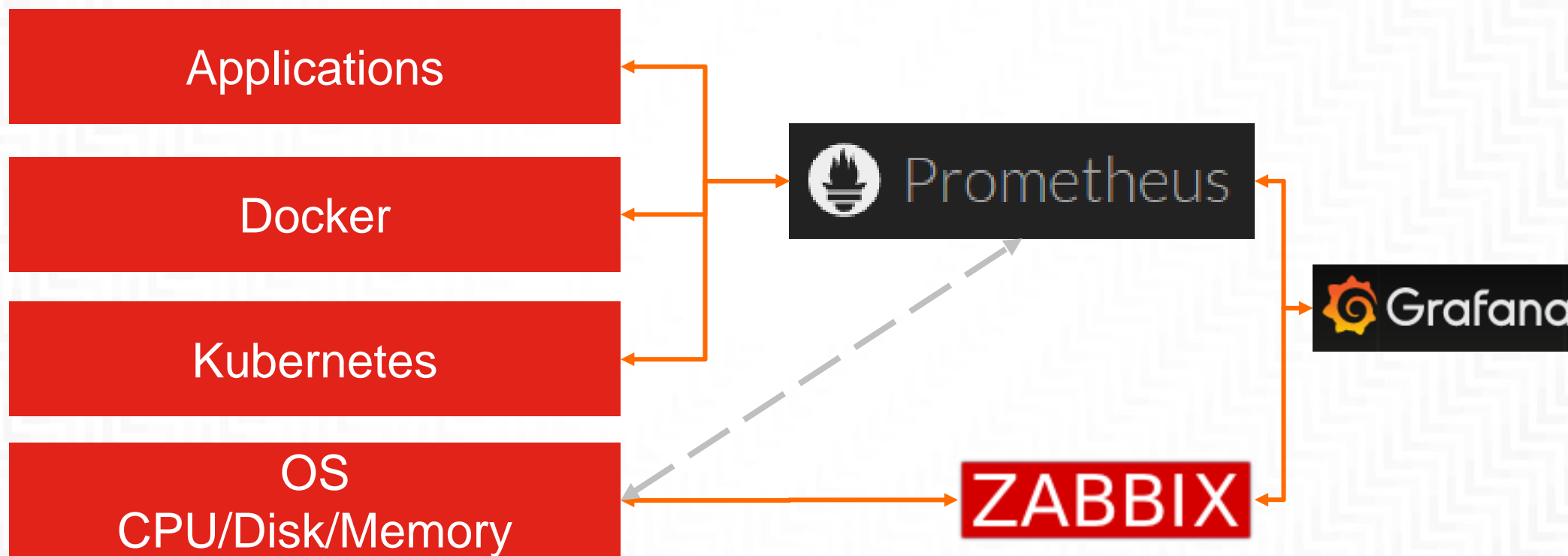
⊕ 让一切自动化--工欲善其事，必先利其器

- 从设计开始之初就把自动化理念融入进来
- 充分利用Docker的优势，加速平台的迭代
- 配置即代码



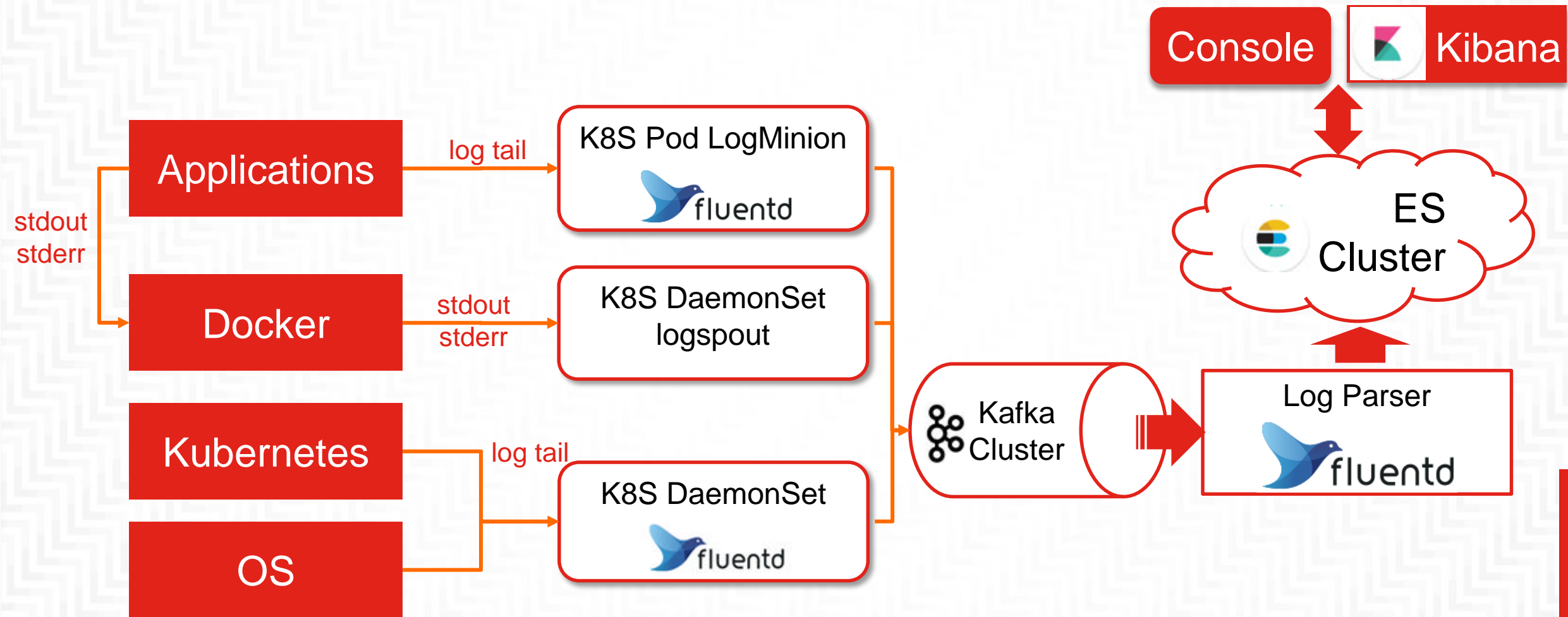
+ 监控与日志

- 监控：传统监控+新监控平台



+ 监控与日志

- 日志平台：多种采集手段并行



+ Showcase

• 平台主要功能特点

- 多集群管理
- 自服务式应用发布和上线部署
- 应用快速Scale Out
- 应用滚动更新
- 集群容器登陆
- 应用日志查看
- 支持MySQL/Redis等常用组件服务市场

+ Showcase

- 部署示例：配置简单，自服务

Deployment Info You're Owner

Type	Port	Domain	Operation
Public	80>HTTP>8080	http://myapp.earth.xpaas.lenovo.com	

Statistic

1 DEPLOYMENTS

2/2 Pods

Information

Project: [user-zhoucq1](#)
Application: MyApp
Landscape: PROD
Created At: 2017/04/10 00:06:12
Updated At: 2017/04/10 00:06:12

完成部署上线

Pod List Cluster Info Dockerfile Deployment Configuration

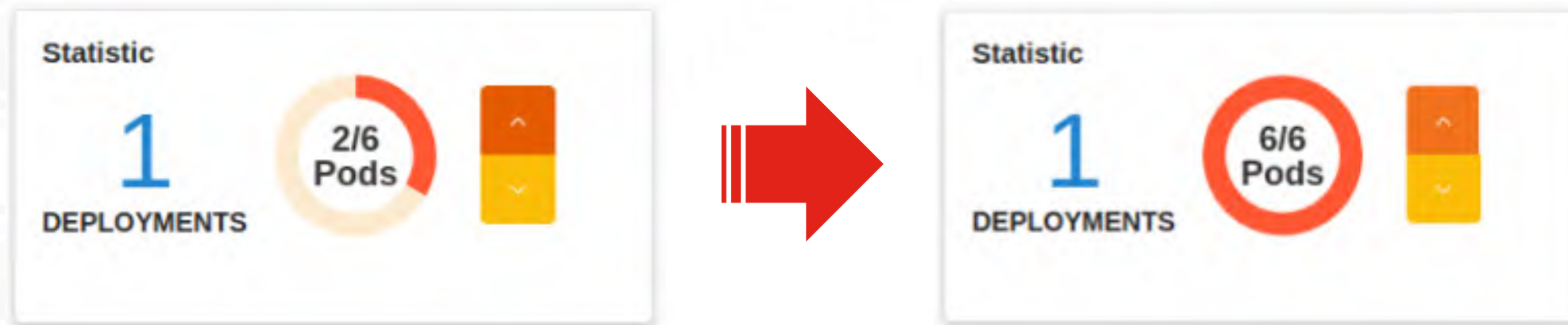
Pods

Name	Status	Created At	Cluster IP	CPU	Memory	Restart	State	Deployment ID	Option
service-251-2903700986-axa90	Running	2017-04-09T16:07:17Z	172.16.76.26			0	new	deployment-484	≡ ▶
service-251-2903700986-hm3ud	Running	2017-04-09T16:07:17Z	172.16.91.28			0	new	deployment-484	≡ ▶

```
2017-04-10 00:07:15: Start to deploy service to kubernetes...
2017-04-10 00:07:15: Deploy service to kubernetes successfully!
```

+ Showcase

- Scale Out横向扩展：简单，快速



```
{"spec":{"replicas":"6"}}
```

+ Showcase

• 滚动更新：实时查看更新进度

Pod List Cluster Info Dockerfile Deployment Configuration

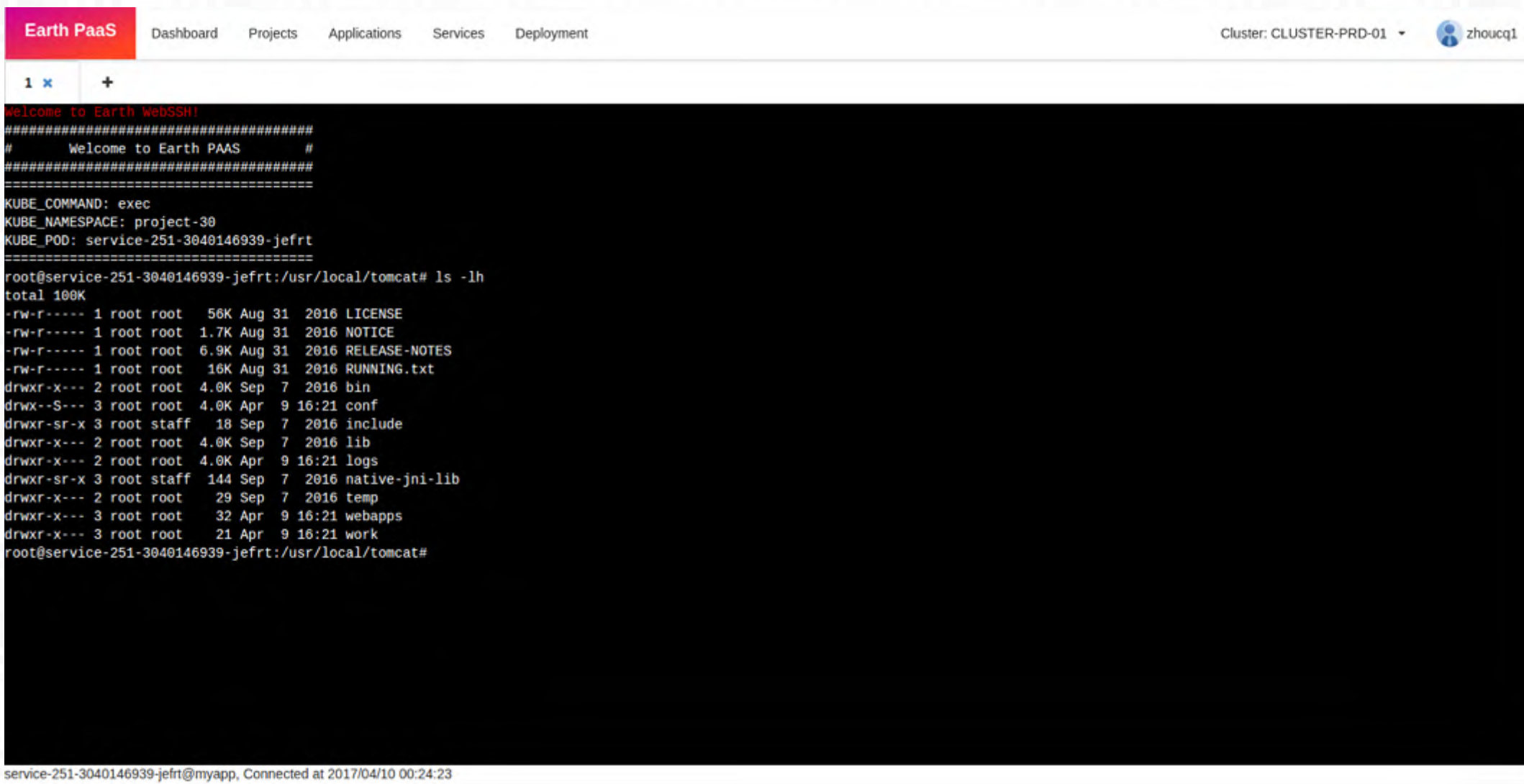
Pods									
Name	Status	Created At	Cluster IP	CPU	Memory	Restart	State	Deployment ID	Option
service-253-158004328-mz50a	Running	2017-04-16T18:07:40Z	172.16.76.30			0	old	deployment-516	☰ >
service-253-158004328-q5fqo	Running	2017-04-16T18:08:30Z	172.16.77.11			0	old	deployment-516	☰ >
service-253-293925993-dk6zu	Running	2017-04-16T18:09:50Z	172.16.91.2			0	new	deployment-517	☰ >



Pods									
Name	Status	Created At	Cluster IP	CPU	Memory	Restart	State	Deployment ID	Option
service-253-293925993-a1dhx	Running	2017-04-16T18:10:00Z	172.16.77.3			0	new	deployment-517	☰ >
service-253-293925993-dk6zu	Running	2017-04-16T18:09:50Z	172.16.91.2			0	new	deployment-517	☰ >

+ Showcase

- 容器访问：使用exec的api，通过websocket提供web终端



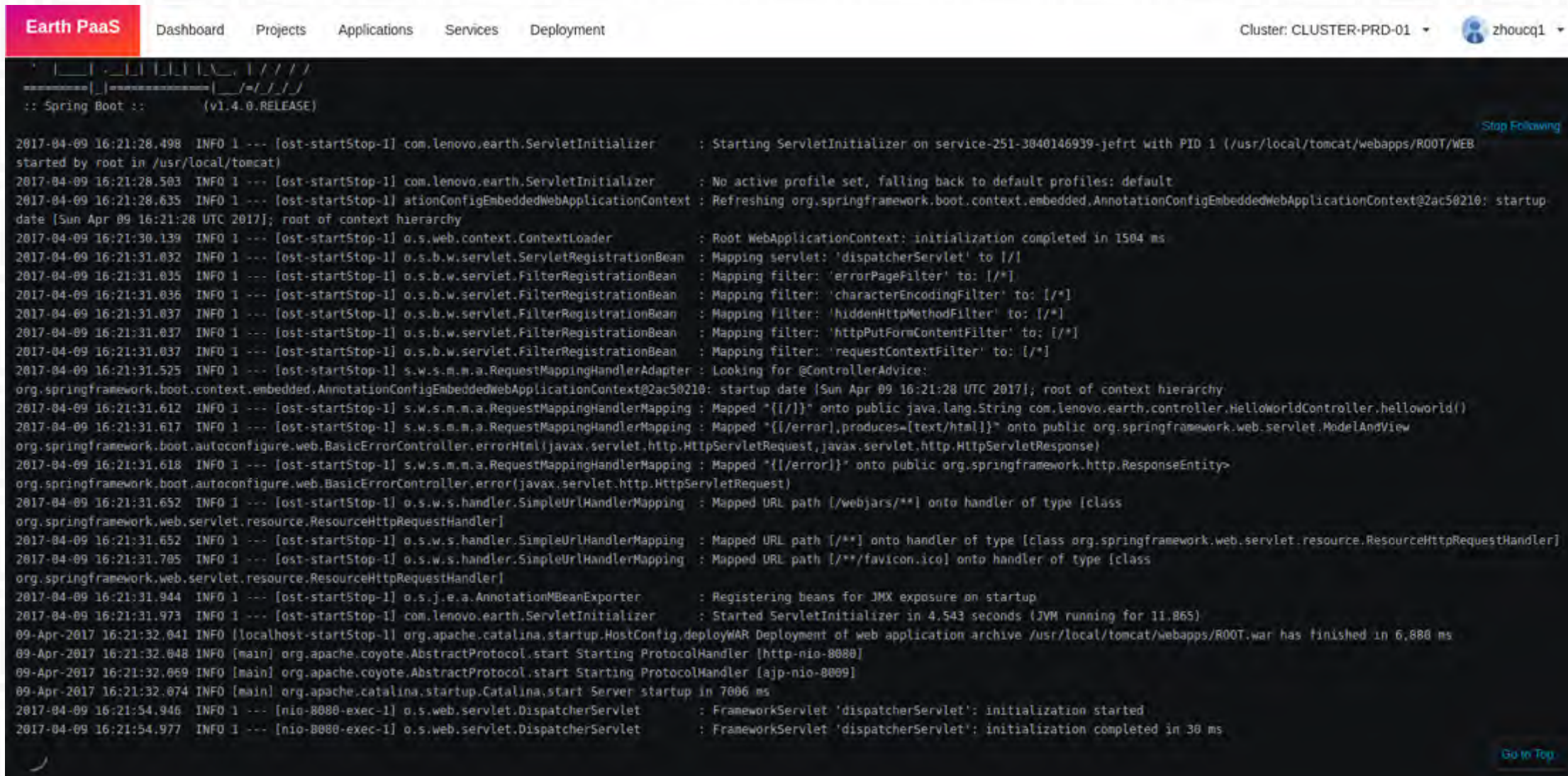
The screenshot shows the Earth PaaS dashboard interface. The top navigation bar includes 'Earth PaaS', 'Dashboard', 'Projects', 'Applications', 'Services', and 'Deployment'. On the right, it displays 'Cluster: CLUSTER-PRD-01' and a user profile for 'zhoucq1'. Below the navigation, there is a terminal window with the following content:

```
welcome to Earth WebSSH!
#####
# Welcome to Earth PAAS #
#####
=====
KUBE_COMMAND: exec
KUBE_NAMESPACE: project-30
KUBE_POD: service-251-3040146939-jefrt
=====
root@service-251-3040146939-jefrt:/usr/local/tomcat# ls -lh
total 100K
-rw-r----- 1 root root 56K Aug 31 2016 LICENSE
-rw-r----- 1 root root 1.7K Aug 31 2016 NOTICE
-rw-r----- 1 root root 6.9K Aug 31 2016 RELEASE-NOTES
-rw-r----- 1 root root 16K Aug 31 2016 RUNNING.txt
drwxr-x--- 2 root root 4.0K Sep 7 2016 bin
drwx--S--- 3 root root 4.0K Apr 9 16:21 conf
drwxr-sr-x 3 root staff 18 Sep 7 2016 include
drwxr-x--- 2 root root 4.0K Sep 7 2016 lib
drwxr-x--- 2 root root 4.0K Apr 9 16:21 logs
drwxr-sr-x 3 root staff 144 Sep 7 2016 native-jni-lib
drwxr-x--- 2 root root 29 Sep 7 2016 temp
drwxr-x--- 3 root root 32 Apr 9 16:21 webapps
drwxr-x--- 3 root root 21 Apr 9 16:21 work
root@service-251-3040146939-jefrt:/usr/local/tomcat#
```

At the bottom of the terminal window, it shows the connection status: 'service-251-3040146939-jefrt@myapp, Connected at 2017/04/10 00:24:23'.

+ Showcase

• 日志查看：实时查看应用日志



The screenshot displays a web application log viewer interface. At the top, there is a navigation bar with tabs for 'Earth PaaS', 'Dashboard', 'Projects', 'Applications', 'Services', and 'Deployment'. The current view is 'Applications', showing a cluster 'CLUSTER-PRD-01' and a user 'zhoucq1'. The main area displays a terminal window with real-time logs for a Spring Boot application. The logs show the application starting, initializing, and mapping various servlets and filters. The logs are as follows:

```
2017-04-09 16:21:28.498 INFO 1 --- [ost-startStop-1] com.lenovo.earth.ServletInitializer : Starting ServletInitializer on service-251-3840146939-jefrt with PID 1 (/usr/local/tomcat/webapps/ROOT/WEB
started by root in /usr/local/tomcat)
2017-04-09 16:21:28.503 INFO 1 --- [ost-startStop-1] com.lenovo.earth.ServletInitializer : No active profile set, falling back to default profiles: default
2017-04-09 16:21:28.635 INFO 1 --- [ost-startStop-1] ationConfigEmbeddedWebApplicationContext : Refreshing org.springframework.boot.context.embedded.AnnotationConfigEmbeddedWebApplicationContext@2ac50210: startup
date [Sun Apr 09 16:21:28 UTC 2017]; root of context hierarchy
2017-04-09 16:21:30.139 INFO 1 --- [ost-startStop-1] o.s.web.context.ContextLoader : Root WebApplicationContext: initialization completed in 1504 ms
2017-04-09 16:21:31.032 INFO 1 --- [ost-startStop-1] o.s.b.w.servlet.ServletRegistrationBean : Mapping servlet: 'dispatcherServlet' to [/]
2017-04-09 16:21:31.035 INFO 1 --- [ost-startStop-1] o.s.b.w.servlet.FilterRegistrationBean : Mapping filter: 'errorPageFilter' to: [/]
2017-04-09 16:21:31.036 INFO 1 --- [ost-startStop-1] o.s.b.w.servlet.FilterRegistrationBean : Mapping filter: 'characterEncodingFilter' to: [/]
2017-04-09 16:21:31.037 INFO 1 --- [ost-startStop-1] o.s.b.w.servlet.FilterRegistrationBean : Mapping filter: 'hiddenHttpMethodFilter' to: [/]
2017-04-09 16:21:31.037 INFO 1 --- [ost-startStop-1] o.s.b.w.servlet.FilterRegistrationBean : Mapping filter: 'httpPutFormContentFilter' to: [/]
2017-04-09 16:21:31.037 INFO 1 --- [ost-startStop-1] o.s.b.w.servlet.FilterRegistrationBean : Mapping filter: 'requestContextFilter' to: [/]
2017-04-09 16:21:31.525 INFO 1 --- [ost-startStop-1] s.w.s.m.m.a.RequestMappingHandlerAdapter : Looking for @ControllerAdvice:
org.springframework.boot.context.embedded.AnnotationConfigEmbeddedWebApplicationContext@2ac50210: startup date [Sun Apr 09 16:21:28 UTC 2017]; root of context hierarchy
2017-04-09 16:21:31.612 INFO 1 --- [ost-startStop-1] s.w.s.m.m.a.RequestMappingHandlerMapping : Mapped "[]" onto public java.lang.String com.lenovo.earth.controller.HelloWorldController.helloWorld()
2017-04-09 16:21:31.617 INFO 1 --- [ost-startStop-1] s.w.s.m.m.a.RequestMappingHandlerMapping : Mapped "[/error,produces=[text/html]]" onto public org.springframework.web.servlet.ModelAndView
org.springframework.boot.autoconfigure.web.BasicErrorController.errorHtml(javax.servlet.http.HttpServletRequest,javax.servlet.http.HttpServletResponse)
2017-04-09 16:21:31.618 INFO 1 --- [ost-startStop-1] s.w.s.m.m.a.RequestMappingHandlerMapping : Mapped "[/error]" onto public org.springframework.http.ResponseEntity>
org.springframework.boot.autoconfigure.web.BasicErrorController.error(javax.servlet.http.HttpServletRequest)
2017-04-09 16:21:31.652 INFO 1 --- [ost-startStop-1] o.s.w.s.handler.SimpleUrlHandlerMapping : Mapped URL path [/webjars/**] onto handler of type [class
org.springframework.web.servlet.resource.ResourceHttpRequestHandler]
2017-04-09 16:21:31.652 INFO 1 --- [ost-startStop-1] o.s.w.s.handler.SimpleUrlHandlerMapping : Mapped URL path [/**] onto handler of type [class org.springframework.web.servlet.resource.ResourceHttpRequestHandler]
2017-04-09 16:21:31.705 INFO 1 --- [ost-startStop-1] o.s.w.s.handler.SimpleUrlHandlerMapping : Mapped URL path [/**/favicon.ico] onto handler of type [class
org.springframework.web.servlet.resource.ResourceHttpRequestHandler]
2017-04-09 16:21:31.944 INFO 1 --- [ost-startStop-1] o.s.j.e.a.AnnotationMBeanExporter : Registering beans for JMX exposure on startup
2017-04-09 16:21:31.973 INFO 1 --- [ost-startStop-1] com.lenovo.earth.ServletInitializer : Started ServletInitializer in 4.543 seconds (JVM running for 11.865)
09-Apr-2017 16:21:32.041 INFO [localhost-startStop-1] org.apache.catalina.startup.HostConfig.deployWAR Deployment of web application archive /usr/local/tomcat/webapps/ROOT.war has finished in 6.886 ms
09-Apr-2017 16:21:32.048 INFO [main] org.apache.coyote.AbstractProtocol.start Starting ProtocolHandler [http-nio-8080]
09-Apr-2017 16:21:32.069 INFO [main] org.apache.coyote.AbstractProtocol.start Starting ProtocolHandler [ajp-nio-8009]
09-Apr-2017 16:21:32.074 INFO [main] org.apache.catalina.startup.Catalina.start Server startup in 7006 ms
2017-04-09 16:21:54.946 INFO 1 --- [nio-8080-exec-1] o.s.web.servlet.DispatcherServlet : FrameworkServlet 'dispatcherServlet': initialization started
2017-04-09 16:21:54.977 INFO 1 --- [nio-8080-exec-1] o.s.web.servlet.DispatcherServlet : FrameworkServlet 'dispatcherServlet': initialization completed in 30 ms
```

+ Showcase

- 资源管理：项目级别的资源控制

[Home](#) / Project Detail

ITS Project

Description:

Statistic

2 APPLICATION
8 SERVICE

Resource Quota



Information

Namespace: project-15
Status:
Creator: admin
Created At: 2016/12/19 15:24:38
Updated At: 2016/12/19 15:24:38

+ 那些坑，那些事

• 底层平台的那些坑

- K8S Deployment ID出现重复，导致部署后不更新应用
<https://github.com/kubernetes/kubernetes/issues/29735>
- K8S Dashboard卡顿的问题
- harbor服务器重启后出现mysql无主进程

• 平台开发的那些事

- 平台健壮性：当服务器频繁挂掉的时候，才知道现实和理想的距离
- Angular2出新版本了，更还是不更

+ 小结

- 背景和挑战
- 企业级容器云设计与思考
 - 设计思路
 - 多集群支持和整体架构
 - 网络方案和路由设计
 - 部署、回滚流程
 - DevOps支持
 - 存储方案
 - 权限设计
- 通过Ansible让运维自动化
- 监控与日志
- Showcase, 系统流程示例
- 踩过的坑



thanks.



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caiqinzhou@gmail.com