

传统企业互联网转型的架构之道

杨果 高级架构师/技术总监

<http://www.yangguo.info>

上海红星美凯龙悦家互联网科技有限公司

摘要

尊重历史还原真相
阐述红美架构体系

Q&A

应用结构

发展初期：业务简单，单体应用

高速增长：业务复杂，巨无霸应用出现

寻求变革：应用拆分，服务独立

持续优化：服务聚合/拆分，服务管控

直面历史

技术架构体系落后，负债太多

性能和稳定性差

巨型应用开发和运维成本高

机房、网络等基础设施落后

开发流程和规范落后

大量使用外包，技术在第三方

发布困难、测试困难、修改困难、排错困难

.....



挑战

快速组建研发团队
设计新架构并落地
核心老系统的优化
新监控体系的搭建
运维测试流程建立

.....

技改经验

历史要尊重，首先不能影响现有业务，最好做add，少做update和delete

重构最好分步进行，尽可能降低风险

先从底层基础设施（中间件、框架）着手

要合理处理好技术之外（人）的问题

有条件一定要做ABTest

架构原则

易部署

易测试

高性能

易伸缩

易开发

易监控

架构推行

框架层面约束

定期内部培训

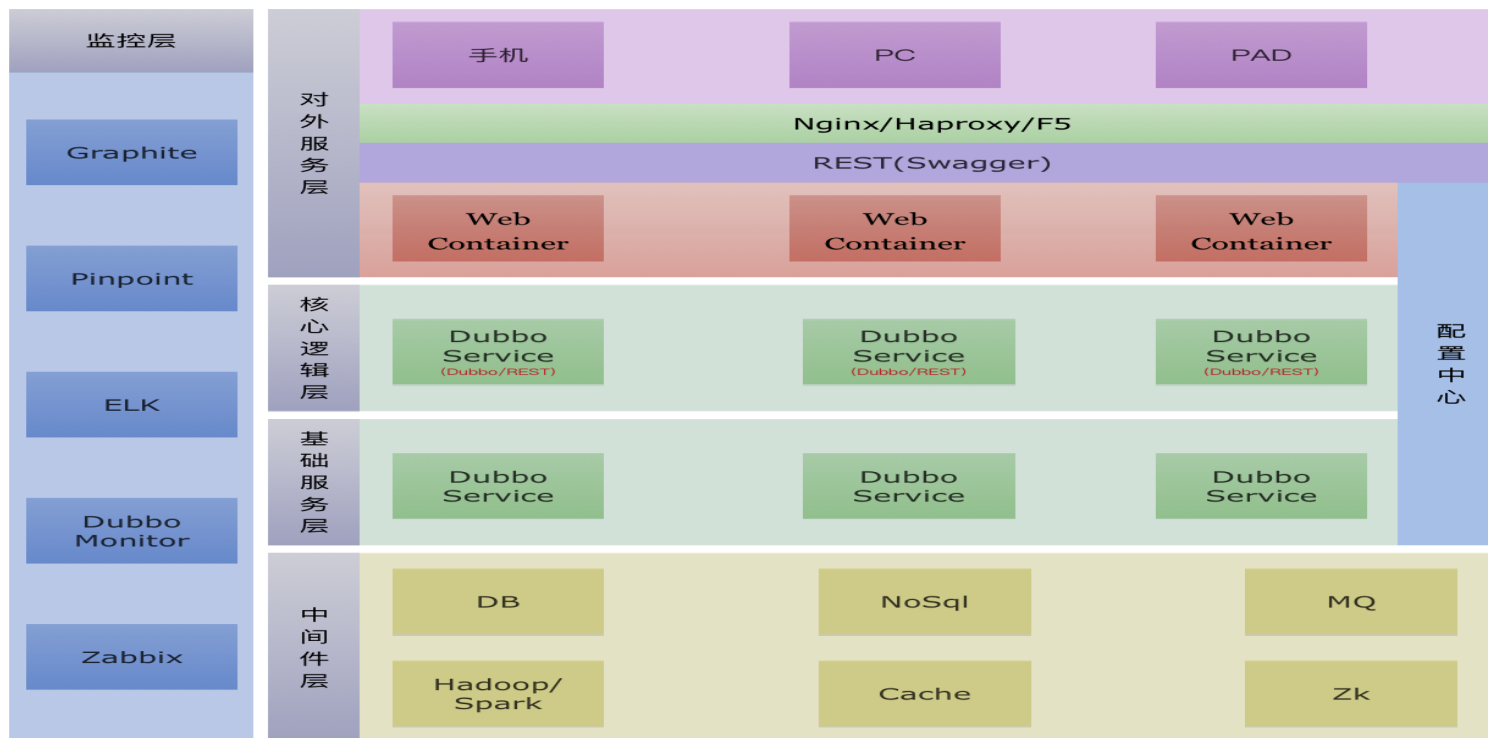
统一的TL思想

知识共享

检查执行

随时修正

整体架构



技术细节

Microservice+SOA

状态维持在web层（spring session+redis）

每层都可以Cache（spring cache+redis）

读写分离在框架层面实现（mybatis+spring）

安全级别高、需要热加载的配置放到配置中心（disconf）

分库分表（sharding-jdbc）

避免分布式事务（best efforts 1pc+eventually consistent）

metrics（dropwizard metrics+metrics-spring+graphite+grafana）

日志收集分析（ELK）

监控及报警（graphite+zabbix+dragon+dubbo monitor）

分布式文件系统（fastdfs）

搜索引擎（Elastic Search）

.....

Microservice+SOA

Spring boot+Dubbo

边界明确

服务自治

服务契约（代码即文档：swagger+java doc）

Java Service Wrapper（appassembler-maven-plugin、maven-assembly-plugin）

Archetype+Parent

技术选型

贡献者背景 (Apache、Jboss、Pivotal、Red Hat...)

社区活跃度

成功案例

小众项目的驾驭能力

架构兼容性

避免过度炫技，稳定快速门槛低

从团队技术特点出发，非个人喜好



关系数据库

架构：MHA（简单可依赖）

读写分离（mybatis+spring）：

- 1.Spring动态数据源（继承AbstractRoutingDataSource）
- 2.Spring事务管理（继承DataSourceTransactionManager）
- 3.Mybatis SqlSessionTemplate(实现Session， SqlSessionInterceptor进行SQL路由)
- 4.Spring DaoSupport/ClassPathBeanDefinitionScanner/MapperScannerConfigurer重写

分库分表(sharding-jdbc):

- 1.极少数业务
- 2.全局ID生成器

监控

基础监控（网络、磁盘、负载、内存、流量...）

服务监控（流量、质量、全链路）

-health check

-宏观

-微观

预警

-阈值

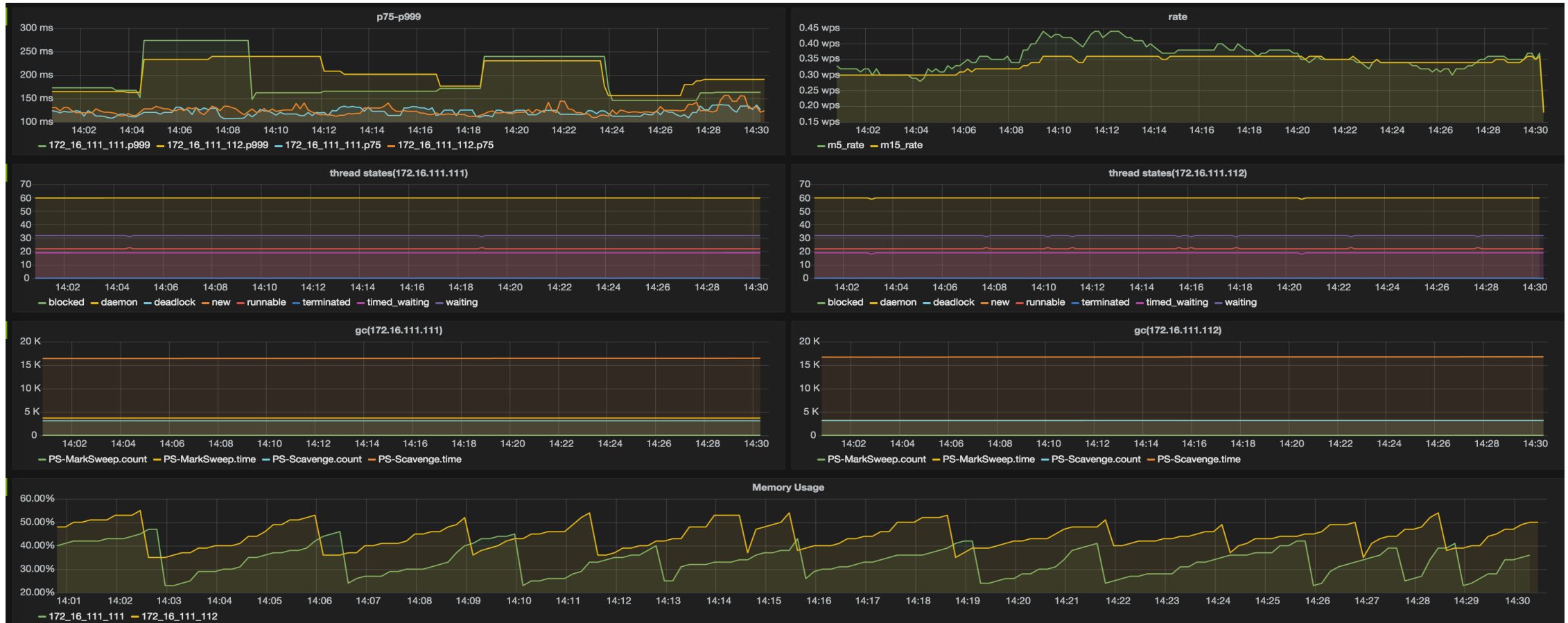
-通知

-级别

窥一斑而见全豹

```
@ApiResponses(value = {@ApiResponse(code = 200, message = "请求成功")})
@ApiOperation(value = "query", notes = "查询用户")
@ResponseBody
@RequestMapping(value = "query/{id}", method = {RequestMethod.GET})
@Cacheable(cacheNames = {"skeleton_userController"}, key = "id toString")
@Timed
public Result<UserVo> query(@PathVariable("id") Integer id, HttpServletRequest request) {
    Result result = new Result();
    result.setCode(ResultCode.C200.getCode());
    UserVo userVo = new UserVo();
    userVo.setId(id);
    userVo.setName("yangguo");
    result.setValue(userVo);
    logger.info("query success");
    request.getSession().setAttribute("result", JsonUtil.toJson(result, false));
    //这个只能由用户中心设置,其余的系统都不能设置这个attribute
    //request.getSession().setAttribute("UC-MaxInactiveIntervalInSeconds", 1000000000);
    return result;
}
```

Graphite+Grafana



Dapper

trace、span、annotation

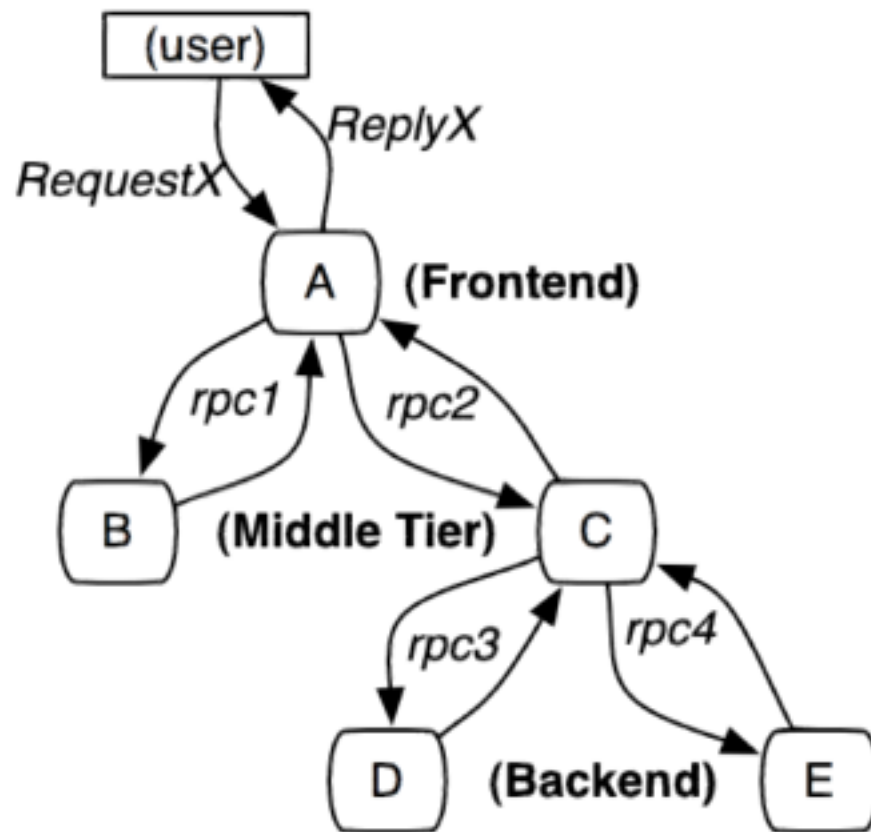
dubbo filter spi

异步低损耗

异常数据收集

动态采样率？

client端继承？



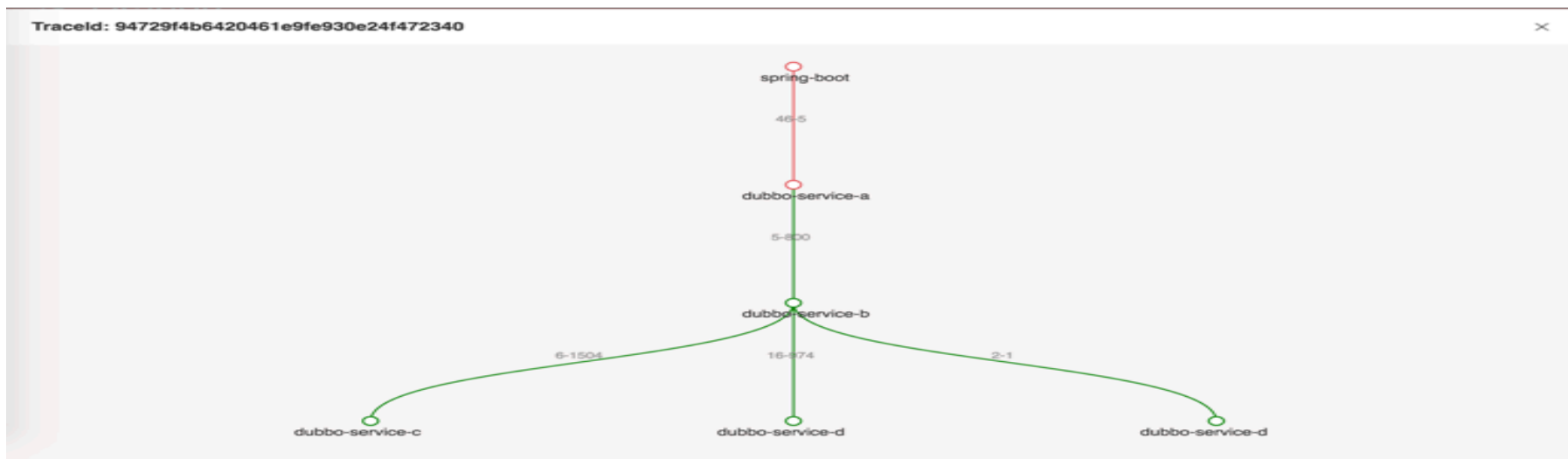
Dragon

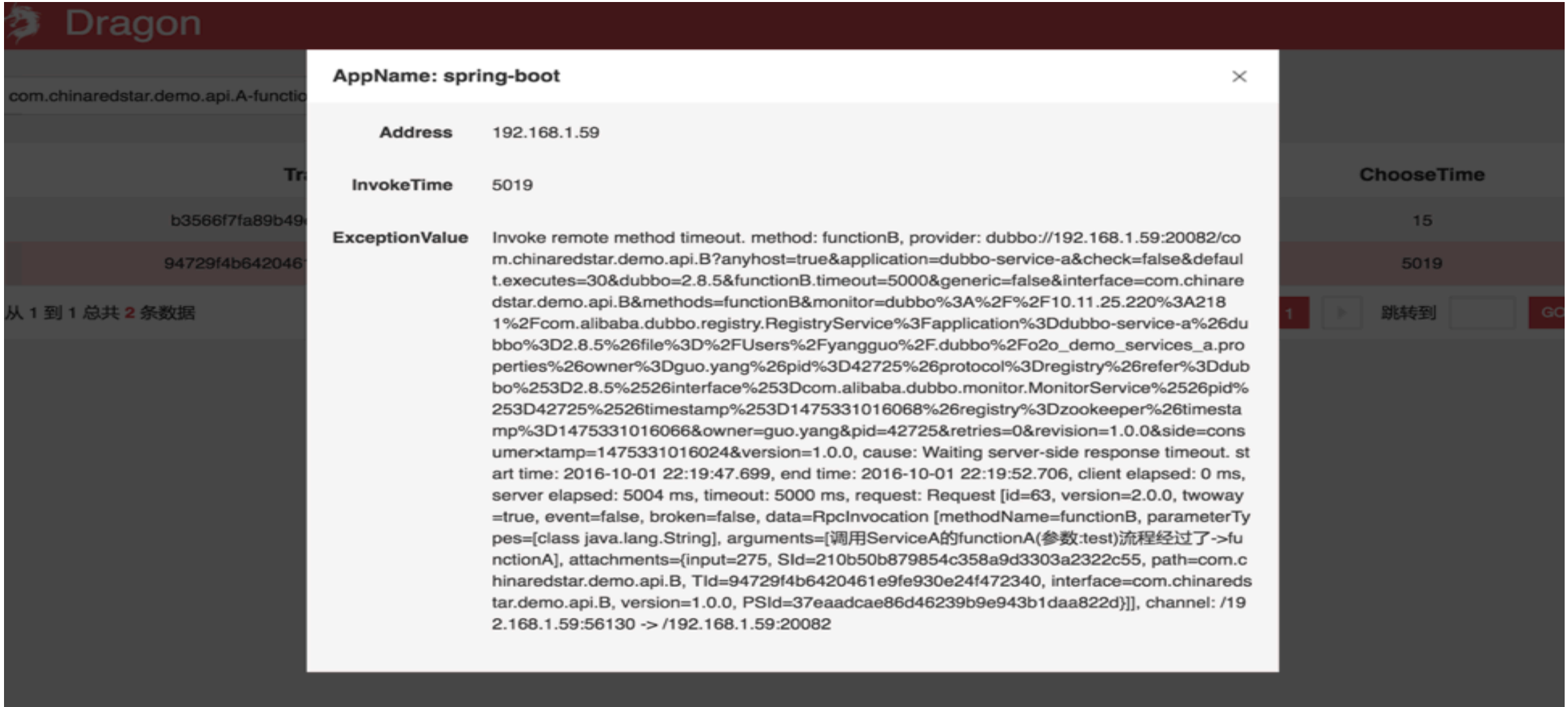
Dragon

com.chinaredstar.demo.api.A-functionA 2016-10-01 22:18:22

TraceId	TraceTime	TotalTime	ChooseTime
b3566f77fa89b49e2b64ce4218bf8cdf	2016-10-01 22:21:15	15	15
94729f4b6420461e9fe930e24f472340	2016-10-01 22:19:47	5019	5019

从 1 到 1 总共 2 条数据





Dragon

com.chinaredstar.demo.api.A-functio

Tr

b3566f7fa89b49

94729f4b642046

从 1 到 1 总共 2 条数据

AppName: spring-boot

Address 192.168.1.59

InvokeTime 5019

ExceptionValue Invoke remote method timeout. method: functionB, provider: dubbo://192.168.1.59:20082/com.chinaredstar.demo.api.B?anyhost=true&application=dubbo-service-a&check=false&default.executes=30&dubbo=2.8.5&functionB.timeout=5000&generic=false&interface=com.chinaredstar.demo.api.B&methods=functionB&monitor=dubbo%3A%2F%2F10.11.25.220%3A2181%2Fcom.alibaba.dubbo.registry.RegistryService%3Fapplication%3Ddubbo-service-a%26dubbo%3D2.8.5%26file%3D%2FUsers%2Fyangguo%2F.dubbo%2Fo2o_demo_services_a.properties%26owner%3Dguo.yang%26pid%3D42725%26protocol%3Dregistry%26refer%3Ddubbo%253D2.8.5%2526interface%253Dcom.alibaba.dubbo.monitor.MonitorService%2526pid%253D42725%2526timestamp%253D1475331016068%26registry%3Dzookeeper%26timestamp%3D1475331016066&owner=guo.yang&pid=42725&retries=0&revision=1.0.0&side=consumer&stamp=1475331016024&version=1.0.0, cause: Waiting server-side response timeout. start time: 2016-10-01 22:19:47.699, end time: 2016-10-01 22:19:52.706, client elapsed: 0 ms, server elapsed: 5004 ms, timeout: 5000 ms, request: Request [id=63, version=2.0.0, twoway=true, event=false, broken=false, data=RpcInvocation [methodName=functionB, parameterTypes=[class java.lang.String], arguments=[调用ServiceA的functionA(参数:test)流程经过了->functionA], attachments={input=275, SId=210b50b879854c358a9d3303a2322c55, path=com.chinaredstar.demo.api.B, TId=94729f4b6420461e9fe930e24f472340, interface=com.chinaredstar.demo.api.B, version=1.0.0, PSId=37eaadcae86d46239b9e943b1daa822d}]], channel: /192.168.1.59:56130 -> /192.168.1.59:20082

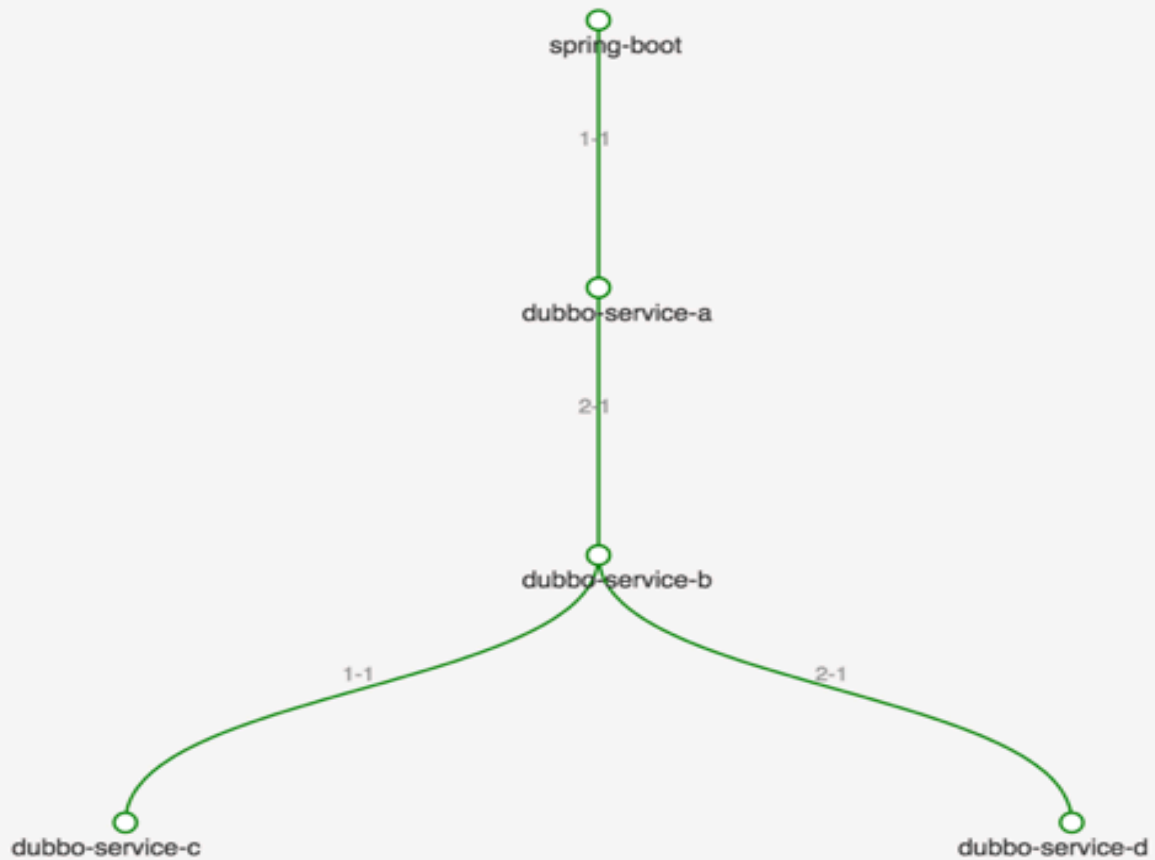
ChooseTime

15

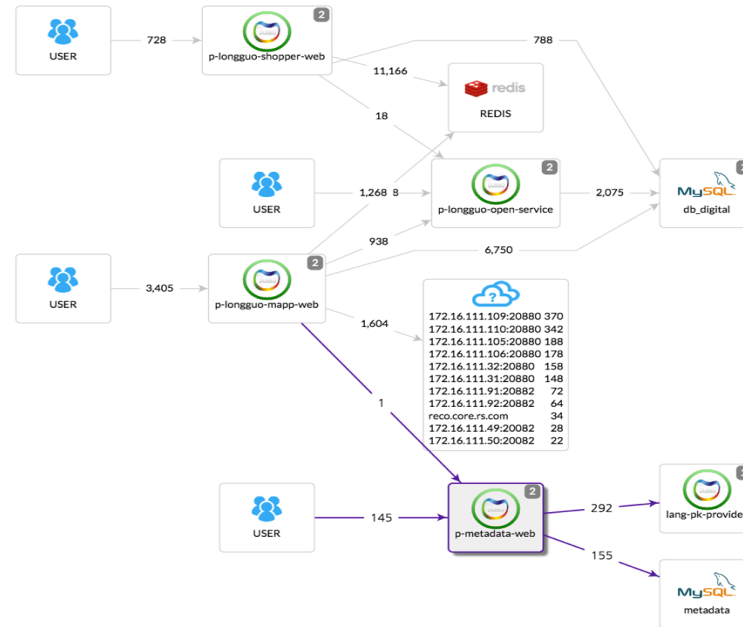
5019

1 跳转到 GC

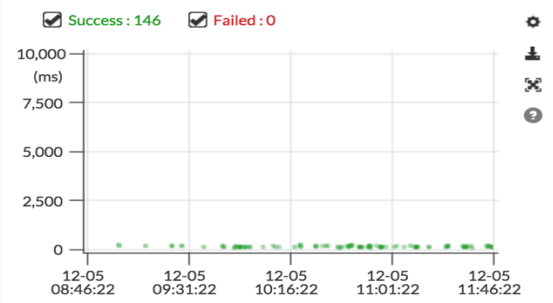
TraceId: b3566f7fa89b49e2b64ce4218bf8cdff



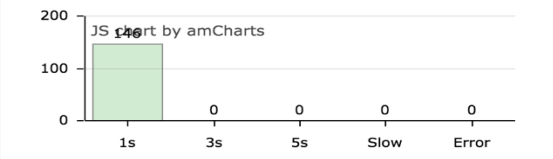
GoJS evaluation
 (c) 1998-2015 Northwoods Software
 Not for distribution or production use
 nwoods.com



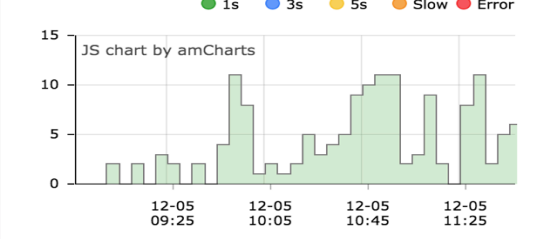
p-metadata-web All



Response Summary



Load



← Servers Total 2 Error 0





TOP 100 CASE STUDIES OF THE YEAR

#	Start Time	Path	Res. (ms) ↓	Exception	Agent	Client IP	Transaction
82	12/05 10:43:43 429	/file/public/inside/upload	205		mdataweb-sha2app112	172.16.135.13	mdataweb-sha2app112^1479372062776^3709
84	12/05 10:43:00 899	/file/public/inside/upload	191		mdataweb-sha2app112	172.16.135.13	mdataweb-sha2app112^1479372062776^3708
7	12/05 11:44:38 277	/file/public/inside/upload	187		mdataweb-sha2app111	172.16.135.13	mdataweb-sha2app111^1479372710665^3828
89	12/05 10:41:43 783	/file/public/inside/upload	187		mdataweb-sha2app111	172.16.135.13	mdataweb-sha2app111^1479372710665^3788
11	12/05 11:43:34 802	/file/public/inside/upload	185		mdataweb-sha2app112	172.16.135.13	mdataweb-sha2app112^1479372062776^3744
23	12/05 11:33:05 487	/file/public/inside/upload	182		mdataweb-sha2app112	172.16.135.13	mdataweb-sha2app112^1479372062776^3739
98	12/05 10:30:39 748	/file/public/inside/upload	176		mdataweb-sha2app112	172.16.135.13	mdataweb-sha2app112^1479372062776^3700
16	12/05 11:34:41 656	/file/public/inside/upload	175		mdataweb-sha2app111	172.16.135.13	mdataweb-sha2app111^1479372710665^3824
99	12/05 10:27:53 853	/file/public/inside/upload	175		mdataweb-sha2app111	172.16.135.13	mdataweb-sha2app111^1479372710665^3783
66	12/05 10:51:24 597	/file/public/inside/upload	171		mdataweb-sha2app112	172.16.135.13	mdataweb-sha2app112^1479372062776^3717

Application : /file/public/inside/upload

TransactionId : mdataweb-sha2app112^1479372062776^3709

AgentId : mdataweb-sha2app112

ApplicationName : p-metadata-web

Call Tree **Server Map** Timeline Mixed View Self >= 1000 🔍 🏠 Complete

Method	Argument	Start Time	Gap(ms)	Exec(ms)	Exec(%)	Self(ms)	Class	API	Agent	Application
Tomcat Servlet Process	/file/public/inside/upload	10:43:43 429	0	205	100%	0		TOMCAT	mdataweb-sha2app112	p-metadata-web
REMOTE_ADDRESS	172.16.135.13									
invoke(Request request, Response response)		10:43:43 429	0	205	100%	0	StandardHostVal...	TOMCAT METH...	mdataweb-sha2app112	p-metadata-web
doPost(HttpServletRequest request, HttpServletResponse response)		10:43:43 429	0	205	100%	22	FrameworkServlet	SPRING	mdataweb-sha2app112	p-metadata-web
upload(String userId, String appName, String metaData)		10:43:43 449	20	182	100%	175	PublicFileInsid...	SPRING_BEAN	mdataweb-sha2app112	p-metadata-web
writeValue(JsonGenerator jgen, Object value)		10:43:43 456	7	0	0%	0	ObjectMapper	JACKSON	mdataweb-sha2app112	p-metadata-web
invoke(Invocation invocation)		10:43:43 624	168	4	100%	0	AbstractCluster...	DUBBO_CONSU...	mdataweb-sha2app112	p-metadata-web
invoke(Invocation invocation)		10:43:43 624	0	4	100%	4	AbstractCluster...	DUBBO_CONSU...	mdataweb-sha2app112	p-metadata-web
invoke(Invocation invocation)	IPKService:pkForTwitterSnowFlake	10:43:43 624	0	0	0%	0	AbstractProxyIn...	DUBBO_PROVI...	pk-xapp01-018	lang-pk-provider
REMOTE_ADDRESS	172.16.111.112:35717									
pkForTwitterSnowFlake()		10:43:43 624	0	0	0%	0	PkService	SPRING_BEAN	pk-xapp01-018	lang-pk-provider
insert(String statement, Object parameter)	com.chinaredstar.metadata.web.services.dao.De	10:43:43 628	0	3	100%	2	SqlSessionTemp...	MYBATIS	mdataweb-sha2app112	p-metadata-web
prepareStatement(String sql)		10:43:43 629	1	0	0%	0	ConnectionImpl	MYSQL(metad...	mdataweb-sha2app112	p-metadata-web
SQL	insert into data (id, updateTime, type, auth									
execute()		10:43:43 630	1	1	100%	1	PreparedStatement...	MYSQL(metad...	mdataweb-sha2app112	p-metadata-web
SQL	insert into data (id, updateTime, type, auth									
SQL-BindValue	123011485662879744, 2016-12-05 10:43:43.628,									
writeValue(JsonGenerator gen, Object value)		10:43:43 633	2	1	100%	1	ObjectWriter	JACKSON	mdataweb-sha2app112	p-metadata-web



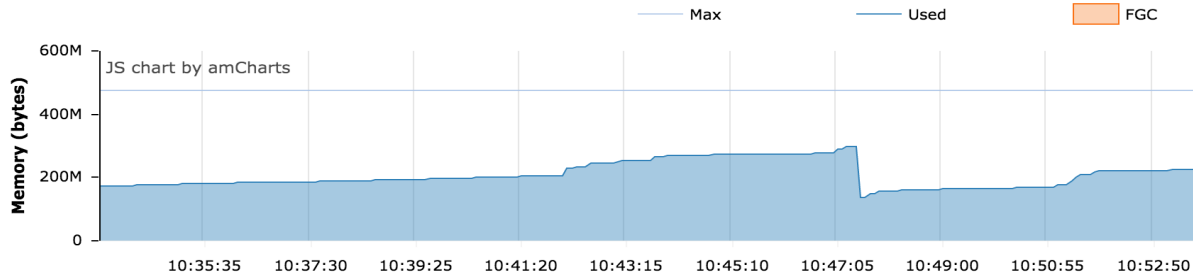
Application : /file/public/inside/upload

TransactionId : mdataweb-sha2app112^1479372062776^3709

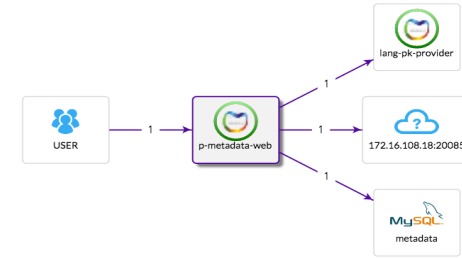
AgentId : mdataweb-sha2app112

ApplicationName : p-metadata-web

Heap PermGen CpuLoad



GoJS evaluation
 (c) 1998-2015 Northwoods Software
 Not for distribution or production use
 nwoods.com



Method	Argument	Start Time	Gap(ms)	Exec(ms)	Exec(%)	Self(ms)	Class	API	Agent	Application
Tomcat Servlet Process	/file/public/inside/upload	10:43:43 429	0	205	100%	0		TOMCAT	mdataweb-sha2app1..	p-metadata-web
REMOTE_ADDRESS	172.16.135.13									
invoke(Request request, Response response)		10:43:43 429	0	205	100%	0	StandardHostVal..	TOMCAT METH..	mdataweb-sha2app1..	p-metadata-web
doPost(HttpServletRequest request, HttpServletResponse response)		10:43:43 429	0	205	100%	0	22 FrameworkServlet	SPRING	mdataweb-sha2app1..	p-metadata-web
upload(String userId, String appName, String metadata)		10:43:43 449	20	182	100%	175	PublicFileInsid..	SPRING_BEAN	mdataweb-sha2app1..	p-metadata-web
writeValue(JsonGenerator jgen, Object value)		10:43:43 456	7	0	0%	0	0 ObjectMapper	JACKSON	mdataweb-sha2app1..	p-metadata-web
invoke(Invocation invocation)		10:43:43 624	168	4	0%	0	0 AbstractCluster..	DUBBO_CONSU..	mdataweb-sha2app1..	p-metadata-web
invoke(Invocation invocation)		10:43:43 624	0	4	0%	4	4 AbstractCluster..	DUBBO_CONSU..	mdataweb-sha2app1..	p-metadata-web
invoke(Invocation invocation)	IPkService:pkForTwitterSnowFlake	10:43:43 624	0	0	0%	0	0 AbstractProxyIn..	DUBBO_PROVI..	pk-xapp01-018	lang-pk-provider
REMOTE_ADDRESS	172.16.111.112:35717									
pkForTwitterSnowFlake()		10:43:43 624	0	0	0%	0	0 PkService	SPRING_BEAN	pk-xapp01-018	lang-pk-provider
insert(String statement, Object parameter)	com.chinaredstar.metadata.web.services.dao.Da	10:43:43 628	0	3	0%	3	2 SqlSessionTemp..	MYBATIS	mdataweb-sha2app1..	p-metadata-web
prepareStatement(String sql)		10:43:43 629	1	0	0%	0	0 ConnectionImpl	MYSQL(metadata..	mdataweb-sha2app1..	p-metadata-web
SQL	insert into data (id, updateTime, type, authc									
execute()		10:43:43 630	1	1	0%	1	1 PreparedStatement..	MYSQL(metadata..	mdataweb-sha2app1..	p-metadata-web
SQL	insert into data (id, updateTime, type, authc									
SQL-BindValue	123011485662879744, 2016-12-05 10:43:43.628,									
writeValue(JsonGenerator gen, Object value)		10:43:43 633	2	1	0%	1	1 ObjectWriter	JACKSON	mdataweb-sha2app1..	p-metadata-web



分布式Session

Spring session

满足servlet规范

x-auth-token+cookie

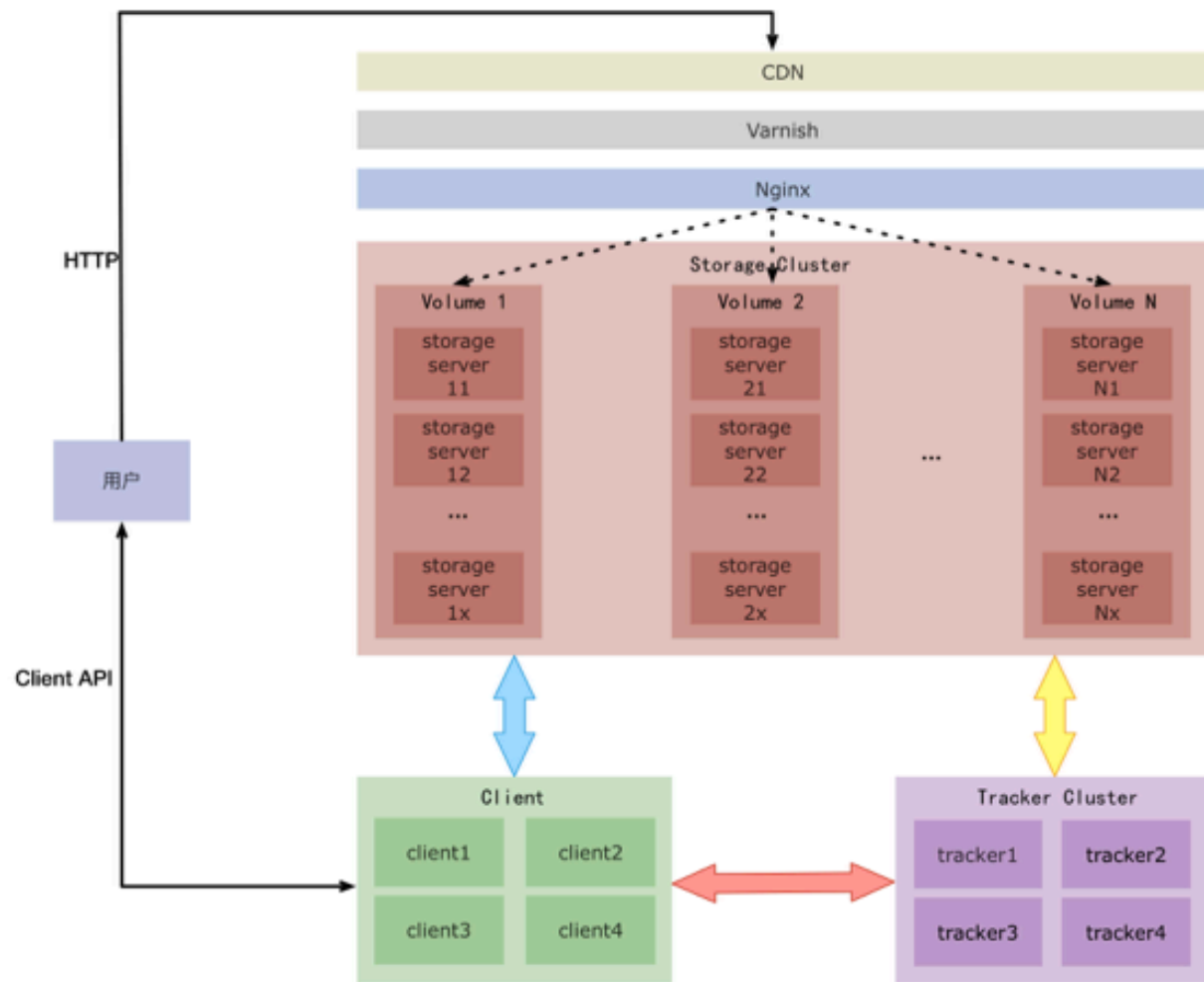
expires失效问题

生命周期问题

数据格式规范

分布式文件服务

GraphicsMagick+Lua
public/private resource
space management



安全

全站HTTPS

关闭错误显示

SQL使用PreparedStatement

禁止自己写任何的加解密或者混淆算法

用户输入需要显示在网页上的都需要编码（ESAPI）

GET不能修改操作资源

外部合作，进行渗透和扫描

普及安全知识和理念，不怕不懂，就怕不关注

Q&A

“非知之艰，行之惟艰”

— 《尚书·说命中》



解读我们身边最有价值的100个研发案例