



ZHDBA.COM
中华数据库行业协会

2017

中华数据库与运维大会

美团点评 分布式实时监控平台CAT

美团点评基础架构 孙佳林



-  CAT介绍
-  架构与设计
-  实战经验

CAT介绍



- CAT (Central Application Tracking)
- 基于纯Java开发的分布式实时监控系统
 - 分布式
 - 实时 (毫秒)
 - 近全量
 - 监控 (性能指标、健康状况、基础告警等)

Why ?



- 系统指标正常 \neq 应用健康
- 故障快速发现定位 (时间 == 金钱)
- 用户侧真实访问情况
- 掌握线上的应用健康，扩容、缩容、降级 ...

Do what ?



- 故障发现
- 性能分析
- 治理

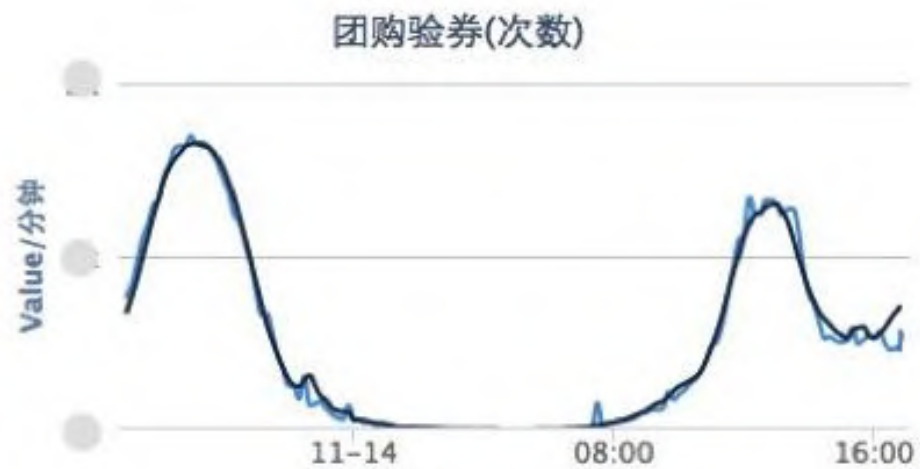
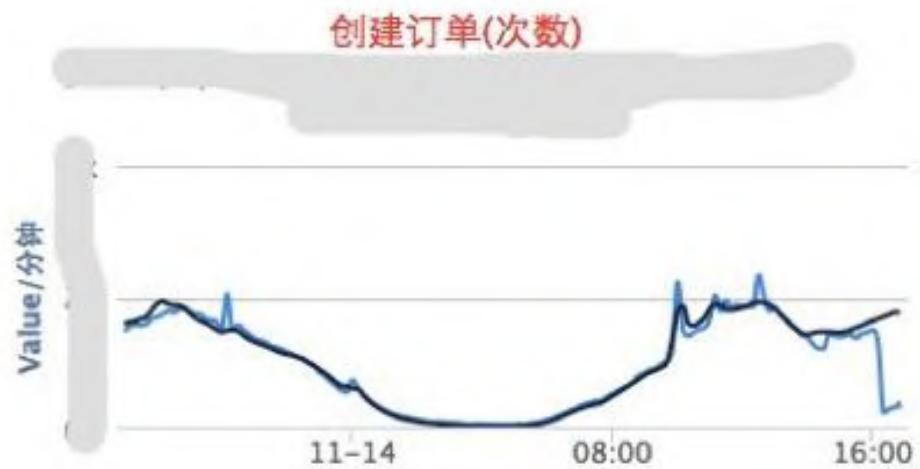
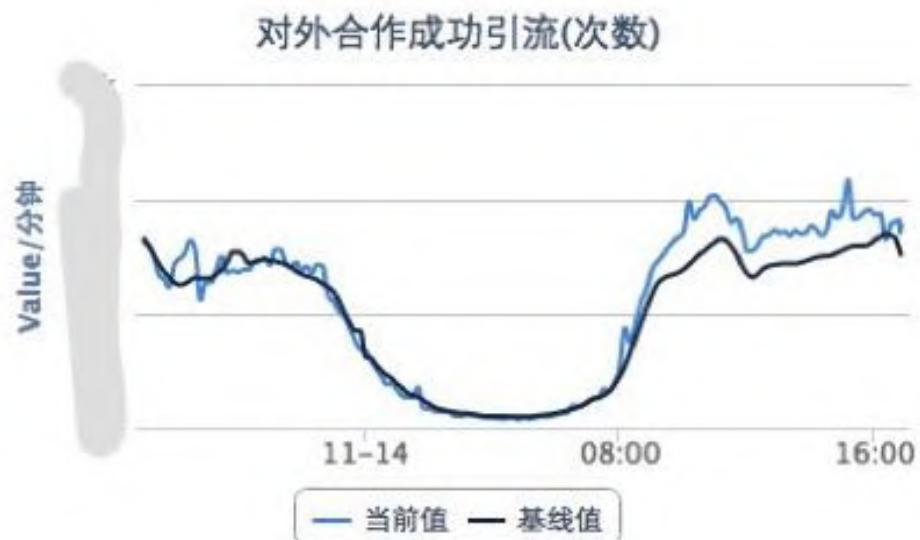
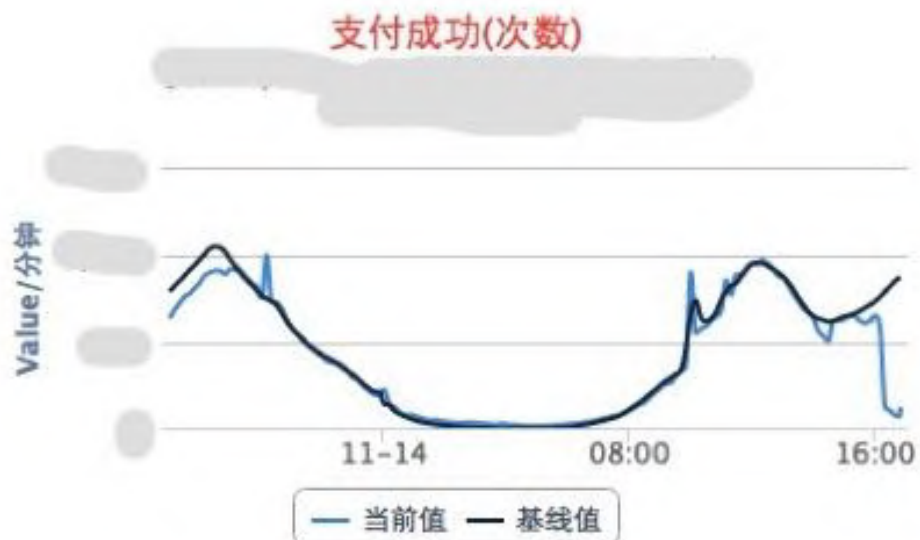
How - 故障发现



- 业务大盘
- 报错大盘
- 服务大盘
- 存储大盘（数据库、缓存）

- 实时告警服务

业务大盘



报错大盘



切换事业群

21:02			21:01			21:00			20:59		
系统		↑	系统		↑	系统		↑	系统		↑
27922	baymax-...-service	25175	baymax-...-service	28836	baymax-...-service	28528	baymax-...-service	27549	baymax-...-service		
817	com.san...platform	2971	com.san...platform	2519	weixin-service	1495	search-...angourec	5703	search-...angourec		
273	com.san...shanghai	341	geoinfo-server	549	baymax-...-service	1094	baymax-...-service	4465	baymax-...-service		
9774	credit-...-service	243	com.san...eraction	431	search-bizer-ads	988	baymax-...-service	583	baymax-...-service		
1192	com.san...campaign	229	search-tuanm-web	398	com.san...platform	928	com.san...shanghai	289	com.san...shanghai		
1181	sailfis...-service	10480	com.san...shanghai	301	geoinfo-server	901	search-tuanm-web	276	search-tuanm-web		
994	search-...angourec	1379	credit-...-service	246	csc-case-web	55	credit-...-service	234	credit-...-service		
836	baymax-...-service	1337	com.san...roup.app	245	violet-...-service	21	search-bizer-ads	222	search-bizer-ads		
561	shark-service	1008	takeawa...-service	203	search-...analysis	357	sailfis...-service	9930	sailfis...-service		
553	credit-...-service	816	sailfis...-service	10400	com.san...shanghai	204	baymax...-service	1074	baymax...-service		
384	com.san...ungleapi	609									

com.dianping.dpsf.exception.NetTimeoutException 16.0
 com.dianping.pigeon.remoting.provider.exception.ProcessTimeoutException 2.0
 com.dianping.takeaway.partner.exception.PartnerException 185.0

服务大盘



19:10	19:09	19:08	19:07	19:06
sms-server 1	sms-server 1	baymax-ad-bizer-service 1	baymax-ad-bizer-service 1	baymax-ad-bizer-service 1
baymax-ad-bizer-service 1	baymax-ad-bizer-service 1	movie-platform-service 1	movie-platform-service 1	movie-platform-service 1
movie-platform-service 1	movie-platform-service 1	com.sankuai...fetchserver 1	com.sankuai...fetchserver 1	com.sankuai...fetchserver 1
com.sankuai...fetchserver 1	com.sankuai...fetchserver 1			
search-cms-service 1	search-cms-service 1			

数据库大盘



20:44	20:43	20:42	20:41	20:40
数据库访问正常	数据库访问正常	DianPing_TGC ¹	数据库访问正常	数据库访问正常

时间	数据库	主机名	IP	标题	内容	状态
20:42:44	dpsearchoutput	dpsearchoutput-n2-read	10.10.10.10	ZEBRA	延迟:0s正常,MARKUP	✓
20:42:44	dianpingsearchlog	dianpingsearchlog-n2-read	10.10.10.10	ZEBRA	延迟:0s正常,MARKUP	✓
20:42:44	dianpingsearchlog	dianpingsearchlog-n2-read	10.10.10.10	ZEBRA	延迟:0s正常,MARKUP	✓
20:42:44	contentsearch	contentsearch-n3-read	10.10.10.10	ZEBRA	延迟:0s正常,MARKUP	✓
20:42:44	contentsearch	contentsearch-n3-read	10.10.10.10	ZEBRA	延迟:0s正常,MARKUP	✓
20:42:44	arts	arts-n2-read	10.10.10.10	ZEBRA	延迟:0s正常,MARKUP	✓
20:42:44	arts	arts-n2-read	10.10.10.10	ZEBRA	延迟:0s正常,MARKUP	✓

How - 性能分析

- 指标
 - 访问量
 - 响应时间
- 对象
 - 应用本身（业务请求量、响应时间）
 - 客户端（RPC服务、数据库、缓存、消息...）
 - 服务端（RPC服务、数据库、缓存、消息...）

一个case



- 特定业务订单成交的分钟级统计
 - 成交额总量
 - 成交数总量
- 成交平均耗时、最大耗时、TP9X ...
- 执行出错量
- 请求落到服务器的分布情况

简单做法



```
long start = System.currentTimeMillis();

try {
    int money = myBusinessPayOrder();

    System.out.println("myBusinessPayOrder");
} catch (Exception e) {
    logger.error(e);
}

long timeElapsed = System.currentTimeMillis() - start;

System.out.println("myBusinessPayOrder_time:"+timeElapsed);
```

CAT API



```
Transaction t = Cat.newTransaction("URL", "PayOrder");

try {
    int money = myBusinessPayOrder();

    Cat.logMetricForCount("myBusinessPayOrder");

    Cat.logMetricForCount("PayMoney", money);

    Cat.logEvent("ServerIp", localIpAddress);

    t.setStatus(Transaction.SUCCESS);
} catch (Exception e) {
    Cat.logError(e);
    t.setStatus(e);
} finally {
    t.complete();
}
```

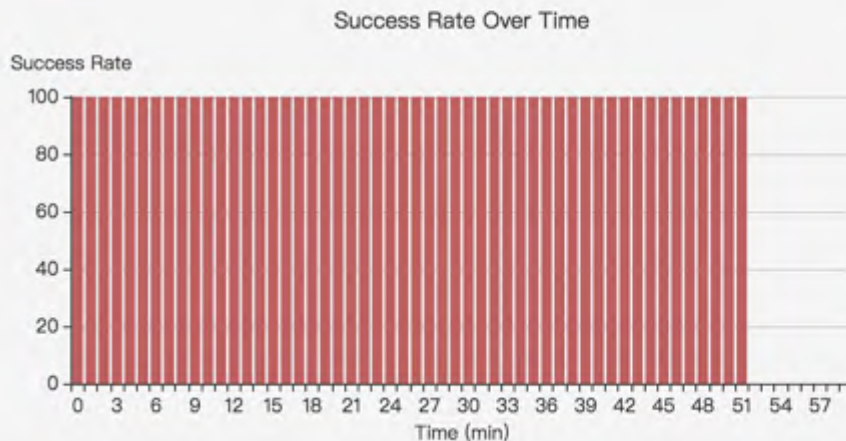
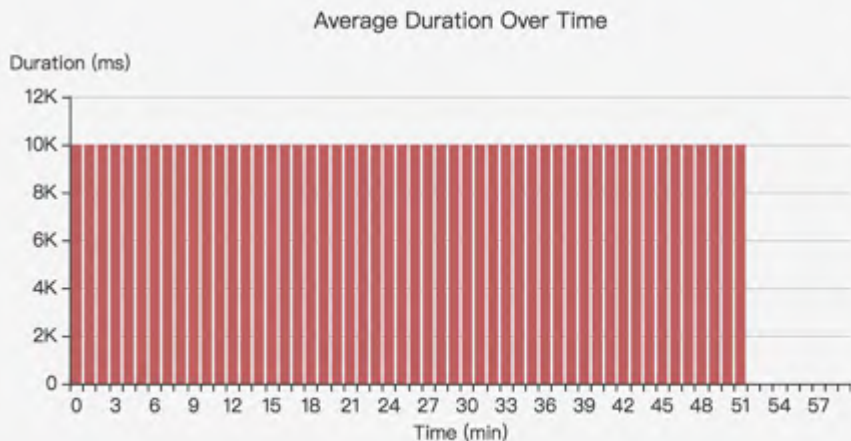
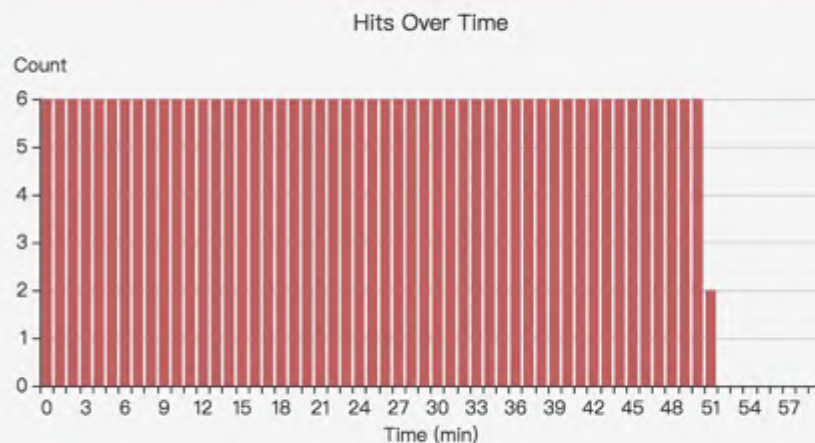
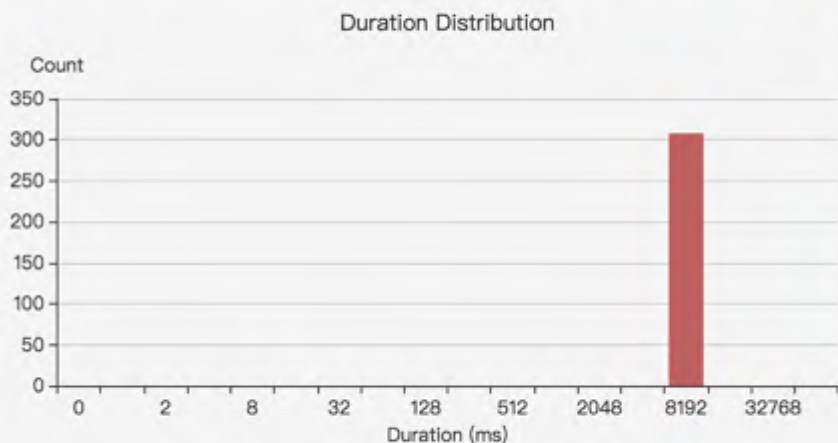
业务监控Metric



Transaction 报表



[:: show ::] Name	Total	Failure	Failure%	Sample	Max	Avg	95Line	99Line	99.9Line	QPS	Percent%
TOTAL	308	0	0.0000%	Log View	10,009.5	10,003.3	-	-	-	0.0	100.00%
[:: hide ::] PayOrder	308	0	0.0000%	Log View	10,009.5	10,003.3	10,000.0	10,000.0	10,000.0	0.1	100.00%



Transaction报表

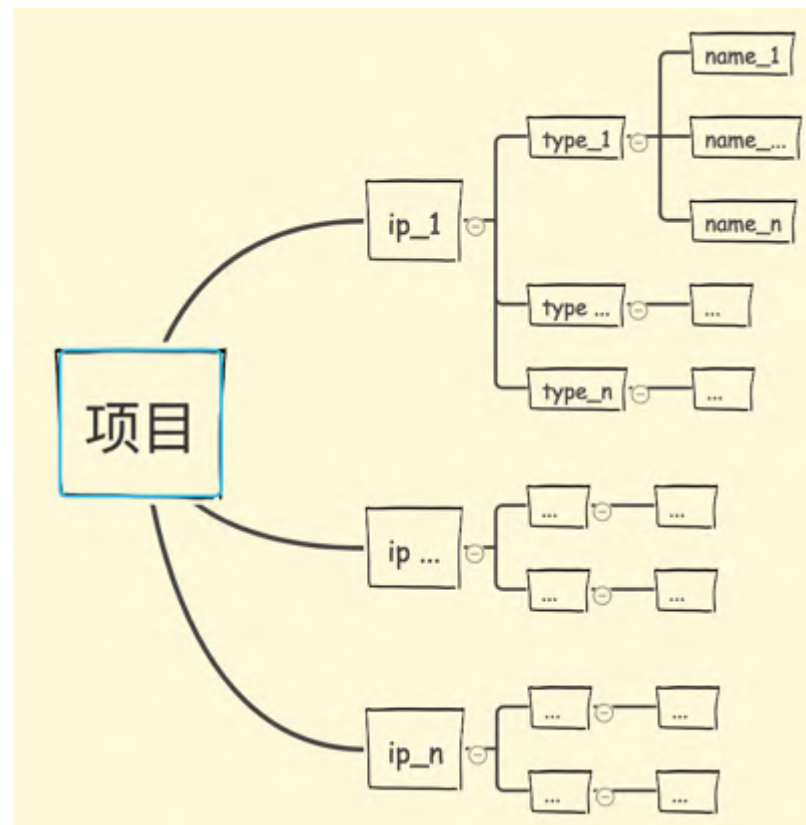


- 支持项目、IP、TYPE、NAME 四层统计

- 数据来源:

- API打点: `Cat.newTransaction(type, name)`

- 框架打点: 框架层面 MVC、RPC、SQL、Cache、Message ...



Transaction报表



[All] [default] [crash] [mt] [connection]

回车搜索

机器列表

Filter

支持多个字符串查询, 例如sql|url|task, 查询结果为包含任一sql、url、task的列。

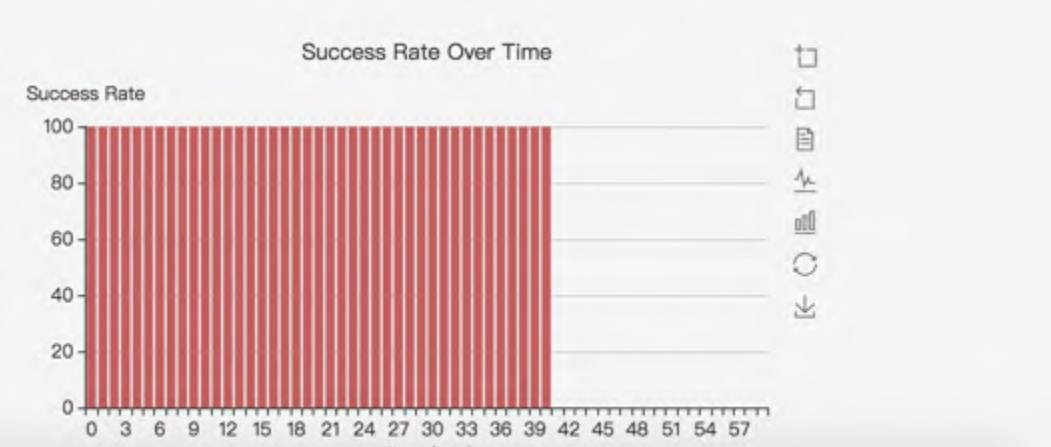
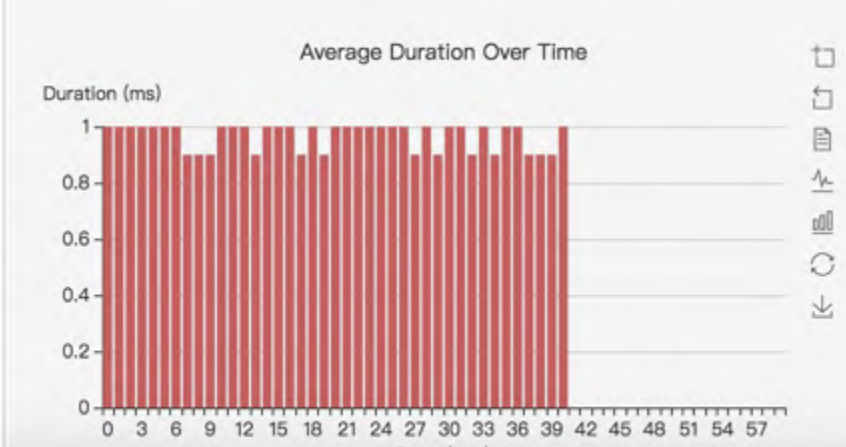
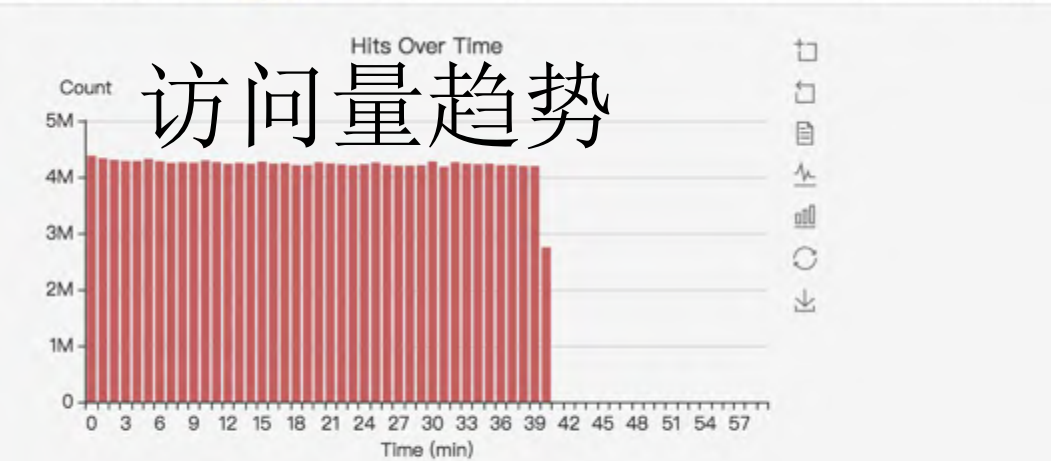
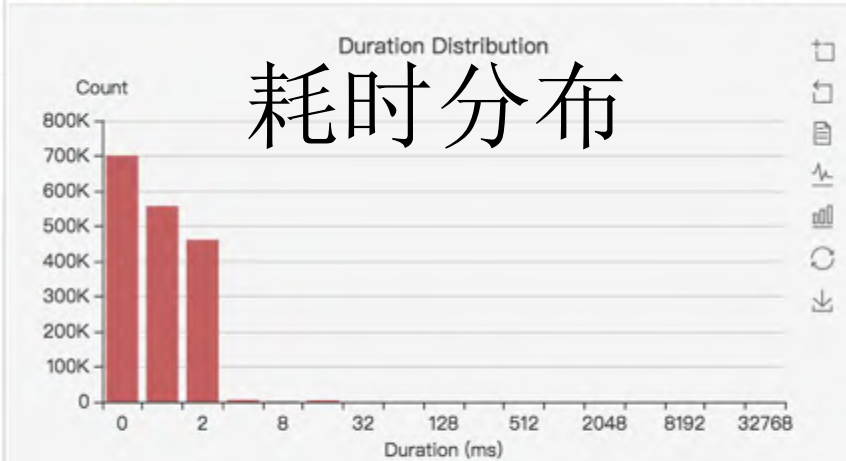
采样

[:: show ::] Name	Total	Failure	Failure%	Sample	Max	Avg	95Line	99Line	99.9Line	QPS	Percent%
TOTAL	161,874,715	6	0.0000%	Log View	555.4	1.0	-	-	-	0.0	100.00%
[:: show ::] /broker-service/api/crash	309	0	0.0000%	Log View	0.7	3.6	0.5	0.5	0.5	0.1	0.00%
[:: show ::] /broker-service/commandbatch	73,623,076	0	0.0000%	Log View	513.2	1.3	3.3	4.3	20.3	32,218.1	45.48%
[:: show ::] /broker-service/api/speed	10,001,504	0	0.0000%	Log View	555.4	1.2	3.1	4.0	22.8	4,376.8	6.18%
[:: show ::] /broker-service/crashlog	1,573	0	0.0000%	Log View	1.6	1.2	1.2	1.2	1.2	0.7	0.00%
[:: show ::] /broker-service/api/batch	17,486,455	0	0.0000%	Log View	498.2	1.1	3.1	4.2	26.1	7,652.3	10.80%
[:: show ::] /broker-service/api/hijack	25,754,281	3	0.0000%	Log View	227.5	1.0	3.0	4.0	47.5	11,270.7	15.91%
[:: show ::] /broker-service/api/config	30,223,374	0	0.0000%	Log View	12.5	0.0	1.0	1.0	1.0	13,226.5	18.67%
[:: show ::] /broker-service/api/connection	4,313,538	0	0.0000%	Log View	0.7	0.0	1.0	1.0	1.0	1,887.7	2.66%
[:: show ::] /broker-service/applog	334,943	3	0.0009%	Log View	3.5	0.0	1.0	1.0	1.8	146.6	0.21%
[:: show ::] /broker-service/api/metric	135,662	0	0.0000%	Log View	1.6	0.0	1.0	1.0	1.2	59.4	0.08%

分钟级统计



[:: hide ::] URL 158,796,017 5 0.0000% Log View 555.4 1.0 3.1 3.8 23.9 70,856.6



Event报表



- 用于一些事件的统计，比如程序异常路径访问、任务执行记录等
- 统计一些QPS分布、SQL长度分布等
- 数据来源：
 - API打点： `Cat.newEvent(type, name)`
 - 框架打点： 框架层面 MVC、RPC、SQL、Cache、Message ...

Event报表



2016-03-21 12:00:00 to 2016-03-21 12:59:59

全部

常用

deal-service

Go

【切到历史模式】

[-7d]

[-1d]

[-1h]

[+1h]

[+1d]

[+7d]

[now]

[All] [10.1.124.26 (deal-service45.nh)] [10.101.14.167] [10.101.14.168] [10.101.16.103] [10.101.18.149] [10.101.18.173] [10.101.18.31] [10.101.18.92] [10.101.2.96] [10.101.4.159 (a97ef7fe1efd)] [10.101.6.123 (ef0278d2e6c8)] [10.101.8.131] [10.3.2.170]

Type	Total	Failure	Failure%	Sample Link	QPS
[:: show ::] PigeonCall.app	20,130,016	0	0.0000%	Log View	5,591.7
[:: show ::] PigeonCall.QPS	20,130,015	0	0.0000%	Log View	5,591.7
[:: show ::] PigeonCall.server	20,130,015	0	0.0000%	Log View	5,591.7
[:: show ::] RemoteCall	20,226,405	0	0.0000%	Log View	5,618.4

[:: show ::] PigeonService.app

2016-03-21 15:00:00 to 2016-03-21 15:59:59

全部

常用

deal-service

Go

[:: show ::] PigeonService.client

[:: show ::] PigeonService.QPS

[All] [10.1.124.26 (deal-service45.nh)] [10.101.14.167] [10.101.14.168] [10.101.16.103]

[:: show ::] SQL.Database

[10.101.4.159 (a97ef7fe1efd)] [10.101.6.123 (ef0278d2e6c8)] [10.101.8.131] [10.3.2.170]

[:: show ::] SQL.Method

[:: show ::] SQL.Length

[:: show ::] Name	Total	Failure
TOTAL	186,273	0
[:: show ::] <= 1K	164,426	0
[:: show ::] <= 10K	21,847	0

Problem报表

- 实时分析所有transaction\event消息
- 找出存在异常的调用链路
 - Exception
 - Failed Transaction
 - Long Http/SQL/Service/Call/KV

problem logview



text graph

```
t15:00:40.892 URL /broker-service/commandbatch
E15:00:40.892 URL URL.Server
E15:00:40.892 URL URL.Method
E15:00:40.893 Exception java.util.zip.ZipException ERROR
IPS=100.100.100.100:8080:1&VirtualIP=127.0.0.1&Server=catdot.dianping.com&Referer=null&Agent=Dalvik/2.1.0 (Linux
HTTP/POST /broker-service/commandbatch?v=4&p=41&unionid=863388039885855
java.util.zip.ZipException: Corrupt GZIP trailer
at java.util.zip.GZIPInputStream.readTrailer(GZIPInputStream.java:221)
at java.util.zip.GZIPInputStream.read(GZIPInputStream.java:118)
at com.dianping.cat.broker.api.page.GzipCompressUtil.deCompress(GzipCompressUtil.java:83)
at com.dianping.cat.broker.api.page.batch.CommandBatchServlet.service(CommandBatchServlet.java:125)
at org.apache.catalina.core.ApplicationFilterChain.internalDoFilter(ApplicationFilterChain.java:290)
at org.apache.catalina.core.ApplicationFilterChain.doFilter(ApplicationFilterChain.java:206)
at com.dianping.cat.servlet.CatFilter.logTransaction(CatFilter.java:267)
at com.dianping.cat.servlet.CatFilter.doFilter(CatFilter.java:83)
at org.apache.catalina.core.ApplicationFilterChain.internalDoFilter(ApplicationFilterChain.java:235)
at org.apache.catalina.core.ApplicationFilterChain.doFilter(ApplicationFilterChain.java:206)
at org.apache.catalina.core.StandardWrapperValve.invoke(StandardWrapperValve.java:219)
at org.apache.catalina.core.StandardContextValve.invoke(StandardContextValve.java:191)
at org.apache.catalina.core.StandardHostValve.invoke(StandardHostValve.java:127)
at org.apache.catalina.valves.ErrorReportValve.invoke(ErrorReportValve.java:103)
at org.apache.catalina.core.StandardEngineValve.invoke(StandardEngineValve.java:109)
at org.apache.catalina.connector.CoyoteAdapter.service(CoyoteAdapter.java:293)
at org.apache.coyote.http11.Http11NioProcessor.process(Http11NioProcessor.java:891)
at org.apache.coyote.http11.Http11NioProtocol$Http11ConnectionHandler.process(Http11NioProtocol.java:750)
at org.apache.tomcat.util.net.NioEndpoint$SocketProcessor.run(NioEndpoint.java:2283)
at java.util.concurrent.ThreadPoolExecutor.runWorker(ThreadPoolExecutor.java:1145)
at java.util.concurrent.ThreadPoolExecutor$Worker.run(ThreadPoolExecutor.java:615)
at java.lang.Thread.run(Thread.java:745)

t15:00:40.893 PigeonCall com.dianping.iphub.service.IpService:getIpInfo(String)
E15:00:40.893 PigeonCall.callType sync
E15:00:40.893 PigeonCall.serialize 2
E15:00:40.893 PigeonCall.timeout 20
E15:00:40.893 PigeonCall.QPS S40
E15:00:40.893 PigeonCall.region com.dianping.iphub.service.IpService#shanghai
[:: show ::]
```

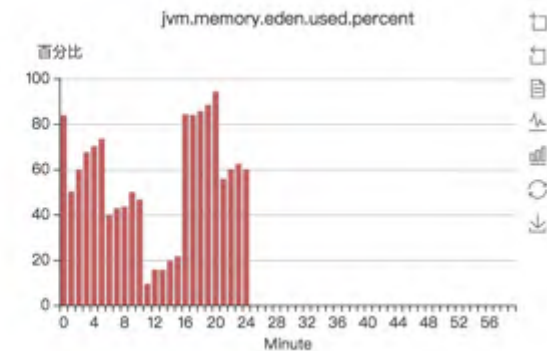
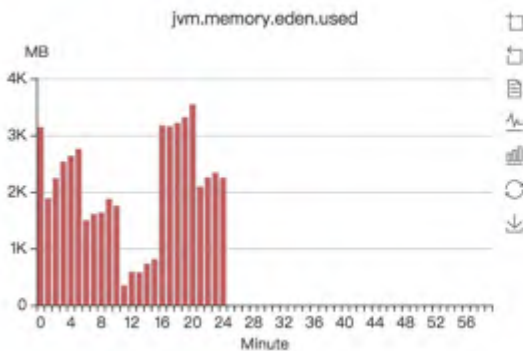
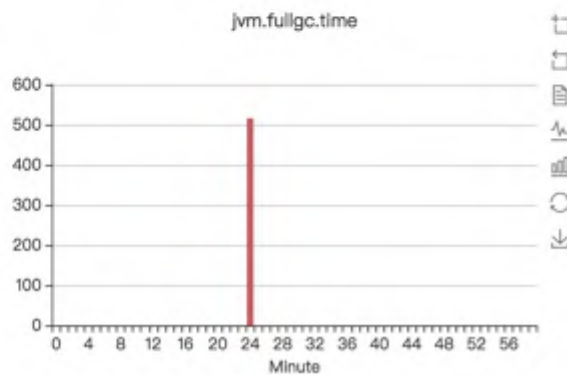
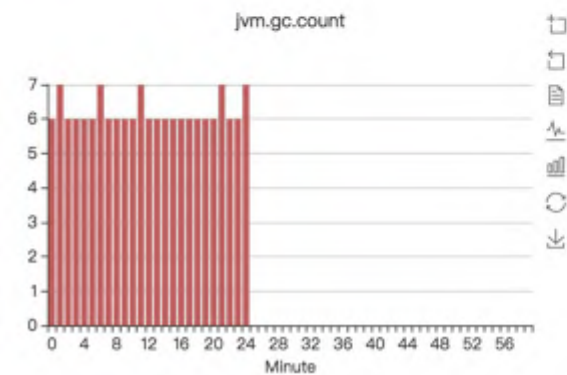
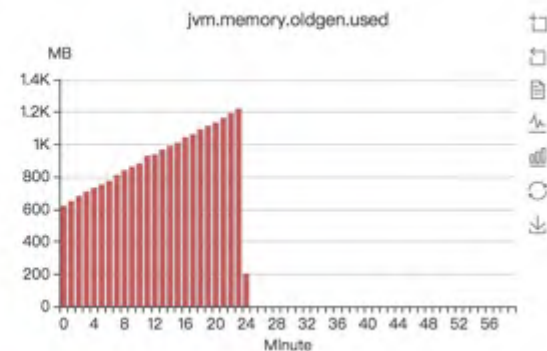
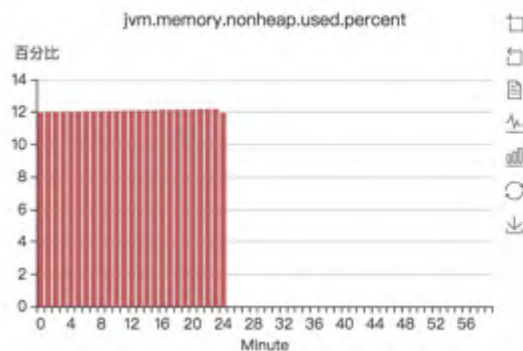
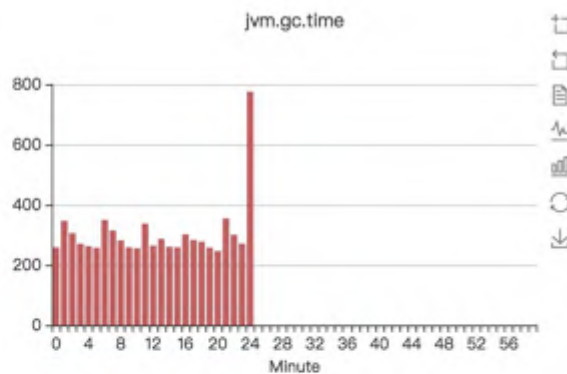
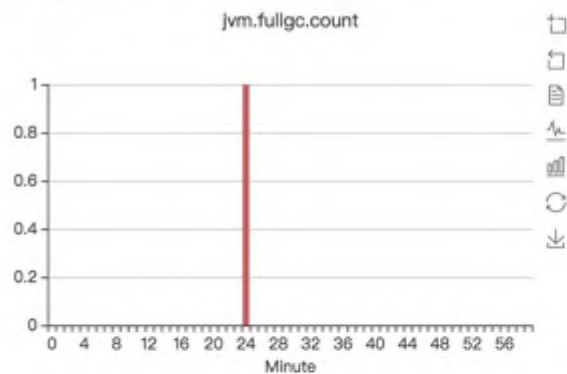
Heartbeat报表

- 系统指标
- JVM指标
- 数据库连接池
- 业务实现SPI上报 ...

Heartbeat报表



jvm.gc Info



远端调用logview



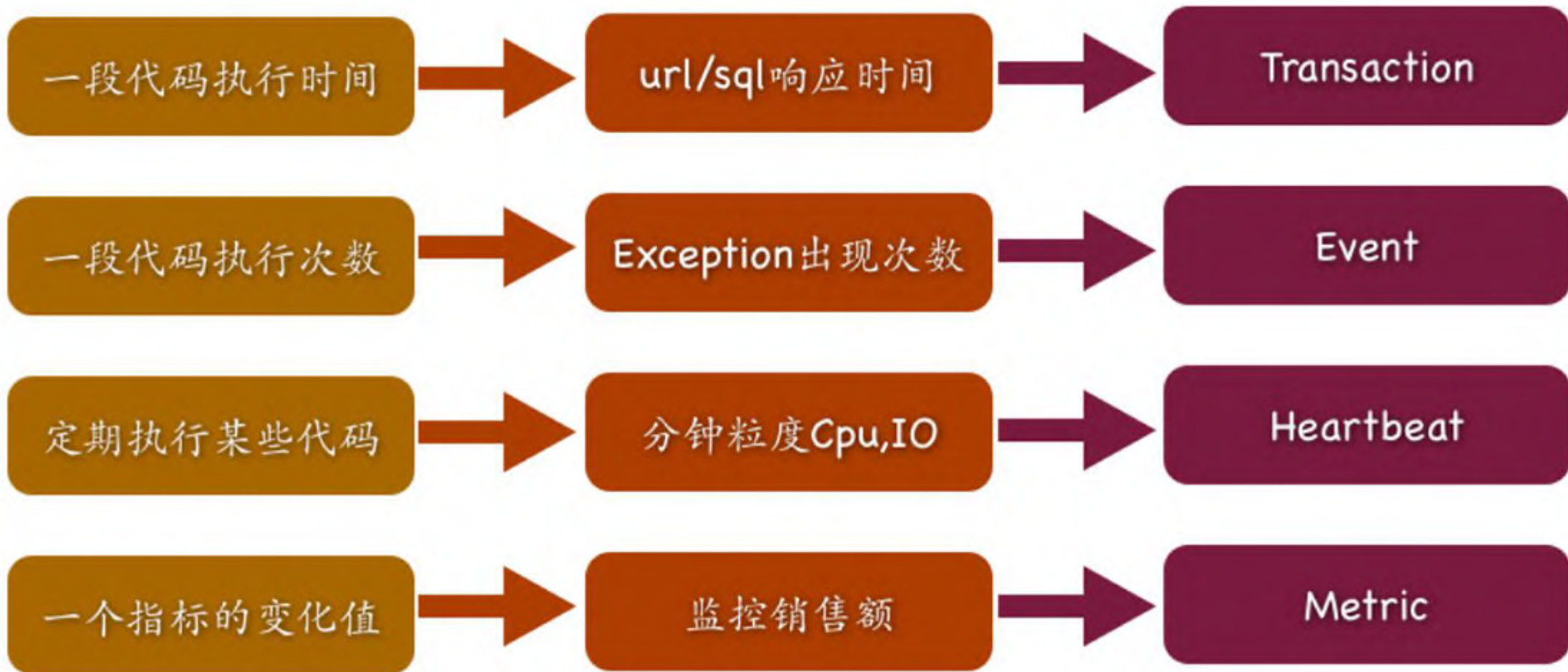
t13:59:37.052	PigeonCall	shopService:shopService_2.0.0:newSearchShops(String,String,int,int,int,int,int,int,int,List,boolean,double,c
E13:59:37.052	PigeonCall.callType	sync
E13:59:37.052	PigeonCall.serialize	2
E13:59:37.052	PigeonCall.timeout	500
E13:59:37.052	PigeonCall.QPS	S37
E13:59:37.052	PigeonCall.region	http://service.dianping.com/shopService/shopService_2.0.0#shanghai
[:: hide ::]		
RootLogview ParentLogview		
t13:59:37.058	PigeonService	shopService:shopService_2.0.0:newSearchShops(String,String,int,int,int,int,int,int,int,List,boo
E13:59:37.058	PigeonService.app	wedding-mobile-m-web
E13:59:37.058	PigeonService.client	10.69.161.148
E13:59:37.058	PigeonService.QPS	S37
t13:59:37.058	PigeonCall	shopService:shopServiceExtrenal_2.0.0:newSearchShops(String,String,int,int,int,int,int,int,int,
E13:59:37.058	PigeonCall.callType	sync
E13:59:37.058	PigeonCall.serialize	2
E13:59:37.058	PigeonCall.timeout	1000
E13:59:37.058	PigeonCall.QPS	S37
E13:59:37.058	PigeonCall.region	http://service.dianping.com/shopService/shopServiceExtrenal_2.0.0#shanghai
[:: show ::]		
E13:59:37.239	PigeonCall.app	shop-ex-service
E13:59:37.239	PigeonCall.server	10.1.134.167:2027
T13:59:37.239	PigeonCall	shopService:shopServiceExtrenal_2.0.0:newSearchShops(String,String,int,int,int,int,int,int,int,
T13:59:37.239	PigeonService	shopService:shopService_2.0.0:newSearchShops(String,String,int,int,int,int,int,int,int,List,boo
E13:59:37.233	PigeonCall.app	shop-server
E13:59:37.233	PigeonCall.server	10.3.13.32:4081
T13:59:37.233	PigeonCall	shopService:shopService_2.0.0:newSearchShops(String,String,int,int,int,int,int,int,int,List,boolean,double,c

点击继续展开下游的调用链

设计目标

- 可扩展 ✓
- 高可用 ✓
- 实时性 ✓
- 全量数据 ✓
- 高吞吐 ✓
- 故障容忍 ✓
- 可靠性 ✗

监控模型



消息组成



消息头

版本号, 消息ID, 所属业务, IP, 所在线程, 根消息ID

消息体

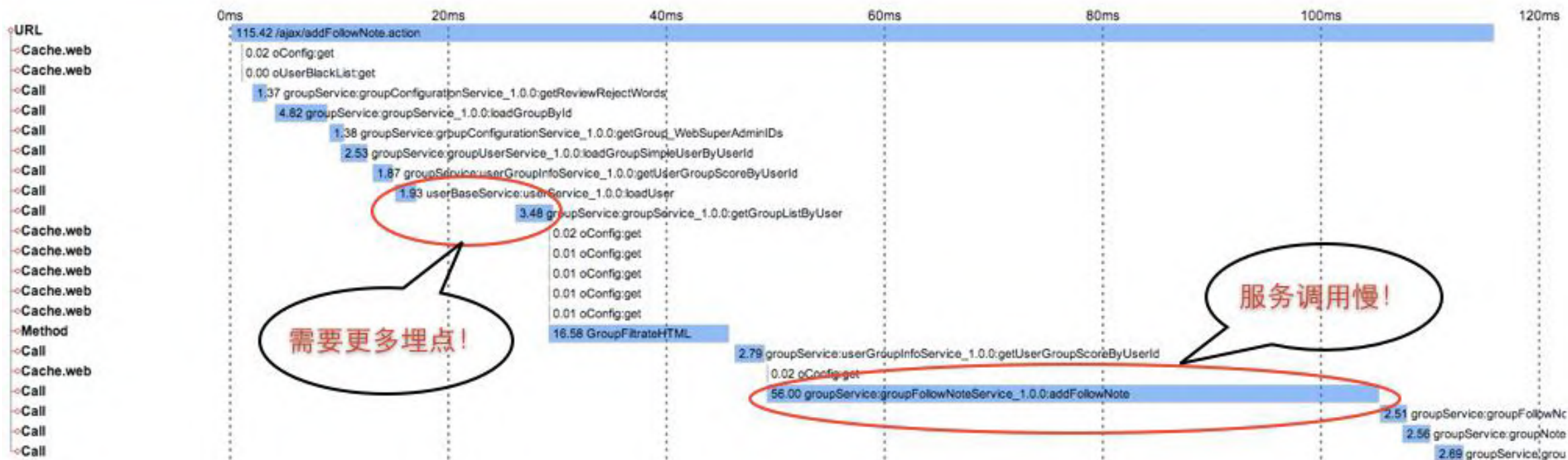
Type & timestamp	1st Category	2nd Category	Status	Duration & Attributes
t14:38:56.595	URL	t		
E14:38:56.595	URL.Server	cat.dianpingoa.com	RemoteIP= [redacted] &Referer=http://cat.dianping	
E14:38:56.595	URL.Method	HTTP/GET	/cat/r/t?domain=&date=2012101314&reportType=	
A14:38:56.595	MVC	InboundPhase		0.06ms
A14:38:56.595	MVC	TransitionPhase		0.00ms
t14:38:56.595	MVC	OutboundPhase		
t14:38:56.595	ModelService	CompositeTransactionService		
A14:38:56.596	ModelService	RemoteTransactionService	1.06ms http:// [redacted]:8080/cat/r/model/transact	
A14:38:56.596	ModelService	RemoteTransactionService	0.86ms http:// [redacted]:8080/cat/r/model/transac	
A14:38:56.596	ModelService	RemoteTransactionService	1.89ms http:// [redacted]:8080/cat/r/model/transac	
A14:38:56.596	ModelService	RemoteTransactionService	1.79ms http:// [redacted]:8080/cat/r/model/transac	
A14:38:56.596	ModelService	RemoteTransactionService	27ms http:// [redacted]:8080/cat/r/model/transacti	
T14:38:56.622	ModelService	CompositeTransactionService	27ms request=ModelRequest(domain=Cat, period	
T14:38:56.628	MVC	OutboundPhase		33ms
T14:38:56.628	URL	t		33ms module=r&in=t&out=t

t: Transaction Start
E: Event
T: Transaction End
A: Atomic Transaction

Transaction: 可嵌套
Event: 不可嵌套
Heartbeat: 不可嵌套



可视化Logview

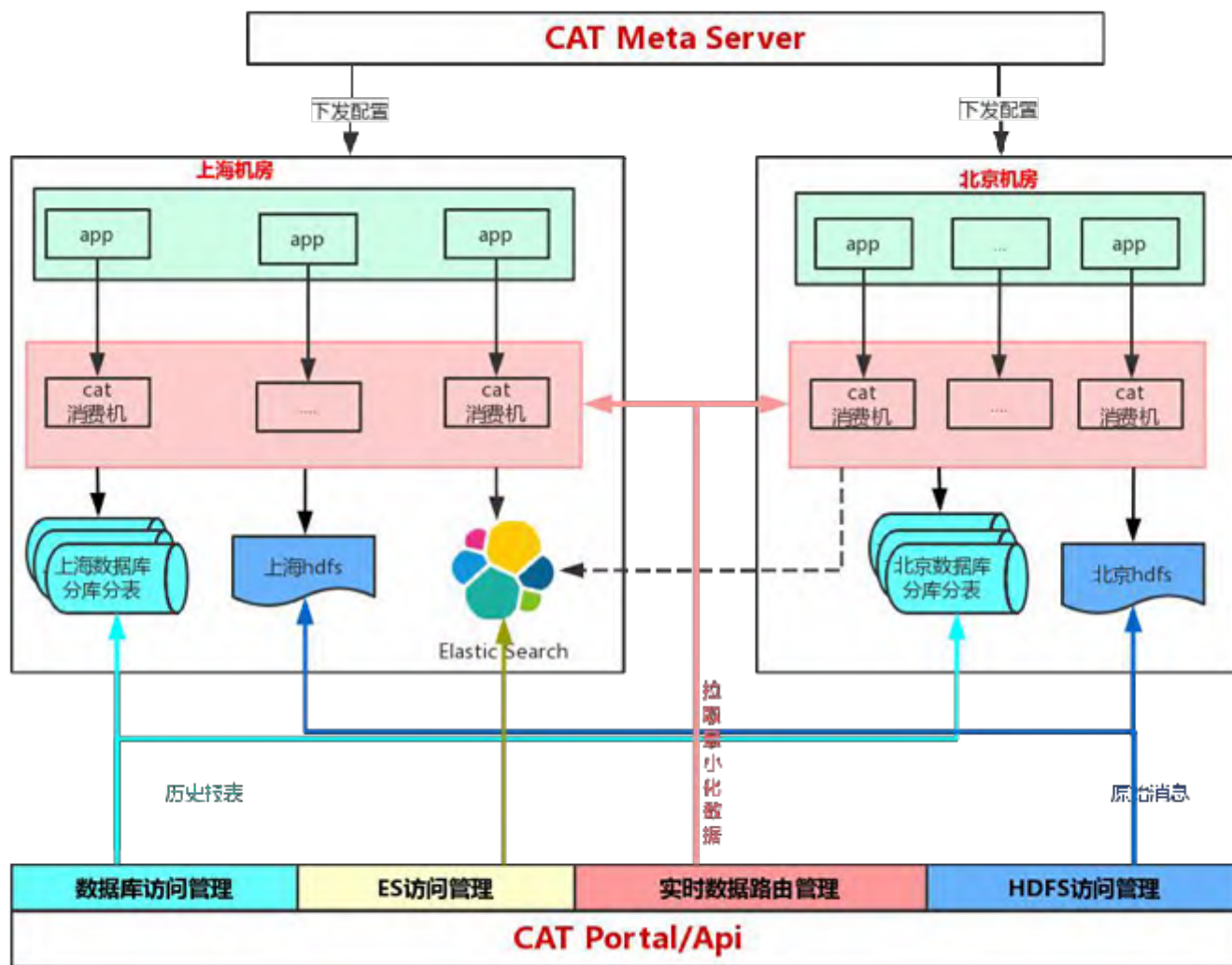


分布式Logview

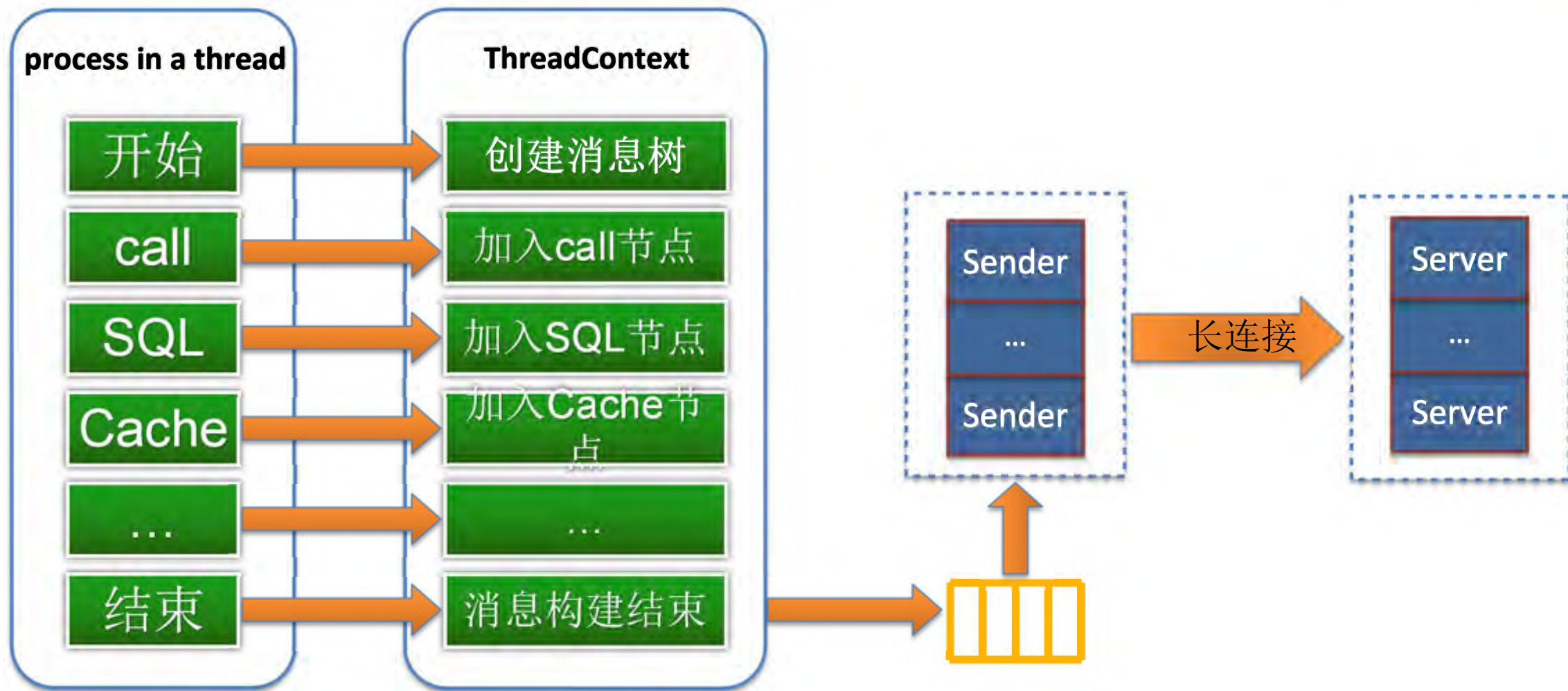


t15:00:44.023	URL	/ajax/addVote.action	
E15:00:44.023	URL	ClientInfo	RemotelP=180.175.162.12
E15:00:44.023	URL	Payload	HTTP/POST /ajax/addVote
A15:00:44.023	Cache.web	oConfig:get	0.02ms finalKey=oConfig.1
A15:00:44.023	Cache.web	oUserBlackList:get	0.00ms finalKey=oUserBlk
t15:00:44.026	Call	groupService:groupSurveyService_1.0.0:addVote	
[: hide :]			
t15:00:43.967	Service	groupService:groupSurveyService_1.0.0:addVote	
E15:00:43.967	PigeonRequest	Payload	
t15:00:43.967	SQL	GroupSurvey.loadSurvey	
E15:00:43.967	SQL.Method	Select	
E15:00:43.968	SQL.Database	jdbc:mysql://[redacted]?characterEncoding=l	
T15:00:43.967	SQL	GroupSurvey.loadSurvey	
t15:00:43.968	Call	userBaseService:userService_1.0.0:loadUser	
[: hide :]			
t15:00:44.089	Service	userBaseService:ut	
E15:00:44.089	PigeonRequest	Payload	
A15:00:44.089	Cache.memcached	eUserAtUC:get	
T15:00:44.089	Service	userBaseService:ut	
[: show :]			
T15:00:43.970	Call	userBaseService:userService_1.0.0:loadUser	
A15:00:43.970	Cache.memcached	oUserGroupScore:get	
t15:00:43.975	SQL	GroupSurvey.addVote	
E15:00:43.975	SQL.Method	Execute	
E15:00:44.244	SQL.Database	jdbc:mysql://[redacted]?characterEncoding=l	
T15:00:44.243	SQL	GroupSurvey.addVote	
T15:00:44.244	Service	groupService:groupSurveyService_1.0.0:addVote	
[: show :]			
T15:00:44.305	Call	groupService:groupSurveyService_1.0.0:addVote	279ms CallType=sync
T15:00:44.307	URL	/ajax/addVote.action	284ms

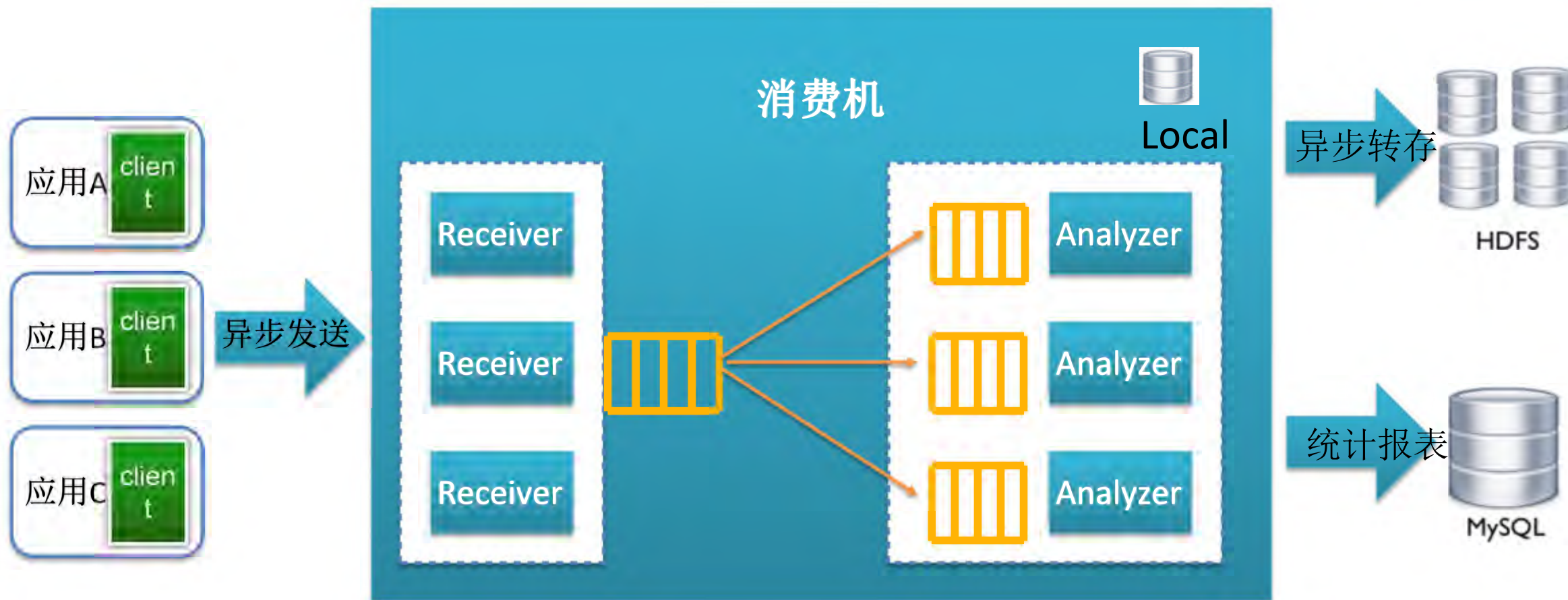
CAT整体架构



客户端设计



CAT消费机制



- Mysql 服务端基本没有慢查询，CAT上却有很多long-sql
- CAT统计不对？OR ...

CAT规模



- 接入应用数：6K+
- 接入机器：40K+
- 消息处理量（每天）：3000亿+
- 消息存储量（每天）：230T+
- 高峰期QPS可达：550万
- 可用性：99.999+

CAT现状



Thanks

Q&A