



当Dubbo遇上Arthas

排查问题的实践

陈志轩/横云断岭

- 阿里巴巴-中间件技术部
- Spring Boot/Dubbo/Arthas
- Github: hengyunabc
- Email: hengyunabc@gmail.com
- Blog: <http://hengyunabc.github.io/>
- 公众号：横云断岭的专栏 ->



排查Dubbo问题

- Dubbo线上服务抛出异常，怎么获取调用参数？
- 怎样线上调试Dubbo服务代码？
- 怎样动态修改Dubbo的logger级别？
- 怎样减少测试小姐姐重复发请求的麻烦？
- Dubbo运行时有哪些Filter？耗时是多少？
- Dubbo动态代理是怎样实现的？



Arthas/阿尔萨斯

- Alibab开源的Java诊断工具
- 9月份开源，Star 6000+
- Github: <https://github.com/alibaba/arthas>
- Wiki: <https://alibaba.github.io/arthas/>
- Arthas开源交流QQ群：916328269
- Arthas开源交流钉钉群：21965291



Dubbo-arthas-demo

<https://github.com/hengyunabc/dubbo-arthas-demo>

/user/{id}	->	UserService	->	UserServiceImpl
Browser		Dubbo Client		Dubbo Server

```
@RestController
public class UserController {

    @Reference(version = "1.0.0")
    private UserService userService;

    @GetMapping("/user/{id}")
    public User findUserById(@PathVariable Integer id) {
        return userService.findUser(id);
    }
}
```

```
@Service(version = "1.0.0")
public class UserServiceImpl implements UserService {
    @Override
    public User findUser(int id) {
        if (id < 1) {
            throw new IllegalArgumentException("user id < 1, id: " + id);
        }
        for (User user : users) {
            if (user.getId() == id) {
                return user;
            }
        }
        throw new RuntimeException("Can not find user, id: " + id);
    }
}
```

Arthas快速开始

```
$ wget https://alibaba.github.io/arthas/arthas-boot.jar
$ java -jar arthas-boot.jar
$ java -jar arthas-boot.jar --repo-mirror aliyun --use-http
```

```
hengyunabcdeMacBook-Air:tmp hengyunabc$ java -jar arthas-boot.jar
```

```
* [1]: 22342
```

```
[2]: 42200 ClientDemoApplication
```

```
[3]: 42142 ServerDemoApplication
```

3

```
[INFO] arthas home: /Users/hengyunabc/.arthas/lib/3.0.5/arthas
```

```
[INFO] Try to attach process 42142
```

```
[INFO] Attach process 42142 success.
```

```
[INFO] arthas-client connect 127.0.0.1 3658
```

wiki: <https://alibaba.github.io/arthas>

version: 3.0.5

pid: 42142

```
time: 2018-11-30 21:13:50
```


Watch – 参数/返回值/异常

```
$ watch com.example.UserService * -e -x 2 '{params,throwExp}'
```

```
$ watch com.example.UserService * -e -x 2 '{params,throwExp}'
Press Ctrl+C to abort.
Affect(class-cnt:1 , method-cnt:4) cost in 38 ms.
ts=2018-11-30 23:18:33; [cost=16.570092ms] result=@ArrayList[
  @Object[][
    @Integer[-1],
  ],
  java.lang.IllegalArgumentException: user id < 1, id: -1
    at com.example.UserServiceImpl.findUser(UserServiceImpl.java:25)
    at com.alibaba.dubbo.common.bytecode Wrapper3.invokeMethod(Wrapper3.java)
    at com.alibaba.dubbo.rpc.proxy.javassist.JavassistProxyFactory$1.doInvoke(JavassistProxyFactory.java:45)
    at com.alibaba.dubbo.rpc.proxy.AbstractProxyInvoker.invoke(AbstractProxyInvoker.java:71)
    at com.alibaba.dubbo.config.invoker.DelegateProviderMetaDataInvoker.invoke(DelegateProviderMetaDataInvoker.java:48)
    at com.alibaba.dubbo.rpc.protocol.InvokerWrapper.invoke(InvokerWrapper.java:52)
    at com.alibaba.dubbo.rpc.filter.ExceptionFilter.invoke(ExceptionFilter.java:61)
    at com.alibaba.dubbo.rpc.protocol.ProtocolFilterWrapper$1.invoke(ProtocolFilterWrapper.java:68)
    at com.alibaba.dubbo.monitor.support.MonitorFilter.invoke(MonitorFilter.java:74)
    at com.alibaba.dubbo.rpc.protocol.ProtocolFilterWrapper$1.invoke(ProtocolFilterWrapper
```

Redefine – 动态更新代码

```
$ redefine -p classes/com/example/UserServiceImpl.class
```

```
$ redefine -h
```

USAGE:

```
redefine [-c <value>] [-h] [-p <value>]
```

SUMMARY:

```
Redefine classes. @see Instrumentation#redefineClasses(ClassDefinition...)
```

EXAMPLES:

```
redefine -p /tmp/Test.class
```

```
redefine -c 327a647b -p /tmp/Test.class /tmp/Test\${Inner}.class
```

WIKI:

```
https://alibaba.github.io/arthas/redefine
```

OPTIONS:

-c, --classloader <value>	classLoader hashCode
-h, --help	this help
-p, --path <value>	.class file paths

```
$ redefine -p /Users/hengyunabc/code/java/dubbo/dubbo-arthas-demo/server-demo/target/classes/com/example/UserServiceImpl.class  
redefine success, size: 1
```


Ognl – 执行任意代码

```
$ ognl '@org.apache.log4j.LogManager@getRootLogger()'
$ sc -d org.apache.log4j.Logger
$ ognl '@org.slf4j.LoggerFactory@getLogger("root")
    .setLevel(@ch.qos.logback.classic.Level@DEBUG)'
$ ognl '@org.slf4j.LoggerFactory@getLogger("root")
    .getLevel().toString()'
@String[DEBUG]
```

```
$ ognl '@org.slf4j.LoggerFactory@getLogger("root").setLevel(@ch.qos.logback.classic.Level@DEBU
null
$ ognl '@org.slf4j.LoggerFactory@getLogger("root").getLevel().toString()'
@String[DEBUG]
$ sc -d org.apache.log4j.Logger
class-info      org.apache.log4j.Logger
code-source     /Users/hengyunabc/.m2/repository/org/slf4j/log4j-over-slf4j/1.7.25/log4j-o
ver-slf4j-1.7.25.jar
name            org.apache.log4j.Logger
```

TimeTunnel – 录制回放调用

```
$ tt -t com.example.UserServiceImpl findUser
$ tt -i 1002 -w 'throwExp'
```

```
$ tt -t com.example.UserServiceImpl findUser
Press Ctrl+C to abort.
Affect(class-cnt:1 , method-cnt:1) cost in 75 ms.
  INDE  TIMESTAMP      COST(m  IS-R  IS-  OBJECT      CLASS      METHOD
  X      s)          s)      ET   EXP
-----
  1000   2018-12-01 0   0.3333  true  fal   0x11313e8  UserServiceImpl  findUser
        1:12:57      45      se   3
  1001   2018-12-01 0   0.3386  true  fal   0x11313e8  UserServiceImpl  findUser
        1:13:06      1      se   3
  1002   2018-12-01 0   2.4407  fals  tru   0x11313e8  UserServiceImpl  findUser
        1:13:19     09      e    e   3

$ tt -i 1002 -w 'throwExp'
java.lang.RuntimeException: Can not find user, id: 9999
    at com.example.UserServiceImpl.findUser(UserServiceImpl.java:32)
    at com.alibaba.dubbo.common.bytecode Wrapper3.invokeMethod(Wrapper3.java)
    at com.alibaba.dubbo.rpc.proxy.javassist.JavassistProxyFactory$1.doInvoke(JavassistPro
xyFactory.java:45)
    at com.alibaba.dubbo.rpc.proxy.AbstractProxyInvoker.invoke(AbstractProxyInvoker.java:7
1)
    at com.alibaba.dubbo.config.invoker.DelegateProviderMetaDataInvoker.invoke(DelegatePro
```


Trace – 跟踪调用栈/定位性能瓶颈

```
$ trace com.alibaba.dubbo.rpc.Filter *  
$ trace javax.servlet.Servlet *
```

```
$ trace com.alibaba.dubbo.rpc.Filter *  
Press Ctrl+C to abort.  
Affect(class-cnt:19 , method-cnt:59) cost in 1098 ms.  
`---ts=2018-12-01 01:20:28;thread_name=DubboServerHandler-192.168.0.6:20880-thread-25;id=57;is  
_daemon=true;priority=5;TCCL=sun.misc.Launcher$AppClassLoader@5c647e05  
  `---[12.774396ms] com.alibaba.dubbo.rpc.filter.EchoFilter:invoke()  
    +---[0.131866ms] com.alibaba.dubbo.rpc.Invocation:getMethodName()  
    +---[0.035554ms] java.lang.String:equals()  
    `---[12.066301ms] com.alibaba.dubbo.rpc.Invoker:invoke()  
      `---[11.789352ms] com.alibaba.dubbo.rpc.filter.ClassLoaderFilter:invoke()  
        +---[min=0.005886ms,max=0.051385ms,total=0.072802ms,count=3] java.lang.Thread:  
currentThread()  
        +---[0.034193ms] java.lang.Thread:getContextClassLoader()  
        +---[0.03543ms] com.alibaba.dubbo.rpc.Invoker:getInterface()  
        +---[0.008347ms] java.lang.Class:getClassLoader()  
        +---[min=0.003737ms,max=0.031166ms,total=0.034903ms,count=2] java.lang.Thread:  
setContextClassLoader()  
        `---[11.133971ms] com.alibaba.dubbo.rpc.Invoker:invoke()  
          `---[10.937465ms] com.alibaba.dubbo.rpc.filter.GenericFilter:invoke()  
            +---[0.022315ms] com.alibaba.dubbo.rpc.Invocation:getMethodName()
```

Jad – 即时反编译

```
$ jad com.alibaba.dubbo.common.bytecode.Wrapper1  
$ jad com.sun.proxy.$Proxy1
```

```
$ jad com.alibaba.dubbo.common.bytecode.Wrapper3
```

ClassLoader:

```
+--sun.misc.Launcher$AppClassLoader@5c647e05  
  +-sun.misc.Launcher$ExtClassLoader@4b54b685
```

Location:

```
/Users/hengyunabc/.m2/repository/com/alibaba/dubbo/2.5.10/dubbo-2.5.10.jar
```

```
/*  
 * Decompiled with CFR 0_132.  
 *  
 * Could not load the following classes:  
 *   com.example.User  
 *   com.example.UserServiceImpl  
 */  
package com.alibaba.dubbo.common.bytecode;
```

```
import com.alibaba.dubbo.common.bytecode.ClassGenerator;  
import com.alibaba.dubbo.common.bytecode.NoSuchMethodException;
```


Thread – 消耗CPU线程

```
$ thread -i 5000
$ thread -i 5000 -n 3
```

```
$ thread -i 5000
Threads Total: 229, NEW: 0, RUNNABLE: 12, BLOCKED: 0, WAITING: 211, TIMED_WAITING: 6, TERMINATED: 0
```

ID	NAME	GROUP	PRIORITY	STATE	%CPU	TIME	INTERRUPTED	DAEMON
230	DubboServerHandler-192	main	5	RUNNABLE	72	0:1	false	true
31	New I/O server worker	main	5	RUNNABLE	24	0:0	false	true
241	as-command-execute-dae	system	10	RUNNABLE	1	0:0	false	true
233	AsyncAppender-Worker-a	system	9	WAITING	0	0:0	false	true

```
$ thread -i 5000 -n 3
"DubboServerHandler-192.168.0.6:20880-thread-200" Id=230 cpuUsage=66% WAITING on java.util.concurrent.SynchronousQueue$TransferStack@618fc4c4
    at sun.misc.Unsafe.park(Native Method)
    - waiting on java.util.concurrent.SynchronousQueue$TransferStack@618fc4c4
    at java.util.concurrent.locks.LockSupport.park(LockSupport.java:175)
    at java.util.concurrent.SynchronousQueue$TransferStack.awaitFulfill(SynchronousQueue.java:458)
    at java.util.concurrent.SynchronousQueue$TransferStack.transfer(SynchronousQueue.java:362)
```

Dashboard

ID	NAME	GROUP	PRIORIT	STATE	%CPU	TIME	INTERRU	DAEMON
155	Timer-for-arthas-dashb	system	10	RUNNABL	76	0:0	false	true
242	DubboServerHandler-192	main	5	WAITING	14	0:0	false	true
31	New I/O server worker	main	5	RUNNABL	9	0:0	false	true
123	AsyncAppender-Worker-a	system	9	WAITING	0	0:0	false	true
118	Attach Listener	system	9	RUNNABL	0	0:0	false	true
23	Curator-ConnectionStat	main	5	WAITING	0	0:0	false	true
26	Curator-Framework-0	main	5	WAITING	0	0:0	false	true
29	DestroyJavaVM	main	5	RUNNABL	0	0:53	false	false
22	DubboRegistryFailedRet	main	5	TIMED_W	0	0:0	false	true
27	DubboSaveRegistryCache	main	5	WAITING	0	0:0	false	true

Memory	used	total	max	usage	GC	
heap	387M	727M	1820M	21.27%	gc.ps_scavenge.count	87
ps_eden_space	363M	663M	663M	54.77%	gc.ps_scavenge.time(ms)	709
ps_survivor_space	8M	9M	9M	89.83%	gc.ps_marksweep.count	1
ps_old_gen	15M	54M	1365M	1.16%		107

Runtime

```
os.name      Mac OS X
os.version   10.13.4
java.version  1.8.0_162
```


JVM

```
$ jvm  
RUNTIME
```

```
MACHINE-NAME      42142@hengyunabcdeMacBook-Air.local  
JVM-START-TIME    2018-11-30 20:58:00  
MANAGEMENT-SPEC-VERSION 1.2  
SPEC-NAME         Java Virtual Machine Specification  
SPEC-VENDOR       Oracle Corporation  
SPEC-VERSION      1.8  
VM-NAME           Java HotSpot(TM) 64-Bit Server VM  
VM-VENDOR         Oracle Corporation  
VM-VERSION        25.162-b12  
INPUT-ARGUMENTS   -Dfile.encoding=UTF-8
```

```
CLASS-PATH         /Library/Java/JavaVirtualMachines/jdk1.8.0_162.jdk/Contents/Home/  
jre/lib/resources.jar:/Library/Java/JavaVirtualMachines/jdk1.8.0_  
162.jdk/Contents/Home/jre/lib/rt.jar:/Library/Java/JavaVirtualMac  
hines/jdk1.8.0_162.jdk/Contents/Home/jre/lib/jsse.jar:/Library/Ja  
va/JavaVirtualMachines/jdk1.8.0_162.jdk/Contents/Home/jre/lib/jce  
.jar:/Library/Java/JavaVirtualMachines/jdk1.8.0_162.jdk/Contents/  
Home/jre/lib/charsets.jar:/Library/Java/JavaVirtualMachines/jdk1.  
8.0_162.jdk/Contents/Home/jre/lib/jfr.jar:/Library/Java/JavaVirtu
```

WebSocket

← → ↻ ⓘ localhost:8563

Welcome to Arthas web console!

IP: PORT:

The logo for Arthas, featuring the word "ARTTHAS" in a stylized, outlined font. Each letter is composed of dashed lines, and the colors of the lines vary by letter: 'A' is red, 'R' is yellow, 'T' is cyan, 'T' is purple, 'H' is green, 'A' is blue, and 'S' is light blue.

```
wiki: https://alibaba.github.io/arthas
version: 3.0.5
pid: 73127
time: 2018-12-01 13:51:18
```

```
$ help
```

NAME	DESCRIPTION
help	Display Arthas Help
keymap	Display all the available keymap for the specified connection.
sc	Search all the classes loaded by JVM
sm	Search the method of classes loaded by JVM
classloader	Show classloader info
jad	Decompile class
getstatic	Show the static field of a class
monitor	Monitor method execution statistics, e.g. total/success/failure count, average rt, fail rate, etc.
stack	Display the stack trace for the specified class and method
thread	Display thread info, thread stack
trace	Trace the execution time of specified method invocation.

更多疯狂的想法

- 获取spring context
- 获取dubbo的配置状态
- 更多的命令: help / sc / sm / classloader
- Tab补全
- 快捷键: keymap



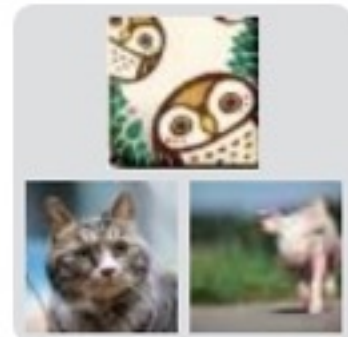


Thank you !

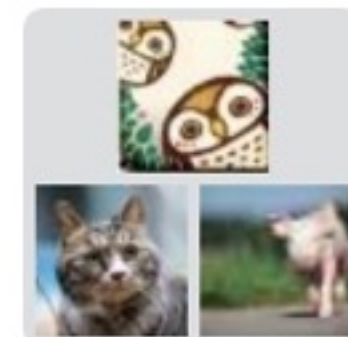
Arthas微信交流群



Arthas微信交流群



Arthas开源交流2群



Arthas开源交流3群

