


# CVE-2022-33891\_Apache\_Spark\_shell 命令注入漏洞


## 漏洞描述

7 月 18 号, Apache 发布安全公告, 修复了一个 Apache Spark 中存在的命令注入漏洞。漏洞编号: CVE-2022-33891, 漏洞威胁等级: 高危。 Apache Spark UI 提供了通过配置选项 Spark .acl .enable 启用 acl 的可能性。使用身份验证过滤器, 这将检查用户是否具有查看或修改应用程序的访问权限。如果启用了 acl, HttpSecurityFilter 中的代码路径可以允许某人通过提供任意用户名来执行模拟。 恶意用户可能能够访问权限检查功能, 该功能最终将根据他们的输入构建一个 Unix shell 命令并执行它。这将导致任意 shell 命令执行。



### CVE-2022-33891: Apache Spark shell command injection vulnerability via Spark UI

Posted to dev@spark.apache.org

**Sean Owen** - 2022年7月18日星期一 GMT+8 07:39:50

Severity: important

Description:

The Apache Spark UI offers the possibility to enable ACLs via the configuration option spark.acls.enable. With an authentication filter, this checks whether a user has access permissions to view or modify the application. If ACLs are enabled, a code path in HttpSecurityFilter can allow someone to perform impersonation by providing an arbitrary user name. A malicious user might then be able to reach a permission check function that will ultimately build a Unix shell command based on their input, and execute it. This will result in arbitrary shell command execution as the user Spark is currently running as. This affects Apache Spark versions 3.0.3 and earlier, versions 3.1.1 to 3.1.2, and versions 3.2.0 to 3.2.1.

This issue is being tracked as SPARK-38992

Mitigation:

Upgrade to supported Apache Spark maintenance release 3.1.3, 3.2.2, or 3.3.0 or later

Credit:

Kostya Kortchinsky (Databricks)

## 相关介绍

Apache Spark 是美国阿帕奇 (Apache) 软件基金会的一款支持非循环数据流和内存计算的大规模数据处理引擎。Spark 优点在于能更好地适用于数据挖掘与机器学习等需要迭代的 MapReduce 的算法。

## 利用范围

Spark Core - Apache <=3.0.3

3.1.1 <= Spark Core - Apache <=3.1.2






3.2.0 <= Spark Core - Apache <=3.2.1

## 漏洞分析

### 环境搭建

在[官网](#)下载 Apache Spark 3.2.1 版本进行漏洞复现分析

### Index of /dist/spark/spark-3.2.1

Name	Last modified	Size	Description
 Parent Directory		-	
 <a href="#">SparkR 3.2.1.tar.gz</a>	2022-01-20 21:37	341K	
 <a href="#">SparkR 3.2.1.tar.gz.asc</a>	2022-01-20 21:37	833	
 <a href="#">SparkR 3.2.1.tar.gz.sha512</a>	2022-01-20 21:37	207	
 <a href="#">pyspark-3.2.1.tar.gz</a>	2022-01-20 21:37	268M	
 <a href="#">pyspark-3.2.1.tar.gz.asc</a>	2022-01-20 21:37	833	
 <a href="#">pyspark-3.2.1.tar.gz.sha512</a>	2022-01-20 21:37	210	
 <a href="#">spark-3.2.1-bin-hadoop2.7.tgz</a>	2022-01-20 21:37	260M	
 <a href="#">spark-3.2.1-bin-hadoop2.7.tgz.asc</a>	2022-01-20 21:37	833	
 <a href="#">spark-3.2.1-bin-hadoop2.7.tgz.sha512</a>	2022-01-20 21:37	268	
 <a href="#">spark-3.2.1-bin-hadoop3.2-scala2.13.tgz</a>	2022-01-20 21:37	293M	
 <a href="#">spark-3.2.1-bin-hadoop3.2-scala2.13.tgz.asc</a>	2022-01-20 21:37	833	
 <a href="#">spark-3.2.1-bin-hadoop3.2-scala2.13.tgz.sha512</a>	2022-01-20 21:37	187	
 <a href="#">spark-3.2.1-bin-hadoop3.2.tgz</a>	2022-01-20 21:37	287M	
 <a href="#">spark-3.2.1-bin-hadoop3.2.tgz.asc</a>	2022-01-20 21:37	833	
 <a href="#">spark-3.2.1-bin-hadoop3.2.tgz.sha512</a>	2022-01-20 21:37	268	
 <a href="#">spark-3.2.1-bin-without-hadoop.tgz</a>	2022-01-20 21:37	200M	
 <a href="#">spark-3.2.1-bin-without-hadoop.tgz.asc</a>	2022-01-20 21:37	833	
 <a href="#">spark-3.2.1-bin-without-hadoop.tgz.sha512</a>	2022-01-20 21:37	288	
 <a href="#">spark-3.2.1.tgz</a>	2022-01-20 21:37	27M	
 <a href="#">spark-3.2.1.tgz.asc</a>	2022-01-20 21:37	833	
 <a href="#">spark-3.2.1.tgz.sha512</a>	2022-01-20 21:37	146	

漏洞触发的关键在于是否启用 ACL，使用身份验证过滤器。

启用 ACL 的两种方式：1、通过设置选项 `spark.acls.enable` 启用。2、运行 `spark-shell` 时，通过 `-c` 参数启动。

为更好分析漏洞，在运行 `spark-shell` 前，需在其中进行远程调试配置

```
export SPARK_SUBMIT_OPTS="-
```

```
agentlib:jdwp=transport=dt_socket,server=y,suspend=n,address=5005"
```

```
root@kali: /home/kali/Desktop/spark-3.2.1-bin-hadoop2.7/bin
File Actions Edit View Help
#!/usr/bin/env bash

#
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# distributed under the License is distributed on an "AS IS" BASIS,
# WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
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# limitations under the License.
#
# Shell script for starting the Spark Shell REPL

export SPARK_SUBMIT_OPTS="-agentlib:jdwp=transport=dt_socket,server=y,suspend=n,address=5005"

cygwin=false
case "$(uname)" in
  CYGWIN*) cygwin=true;;
esac

# Enter posix mode for bash
set -o posix

if [ -z "${SPARK_HOME}" ]; then
```

配置完成后运行 spark-shell，并开启 ACL

```
./spark-shell --conf spark.acls.enable=true
```

The screenshot displays the Spark shell terminal on the left and the Spark Jobs web UI on the right. The terminal shows the command `./spark-shell --conf spark.acls.enable=true` being executed, followed by various status messages and the Spark logo. The web UI on the right shows the Spark Jobs page with the URL `192.168.43.135:4040/jobs/`. The UI includes a navigation bar with links for Jobs, Stages, Storage, Environment, and Execution. The main content area shows the Spark Jobs page with the user `root`, total uptime of `9 s`, and scheduling mode of `FIFO`. There is also a link to the Event Timeline.

## 漏洞原理

根据 [diff](#) 分析

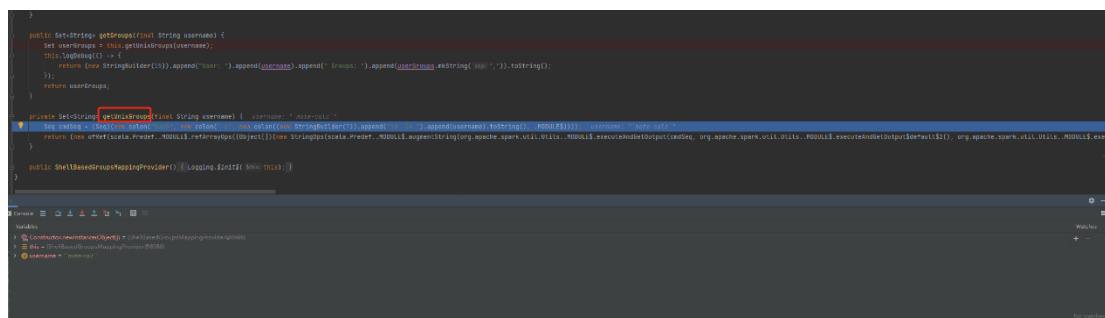
```
changes from an commit  The files  Corrections  Sample  ↗
core/src/main/scala/org/apache/spark/security/ShellBasedGroupsMappingProvider.scala
@@ -30,6 +30,8 @@ import org.apache.spark.util.Utils
30 30 private[spark] class ShellBasedGroupsMappingProvider extends GroupMappingServiceProvider
31 31 with Logging {
32 32
33 + private lazy val idPath = Utils.executeAndGetOutput("which" :: "id" :: Nil).stripLineEnd
34 +
35
36 override def getGroups(username: String): Set[String] = {
37   val userGroups = getUnixGroups(username)
38   logDebug("User: " + username + " Groups: " + userGroups.mkString(","))
39
40 @@ -38,8 +40,7 @@ private[spark] class ShellBasedGroupsMappingProvider extends GroupMappingService
41
42 // shells out a "bash -c id -Gn username" to get user groups
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后续跟进一系列函数进行处理

进入 `org.apache.spark.security.ShellBasedGroupsMappingProvider#getGroups` 函数时，`username` 为传入参数

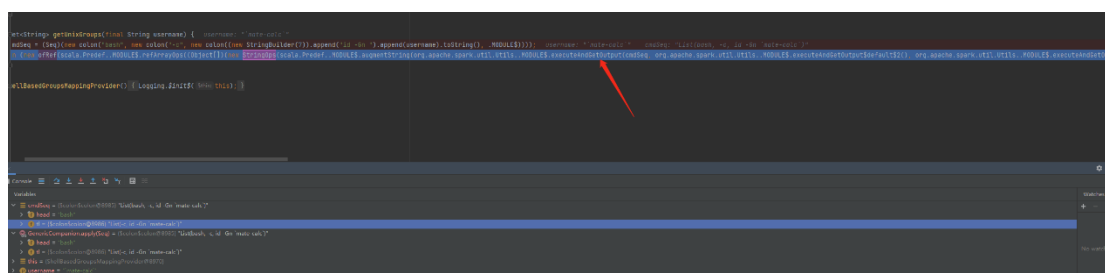
随后进入

## org.apache.spark.security.ShellBasedGroupsMappingProvider#getUnixGroups 函数



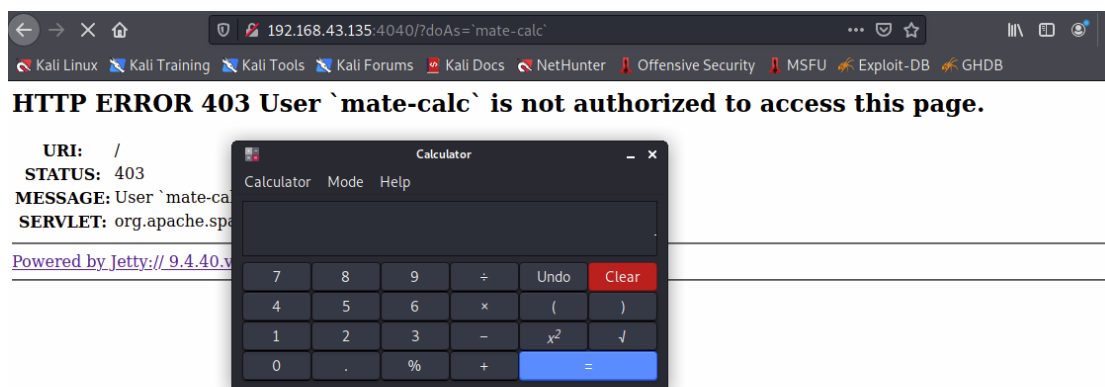
在这里 username 进行了拼接处理，因为我们传入的 username 参数可控，便形成了命令注入。

后续将通过 executeAndGetOutput 函数直接触发传入的命令，造成命令执行。



## 漏洞复现

通过反单引号和参数“doAs”成功命令注入



## 修复建议

建议受影响的用户升级到安全版本： Apache Spark 3.1.3、3.2.2 或 3.3.0 或更高版本。