

# Apache

Web???Apache???

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Apache??

Apache??

# Apache??????????

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Ubuntu24.04?Web????Apache?????????????????Nginx???????

- 1. ?????????????
- 2. ?????????????
- 3. ?????????????????

?????Apache?????

??????????

- 1. Apache????????????
- 2. Apache????????
- 3. ???????????

??????????????

- ???????

```
sudo add-apt-repository ppa:ondrej/apache2
```

- ?????????????

```
sudo aptitude update
```

- apache??????

```
sudo aptitude install apache2
```

- ???????

```
apache2ctl -v
```

```
Server version: Apache/2.4.62 (Ubuntu)
Server built: 2024-07-22T12:37:10
```

- ???????

```
systemctl status apache2.service
```

enabled ? active (running) ??????

????????

- ?????????????

```
sudo cp -pi /etc/apache2/apache2.conf /path/to/backup/directory/apache2.conf.$(date +%Y%m%d)
```

????????????????????

- ?????????????

```
diff -u /path/to/backup/directory/apache2.conf.$(date +%Y%m%d) /etc/apache2/apache2.conf
```

????????????????????

- ????????

```
sudo tee /etc/apache2/apache2.conf > /dev/null << 'EOF'
ServerSignature Off
ServerTokens Prod
ServerName [ ] [ ] [ ] [ ] [ ] [ ]
EOF
```

????????????????????

1. ?????????????
2. ?????????????
3. Web????????????

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- ????

```
diff -u /path/to/backup/directory/apache2.conf.$(date +%Y%m%d) /etc/apache2/apache2.conf
```

- ????

```
+ ServerSignature Off
+ ServerTokens Prod
+ ServerName [ ] [ ] [ ] [ ] [ ] [ ]
```

????????????

- ????

```
sudo apache2ctl configtest
```

Syntax OK??????

- ??????

```
sudo systemctl restart apache2.service
```

- ????????

```
systemctl status apache2.service
```

active (running) ??????

- ??????

```
curl -I http://localhost
```

??????Server?????Apache????????????????????

```
Server: Apache
```

Apache??

# Apache????????????

Ubuntu?Linux?apache?nginx???Web????????????????????

`/var/www` ????????????

?????? `/var` ?????????????????????????????

???www-data? `/usr/sbin/nologin` ??????????????????????ruby? `bundle install` ?????????????????????????????

## ??????????

- 1. ???????????????????
- 2. /etc/passwd???????????

## ????????????

- ????????

```
sudo mkdir -p /home/www-data
```

?????????

- ????????????

```
sudo chown -R www-data:www-data /home/www-data
```

- ????

```
ls -ld /home/www-data
```

???www-data????????????????

## passwd??????????

????????????????????????????????????

- ????????

```
sudo cp -pi /etc/passwd /path/to/backup/directory/passwd.$(date +%Y%m%d)
```

????????????????????

- ??????????

```
diff -u /path/to/backup/directory/passwd.$(date +%Y%m%d) /etc/passwd
```

????????????????

- ???????

```
sudo sed -i 's|/var/www|/home/www-data|' /etc/passwd
```

- ?????

```
diff -u /path/to/backup/directory/passwd.$(date +%Y%m%d) /etc/passwd
```

????????????

```
-www-data:x:33:33:www-data:/var/www:/usr/sbin/nologin
```

```
+www-data:x:33:33:www-data:/home/www-data:/usr/sbin/nologin
```

?????2????????????????

Apache????????????????????  
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- ??

- ????

- ??????

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- ??????

????????????????



- ?????

```
sudo cp -pi /etc/apache2/sites-available/sites.conf /path/to/backup/directory/sites.conf.$(date +%Y%m%d)
```

???????????????????? / ?????????????????

- diff????????

```
diff -u /etc/apache2/sites-available/sites.conf /path/to/backup/directory/sites.conf.$(date +%Y%m%d)
```

????????????????

????????????????

```
/etc/apache2/sites-available/sites.conf
```

????????????????

???

????????????

- ??IP: 192.168.1.11
- ??NW: 192.168.2.0/24
- ??????????: /var/log/redmine/access.log

```
# [IP/NW[
SetEnvIf Remote_Addr "192.168.1.11" dontlog
SetEnvIf Remote_Addr "^192\.168\.2\." dontlog
CustomLog /var/log/redmine/access.log combined env=!dontlog
```

????????????????

```
diff -u /path/to/backup/directory/sites.conf.$(date +%Y%m%d) /etc/apache2/sites-available/sites.conf
```

- ???

```
+ # [IP/NW[
+ SetEnvIf Remote_Addr "192.168.1.11" dontlog
+ SetEnvIf Remote_Addr "^192\.168\.2\." dontlog
- CustomLog /var/log/redmine/access.log combined
+ CustomLog /var/log/redmine/access.log combined env=!dontlog
```

????????????????

- ?????

```
sudo apache2ctl configtest
```

Syntax OK??????

- ?????????

```
systemctl status apache2.service
```

active (running)??????

- Apache???

```
sudo systemctl restart apache2.service
```

- ?????????

```
systemctl status apache2.service
```

active (running)??????

# ????

## ??????????????

- ?????????????

```
tail -f /var/log/redmine/access.log
```

?????(????????)??????

- ?????????????

??????????????

```
tail -f /var/log/redmine/error.log
```

?????(????????)??????

- ??????????

1. ???IP / NW?????Web?????????
  - ???IP / NW??????????????
2. ??????IP / NW?????Web?????????
  - ??????IP / NW??????????????
3. ???IP / NW?????Web????????????????(404/403?????)
  - ???IP / NW??????????????
4. ??????IP / NW?????Web????????????????(404/403?????)
  - ??????IP / NW??????????????



Apache??

# apache????????????????????

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????????????

```
"GET /picture.php?/6797/category/73 HTTP/1.1" 200 14394 "-" "facebookexternalhit/1.1 (+http://www.facebook.com/externalhit_uatext.php)"
```

?????????????????robots.txt?????????bot????????????????????

??

- Ubuntu 20.04
- Apache 2.4 (apt???????????????? /etc/apache2 ????????)

????????????????????????????????1????????

## ????????

1. Apache????????????????????
2. ?????????
3. ????????
4. ?????????

## ????????

- ???????

```
cd /etc/apache2/sites-available && pwd
```

- ???????

```
sudo cp -pi hoge.conf /path/to/backup/directory/hoge.conf.$(date +%Y%m%d)
```

????????????????????????????????

- ???????

```
diff -u /path/to/backup/directory/hoge.conf.$(date +%Y%m%d) hoge.conf
```

????????????????????

????????

????????????????????????????????????

- ???

```
DocumentRoot /var/www/html/hoge
<Directory /var/www/html/hoge>
    Options Indexes FollowSymLinks MultiViews
    AllowOverride All
    ##■■■■■■■■■
    SetEnvIfNoCase User-Agent "facebookexternalhit/1.1" spam_crawler
    SetEnvIfNoCase User-Agent "SemrushBot/7~bl" spam_crawler
    SetEnvIfNoCase User-Agent "AhrefsBot" spam_crawler
    SetEnvIfNoCase User-Agent "MJ12bot" spam_crawler
    SetEnvIfNoCase User-Agent "DotBot" spam_crawler
    SetEnvIfNoCase User-Agent "Baiduspider" spam_crawler
    SetEnvIfNoCase User-Agent "YandexBot" spam_crawler
    SetEnvIfNoCase User-Agent "Sogou web spider" spam_crawler
    SetEnvIfNoCase User-Agent "Exabot" spam_crawler
    SetEnvIfNoCase User-Agent "MegaIndex.ru" spam_crawler
    SetEnvIfNoCase User-Agent "SeznamBot" spam_crawler
    SetEnvIfNoCase User-Agent "BLEXBot" spam_crawler
    SetEnvIfNoCase User-Agent "Bytespider" spam_crawler
</RequireAll>
Require all granted
## ■■■■■■■■■
Require not env spam_crawler
</RequireAll>
```

`/var/www/html/hoge` ????????????

- ???

```
diff -u /path/to/backup/directory/hoge.conf.$(date +%Y%m%d) hoge.conf
```

- ???

```
- Require all granted
+ ##2 ■■■■■■■■■
+ SetEnvIfNoCase User-Agent "facebookexternalhit/1.1" spam_crawler
+ SetEnvIfNoCase User-Agent "SemrushBot/7~bl" spam_crawler
```

```
+ SetEnvIfNoCase User-Agent "AhrefsBot" spam_crawler
+ SetEnvIfNoCase User-Agent "MJ12bot" spam_crawler
+ SetEnvIfNoCase User-Agent "DotBot" spam_crawler
+ SetEnvIfNoCase User-Agent "Baiduspider" spam_crawler
+ SetEnvIfNoCase User-Agent "YandexBot" spam_crawler
+ SetEnvIfNoCase User-Agent "Sogou web spider" spam_crawler
+ SetEnvIfNoCase User-Agent "Exabot" spam_crawler
+ SetEnvIfNoCase User-Agent "MegaIndex.ru" spam_crawler
+ SetEnvIfNoCase User-Agent "SeznamBot" spam_crawler
+ SetEnvIfNoCase User-Agent "BLEXBot" spam_crawler
+ SetEnvIfNoCase User-Agent "Bytespider" spam_crawler
+ <RequireAll>
+ Require all granted
+ ##[ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]
+ Require not env spam_crawler
+ </RequireAll>
```

????

- ????

```
sudo apache2ctl configtest
```

Syntax OK ??????

- Apache??

```
sudo systemctl restart apache2.service
```

- Apache????

```
systemctl status apache2.service
```

active(running) ??????

??????

????????????????

```
403 3772 "-" "facebookexternalhit/1.1
```

????????????????403????????????????????

Apache?????

Apache????

# Ubuntu20.04????Apache?DoS???? ??(mod\_evasive)????

??

DoS/DDoS????????Apache????????

??

- Ubuntu 20.04
- Apache 2.4?
- FW?ufw??

????????

1. mod\_evasive????????
2. apache2?????(www-data)?ufw????????
3. mod\_evasive????????
4. ?????????

????????????????

mod\_evasive??????

```
sudo aptitude install libapache2-mod-evasive
```

????postfix????????????????????????????AWS????????????????????????

apache2????????

????www-data?ufw????????????????????????????

- sudoers????????

```
sudo cp -pi /etc/sudoers /path/to/backup/directory/sudoers.$(date +%Y%m%d)
```

????????????

- diff????????

```
sudo diff -u /path/to/backup/directory/sudoers.$(date +%Y%m%d) /etc/sudoers
```



????????????

- ?????

```
echo 'www-data ALL=(ALL) NOPASSWD: /usr/sbin/ufw' | sudo tee -a /etc/sudoers
```

- ???????

```
sudo diff -u /path/to/backup/directory/sudoers.$(date +%Y%m%d) /etc/sudoers
```

????????????

```
+www-data ALL=(ALL) NOPASSWD: /usr/sbin/ufw
```

evasive????

- ?????????

```
sudo cp -pi /etc/apache2/mods-available/evasive.conf /path/to/backup/directory/evasive.conf.$(date +%Y%m%d)
```

- diff????????

```
sudo diff -u /path/to/backup/directory/evasive.conf.$(date +%Y%m%d) /etc/apache2/mods-available/evasive.conf
```

????????????

- ?????????????????????
  - /etc/apache2/mods-available/evasive.conf
- ??

```
DOSHashTableSize 3097
DOSPageCount     100
DOSSiteCount     100
#[]
DOSPageInterval  1
DOSSiteInterval  1
DOSBlockingPeriod 10

#DOSEmailNotify  you@yourdomain.com
#[]
DOSSystemCommand "sudo ufw deny proto tcp from %s to any port 80,443"
# []80/443[]
DOSLogDir         "/var/log/mod_evasive"
DOSWhitelist      127.0.0.1
```

DOSWhitelist      xx.xx.xx.xx

# [ ] [ ] [ ] [ ] [ ] [ ] IP [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

???[Apache ? DoS????????? mod\\_evasive](#)

- ??????

```
sudo diff -u /path/to/backup/directory/evasive.conf.$(date +%Y%m%d) /etc/apache2/mods-available/evasive.conf
```

- ???

```
- #DOSHashTableSize 3097
- #DOSPageCount      2
- #DOSSiteCount       50
- #DOSPageInterval    1
- #DOSSiteInterval    1
- #DOSBlockingPeriod  10
+ DOSHashTableSize 3097
+ DOSPageCount      100
+ DOSSiteCount       100
+ DOSPageInterval    1
+ DOSSiteInterval    1
+ DOSBlockingPeriod  10

#DOSEmailNotify  you@yourdomain.com
- #DOSSystemCommand  "su - someuser -c '/sbin/... %s ...'"
- #DOSLogDir          "/var/log/mod_evasive"
+ DOSSystemCommand  "sudo ufw deny proto tcp from %s to any port 80,443"
+ DOSLogDir          "/var/log/mod_evasive"
+ DOSWhitelist       127.0.0.1
+ DOSWhitelist       xx.xx.xx.xx

</IfModule>
```

????

- ????

```
sudo apache2ctl configtest
```

Syntax OK ???????

- apache???

```
sudo systemctl restart apache2.service
```

```
????????????????????ufw????????????
```

Apache????

# Ubuntu????Mod\_Security????

Apache?WAF???????mod\_security??????

- AWS Lightsail???????????
- ????IP???????????

????????????????????????Web Arena???????????????

??

- Ubuntu 24.04 (20.04???????????)
- Apache 2.4

? ??????aptitude?????????apt?????????

??????????

1. mod\_security???????????
2. mod\_security?????????
3. Apache?????????mod\_security?????????
4. ????????????????

## mod\_security?????????????

- ????????????

```
sudo aptitude update
```

- mod\_security?????

```
sudo aptitude install libapache2-mod-security2
```

- ????????

```
sudo apache2ctl -M |grep security
```

```
security2_module (shared)
```

?????????????????

## ModSecurity???

- ??????????

```
sudo mv /etc/modsecurity/modsecurity.conf-recommended /etc/modsecurity/modsecurity.conf
```

????????????????????

## OWASP Core Rule Set (CRS)????????

- ???????

```
cd /usr/share/modsecurity-crs && pwd
```

- ?????????

```
sudo git clone https://github.com/coreruleset/coreruleset.git
```

- ?????????

```
sudo mv /usr/share/modsecurity-crs/coreruleset/crs-setup.conf.example /usr/share/modsecurity-  
crs/coreruleset/crs-setup.conf
```

## mod\_security????CRS????????

- ???????

```
cd /etc/apache2/mods-available/ && pwd
```

- ?????????

```
sudo cp -pi security2.conf /path/to/backup/directory/security2.conf.$(date +%Y%m%d)
```

????????????????

- ???????

```
diff -u /path/to/backup/directory/security2.conf.$(date +%Y%m%d) security2.conf
```

????????????????

- ??????

```
/etc/apache2/mods-available/security2.conf ?????????????????????????????????root??
```

```
- </IfModule>  
+     # Include OWASP ModSecurity CRS rules if installed  
+     IncludeOptional /usr/share/modsecurity-crs/*.load  
+</IfModule>
```

- ?????????

```
sudo apache2ctl configtest
```

Syntax OK ??????

- Apache???

```
sudo systemctl restart apache2.service
```

- Apache????

```
systemctl status apache2.service
```

active (running) ??????

## Apache??????????

????Apache??

- ????????

```
cd /etc/apache2/sites-available && pwd
```

- ?????????????????

```
sudo cp -pi your_site.conf /path/to/backup/directory/your_site.conf.$(date +%Y%m%d)
```

.conf????????????????????????????

- ????????

```
diff -u /path/to/backup/directory/your_site.conf.$(date +%Y%m%d) your_site.conf
```

????????????????

- ??????

```
/etc/apache2/sites-available/your_site.conf ??????????????????????????????root???
```

```
# Mod Security
```

```
## ModSecurity[ ]
```

```
SecRuleEngine On
```

```
## ModSecurity[ ]
```

```
### [ ]SecRuleEngine On[ ]
```

```
#SecRuleEngine DetectionOnly
```

```
## [redacted]
```

```
SecRequestBodyInMemoryLimit 524288000
```

```
SecRequestBodyLimit 524288000
```

```
## [redacted]
```

```
SecRule ARGS:modseccparam "@contains test" "id:4321,deny,status:403,msg:'ModSecurity test rule has triggered'"
```

- ??????

```
diff -u /path/to/backup/directory/your_site.conf.$(date +%Y%m%d) your_site.conf
```

```
+ # Mod Security
```

```
+
```

```
+ ## ModSecurity [redacted]
```

```
+ SecRuleEngine On
```

```
+ ## ModSecurity [redacted]
```

```
+ ### [redacted] SecRuleEngine On [redacted]
```

```
+ # SecRuleEngine DetectionOnly
```

```
+
```

```
+ ## [redacted]
```

```
+ SecRequestBodyInMemoryLimit 524288000
```

```
+ SecRequestBodyLimit 524288000
```

```
+
```

```
+ ## [redacted]
```

```
+ SecRule ARGS:modseccparam "@contains test" "id:4321,deny,status:403,msg:'ModSecurity test rule has triggered'"
```

```
+
```

- ??????????

```
sudo apache2ctl configtest
```

Syntax OK ??????

- Apache???

```
sudo systemctl restart apache2.service
```

- Apache????

```
systemctl status apache2.service
```

```
active (running) ??????
```

mod\_security???

1. ?????????Web????????????????????
2. ??????????modseccparam=test????????????

# Forbidden

You don't have permission to access this resource.

????????????????????

???????

```
sudo cat /path/to/sites_log/directory/sites_error.log
```

????????????????????

???

```
ModSecurity: Access denied with code 403 (phase 2). String match "test" at ARGS:modseccparam. [file
"/etc/apache2/sites-enabled/your_site.conf"] [line "53"] [id "4321"] [msg "ModSecurity test rule has triggered"]
[hostname "host_address"] [uri "/" ] [unique_id "xxxxxxx"]
```

????????????????????

??

Wordpress?Redmine??Web????????????????????????????????(??)

????????????

```
## ModSecurity[]
#SecRuleEngine On
## ModSecurity[]
### []SecRuleEngine On[]
SecRuleEngine DetectionOnly
```

????????????????



Apache????

# Mod\_Security????????Next cloud????????

Nextcloud?mod\_security??Mod\_security????????????????????????????????

???

- 1. ?????????
- 2. ????????
- 3. ?????????????

?????

????

`/var/log/nextcloud_error.log` ??????????????

```
[Wed Sep 11 16:35:02.048442 2024] [security2:error] [pid 32762:tid 32762] [client aaa.bbb.ccc.ddd:56994]
[client aaa.bbb.ccc.ddd] ModSecurity: Warning. Operator GE matched 5 at TX:inbound_anomaly_score. [file
"/usr/share/modsecurity-crs/rules/RESPONSE-980-CORRELATION.conf"] [line "92"] [id "980130"] [msg "Inbound
Anomaly Score Exceeded (Total Inbound Score: 5 -
SQLI=0,XSS=0,RFI=0,LFI=0,RCE=0,PHPI=0,HTTP=0,SESS=0): individual paranoia level scores: 5, 0, 0, 0"] [ver
"OWASP_CRS/3.3.5"] [tag "event-correlation"] [hostname "nextcloud.hoge.com"] [uri
"/ocs/v2.php/apps/user_status/api/v1/heartbeat"] [unique_id "ZuFIJU_udFaqxqrjvRLaPQAAAAA"]
```

???????

- ??????IP???
- ??????ID?
- ????????

??

???????????

?????????copilot???????awk????????????

```
awk '/ModSecurity/ {
ip = gensub(/.*\[client ([0-9.]+):.*/,"\\1", "g", $0);
rule_id = gensub(/.*\[id "([0-9]+)"\].*/,"\\1", "g", $0);
```

```
print rule_id, ip;
}' /var/log/nextcloud/nextcloud_error.log | sort | uniq -c
```

?????????Mod\_Security????????????????

```
36 911100 127.0.0.1
267 911100 aaa.bbb.ccc.ddd
65 920420 aaa.bbb.ccc.ddd
36 949110 127.0.0.1
267 949110 aaa.bbb.ccc.ddd
36 980130 127.0.0.1
267 980130 aaa.bbb.ccc.ddd
```

?????????127.0.0.1?????????aaa.bbb.ccc.ddd?????????IP?????????Nextcloud?????????

Mod\_security?????ID????????????????

# Mod\_Security?????????

Apache????????????????

????????

- ???????

```
sudo cp -ci /etc/apache2/sites-available/nextcloud.conf /path/to/backup/directory/nextcloud.conf.$(date +%Y%m%d)
```

????????????????????

- ??????

```
diff -u /path/to/backup/directory/nextcloud.conf.$(date +%Y%m%d) /etc/apache2/sites-available/nextcloud.conf
```

????????????????????

- ?????

```
/etc/apache2/sites-available/nextcloud.conf ??????????(?root?)
```

```
# Mod_security
## [ ]

SecRuleEngine DetectionOnly
```

## [REDACTED]ID

SecRuleRemoveById 911100

SecRuleRemoveById 920420

SecRuleRemoveById 949110

SecRuleRemoveById 980130

- ???????

```
diff -u /path/to/backup/directory/nextcloud.conf.$(date +%Y%m%d) /etc/apache2/sites-available/nextcloud.conf
```

SecRuleRemoveById ID [REDACTED]

- ???

## [REDACTED]

SecRuleEngine DetectionOnly

+

+## [REDACTED]ID

+SecRuleRemoveById 911100

+SecRuleRemoveById 920420

+SecRuleRemoveById 949110

+SecRuleRemoveById 980130

+

</VirtualHost>

???????????

- ???

```
sudo apache2ctl configtest
```

Syntax OK [REDACTED]

- ???

```
sudo systemctl restart apache2.service
```

- Apache???

```
systemctl status apache2.service
```

active(running) [REDACTED]

???

????

```
tail -f /var/log/nextcloud/nextcloud_error.log
```

????????????????????????????

- ??????Nextcloud????????????
- ?????ID????????????

Apache????

# Ubuntu

## 24.04????mod\_dosdetector????

??

???Web????????????????????????????????mod\_dosdetector????????

mod\_dosdetector ??Apache HTTP Server ????????DoS?Denial of Service????????????????????????????????IP????????????????????????????IP????????????????????????????????

mod\_evasive????

- ????????
- ???????????

????????????

??

- Ubuntu 24.04
- Apache 2.4
  - Apache2-dev????????????????

??????????

1. git????????????
2. Makefile????????????
3. ?????????
4. ???????Apache????

mod\_dosdetector??????

- ?????????

```
cd /usr/local/src && pwd
```

????????

- git clone

```
sudo git clone https://github.com/stanaka/mod_dosdetector.git
```

- ?????????

```
cd mod_dosdetector && pwd
```

# Makefile??????????

- Makefile??

?????Makefile? `/usr/sbin/apxs` ??????????????

```
sudo sed -i 's|^APXS=.*|APXS=/usr/bin/apxs|' Makefile
```

- ??????

```
sudo make install
```

- ???????

```
cat /etc/apache2/mods-available/dosdetector.load
```

```
LoadModule dosdetector_module /usr/lib/apache2/modules/mod_dosdetector.so ????????
```

?????????

?: [mod\\_dosdetector????????????????????](#)

```
sudo tee /etc/apache2/mods-available/dosdetector.conf > /dev/null <<EOF
<IfModule dosdetector_module>
DoSDetection on
DoSPeriod 60
DoSThreshold 5
DoSHardThreshold 10
DoSBanPeriod 60
DoSTableSize 100
DoSIgnoreContentType ^(image/|application/|text/javascript|text/css)
</IfModule>
EOF
```

- DoSDetection on
  - ?: DoS (Denial of Service) ??????????
- DoSPeriod 60
  - ?: DoS????????????????????????????
- DoSThreshold 5
  - ?: DoS????????????????????????
- DoSHardThreshold 10
  - ?: ?????????????????
  - 60????IP?????10????????????????????IP????????????
- DoSBanPeriod 60

- ??: DoS??????IP????????????????????
- DoSTableSize 100
  - ??: DoS??????IP????????????
- DoIgnoreContentType ^(image/|application/|text/javascript|text/css)
  - ??: DoS????????????????????

## ?????Apache???

- mod???

```
sudo a2enmod dosdetector
```

- Web??????

```
sudo systemctl restart apache2.service
```

????????????

Apache??



Apache??

# Ubuntu?????????Let's Encrypt???????

??

??

- Ubuntu 20.04
- Apache 2.4??????????
- Let's Encrypt???????

???

????????????????????

??

???????????????

- ???????

```
cd /etc/apache2/sites-enabled && pwd
```

- ???????????

```
ls -la
```

sites-le-ssl.conf ?????Let's Encrypt????????????????????????????????

??????????

```
sites-le-ssl.conf
```

- ???????????

```
ls -la
```

????????????????

??????????????????

- ???????

```
cd /etc/apache2/sites-available/ && pwd
```

- ??????

```
sudo mv sites-le-ssl.conf /path/to/backup/directory/sites-le-ssl.conf.$(date +%Y%m%d)
```

- ???????

```
ls -la sites-le-ssl.conf
```

????????????????

```
ls -la /path/to/backup/directory/sites-le-ssl.conf.$(date +%Y%m%d)
```

????????????????

## Apache????????

- ????

```
sudo apache2ctl configtest
```

Syntax OK ??????

- ??????

```
sudo systemctl restart apache2.service
```

- ???????

```
systemctl status apache2.service
```

active (running) ??????

????????????????

## Let's Encrypt????????????

```
sudo certbot delete --cert-name [REDACTED]
```

```
-----  
Deleted all files relating to certificate [REDACTED]  
-----
```

????????????OK???