snyk Vulnerability DB

Snyk Vulnerability Database > npm > css-what

Regular Expression Denial of Service (ReDoS)

Affecting css-what package, versions <2.1.3

INTRODUCED: 29 SEP 2022 CVE-2022-21222 ②
CWE-1333 ②

How to fix?

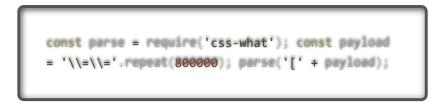
Upgrade css-what to version 2.1.3 or higher.

Overview

css-what is an a CSS selector parser

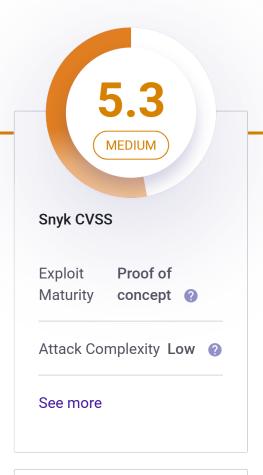
Affected versions of this package are vulnerable to Regular Expression Denial of Service (ReDoS) due to the usage of insecure regular expression in the <code>re_attr</code> variable of <code>index.js</code>. The exploitation of this vulnerability could be triggered via the <code>parse</code> function.

PoC



Details

Q Search by package n







Do your applications use this vulnerable package?

In a few clicks we can analyze your entire application and see what components are vulnerable in your application, and suggest you quick fixes

Denial of Service (DoS) describes a family of attacks, all aimed at making a system inaccessible to its original and legitimate users. There are many types of DoS attacks, ranging from trying to clog the network pipes to the system by generating a large volume of traffic from many machines (a Distributed Denial of Service - DDoS - attack) to sending crafted requests that cause a system to crash or take a disproportional amount of time to process.

The Regular expression Denial of Service (ReDoS) is a type of Denial of Service attack. Regular expressions are incredibly powerful, but they aren't very intuitive and can ultimately end up making it easy for attackers to take your site down.

Let's take the following regular expression as an example:

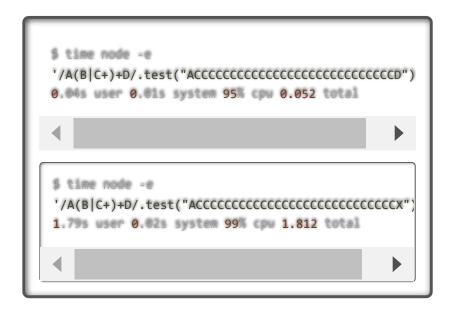
```
regex = /A(B|C+)+D/
```

This regular expression accomplishes the following:

- A The string must start with the letter 'A'
- (B|C+)+ The string must then follow the letter A with either the
 letter 'B' or some number of occurrences of the letter 'C' (the +
 matches one or more times). The + at the end of this section states
 that we can look for one or more matches of this section.
- D Finally, we ensure this section of the string ends with a 'D'

The expression would match inputs such as $\mbox{\sc abbd}$, $\mbox{\sc Abccccd}$, $\mbox{\sc Abccccd}$ and $\mbox{\sc Acccccd}$

It most cases, it doesn't take very long for a regex engine to find a match:



aggeot jou quion lineo

Test your applications



Learn about Regular Expression Denial of Service (ReDoS) vulnerabilities in an interactive lesson.

Start learning

Snyk SNYK-JS-CSSWHAT-ID 3035488

Published 29 Sep 2022

Disclosed 29 Sep 2022

CreditSnyk Research
Team, Joe Portner

Report a new vulnerability

Found a mistake?

The entire process of testing it against a 30 characters long string takes around ~52ms. But when given an invalid string, it takes nearly two seconds to complete the test, over ten times as long as it took to test a valid string. The dramatic difference is due to the way regular expressions get evaluated.

Most Regex engines will work very similarly (with minor differences). The engine will match the first possible way to accept the current character and proceed to the next one. If it then fails to match the next one, it will backtrack and see if there was another way to digest the previous character. If it goes too far down the rabbit hole only to find out the string doesn't match in the end, and if many characters have multiple valid regex paths, the number of backtracking steps can become very large, resulting in what is known as *catastrophic backtracking*.

Let's look at how our expression runs into this problem, using a shorter string: "ACCCX". While it seems fairly straightforward, there are still four different ways that the engine could match those three C's:

- 1. CCC
- 2. CC+C
- 3. C+CC
- 4. C+C+C.

The engine has to try each of those combinations to see if any of them potentially match against the expression. When you combine that with the other steps the engine must take, we can use RegEx 101 debugger to see the engine has to take a total of 38 steps before it can determine the string doesn't match.

From there, the number of steps the engine must use to validate a string just continues to grow.

String	Number of C's	Number of steps
ACCCX	3	38
ACCCCX	4	71
ACCCCCX	5	136
ACCCCCCCCCCCX	14	65,553

By the time the string includes 14 C's, the engine has to take over 65,000 steps just to see if the string is valid. These extreme situations can cause them to work very slowly (exponentially related to input size,

as shown above), allowing an attacker to exploit this and can cause the service to excessively consume CPU, resulting in a Denial of Service.

References

• Vulnerable Code

PRODUCT
Snyk Open Source
Snyk Code
Snyk Container
Snyk Infrastructure as Code
Test with Github
Test with CLI
DECOUDOES
RESOURCES
Vulnerability DB
Documentation
Disclosed Vulnerabilities
Blog
FAQs
COMPANY
About
Jobs
Contact
Policies
Do Not Sell My Personal Information
CONTACT US
Support
Report a new vuln
Press Kit

Events

FIND US ONLINE

TRACK OUR DEVELOPMENT



© 2022 Snyk Limited

Registered in England and Wales. Company number: 09677925

Registered address: Highlands House, Basingstoke Road, Spencers Wood, Reading, Berkshire, RG7 1NT.