

Load Testing Containerised Microservices

by
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<https://github.com/oasis9/compx341-a5>

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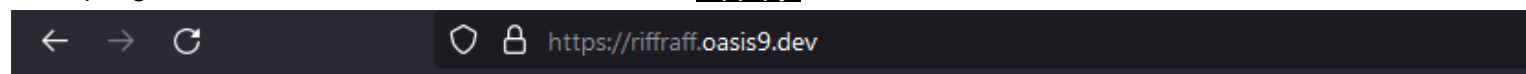
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Deploying the Application and Toolchain

Running `docker-compose build && docker-compose up` builds and starts the web application.

```
redis_1 | 1:C 18 Jun 2021 05:37:59.277 # 000000000000 Redis is starting 000000000000
redis_1 | 1:C 18 Jun 2021 05:37:59.277 # Redis version=6.2.4, bits=64, commit=00000000, modified=0, pid=1, just started
redis_1 | 1:C 18 Jun 2021 05:37:59.277 # Warning: no config file specified, using the default config. In order to specify a config file use redis-server /path/to/redis.conf
redis_1 | 1:M 18 Jun 2021 05:37:59.278 * monotonic clock: POSIX clock_gettime
redis_1 | 1:M 18 Jun 2021 05:37:59.369 # Running mode=standalone, port=6379.
redis_1 | 1:M 18 Jun 2021 05:37:59.369 # Server initialized
redis_1 | 1:M 18 Jun 2021 05:37:59.369 # WARNING overcommit_memory is set to 0! Background save may fail under low memory condition. To fix this issue add 'vm.overcommit_memory = 1' to /etc/sysctl.conf
and then reboot or run the command 'sysctl vm.overcommit_memory=1' for this to take effect.
redis_1 | 1:M 18 Jun 2021 05:37:59.370 * Loading RDB produced by version 6.2.4
redis_1 | 1:M 18 Jun 2021 05:37:59.370 * RDB age 34 seconds
redis_1 | 1:M 18 Jun 2021 05:37:59.370 * RDB memory usage when created 0.77 Mb
redis_1 | 1:M 18 Jun 2021 05:37:59.370 * DB loaded from disk: 0.000 seconds
redis_1 | 1:M 18 Jun 2021 05:37:59.370 * Ready to accept connections
web_1 | * Serving Flask app "app" (lazy loading)
web_1 | * Environment: production
web_1 | WARNING: This is a development server. Do not use it in a production deployment.
web_1 | Use a production WSGI server instead.
web_1 | * Debug mode: on
web_1 | * Running on http://0.0.0.0:5000/ (Press CTRL+C to quit)
web_1 | * Restarting with stat
web_1 | * Debugger is active!
web_1 | * Debugger PIN: 266-112-070
```

Attempting to make a connection results in a 404, as `app.py` has no handler for the default route.



Not Found

The requested URL was not found on the server. If you entered the URL manually please check your spelling and try again.

The request is logged simultaneously which shows the application is receiving requests and just returned an `HTTP 404` error code to a request at the default route:

```
web_1 | 10.0.0.254 - - [18/Jun/2021 05:46:16] "GET / HTTP/1.1" 404 -
```

Prime Numbers and Redis Caching

The function `isPrime(number)` is annotated as a handler for the route `/isPrime/<int:number>`, which does not capture negative numbers. It calls the helper function `checkPrime(number)` to determine whether `number` is prime. Before `checkPrime` checks if the number is prime, it first checks if the Redis cache contains the key `data`. If so, it checks whether the list contains `number`, and if so, it does not need to check if the number is prime. All non-prime numbers fall through this check because only prime numbers are stored (wherever `checkPrime` returns true, the number passed to it has been ascertained to be prime).

```
@app.route('/isPrime/<int:number>')
def isPrime(number):
    result = checkPrime(number)
    if (result == True):
        return '{}'.format(number) + " is prime\n"
    else:
        return '{}'.format(number) + " is not prime\n"
```

```
def checkPrime(number):
    if (cache.exists('data')):
        data = cache.get('data')
        primes = json.loads(data)
        if (number in primes):
            return True

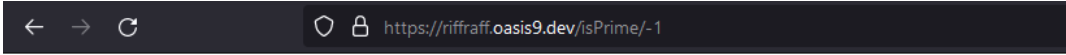
    if (number < 2):
        return False
    if (number == 2):
        storePrime(number)
        return True
    if (number % 2 == 0):
        return False

    i = 3
    to = math.sqrt(number)
    while i <= to:
        if (number % i == 0):
            return False
        i += 2

    storePrime(number)
    return True
```

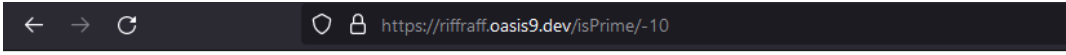
```
def storePrime(number):
    if (cache.exists('data')):
        data = cache.get('data')
    else:
        data = '[]'
    primes = json.loads(data)
    primes.append(number)
    cache.set('data', json.dumps(primes))
```

Making a request to `/isPrime/-1`, `/isPrime/-10`, and `/isPrime/-99999` all return an `HTTP 404` error code, as negatives are not captured by `<int:number>`.



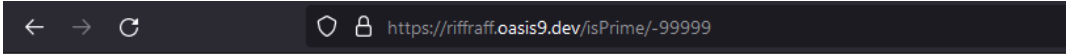
Not Found

The requested URL was not found on the server. If you entered the URL manually please check your spelling and try again.



Not Found

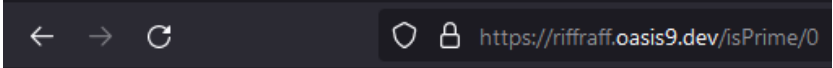
The requested URL was not found on the server. If you entered the URL manually please check your spelling and try again.



Not Found

The requested URL was not found on the server. If you entered the URL manually please check your spelling and try again.

A request to `/isPrime/0` returns `0 is not prime`, which is correct.



0 is not prime

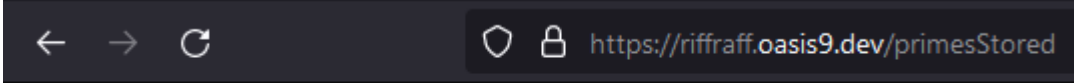
Stored Prime Numbers

`primesStored()` returns `[]` when the Redis cache does not contain the key `data`. Otherwise, it returns the list stored at that key as a string followed by a newline character.

```
@app.route('/primesStored')
def primesStored():
    if (not cache.exists('data')):
        return '[]'

    data = cache.get('data')
    primes = json.loads(data)
    return str(primes) + '\n'
```

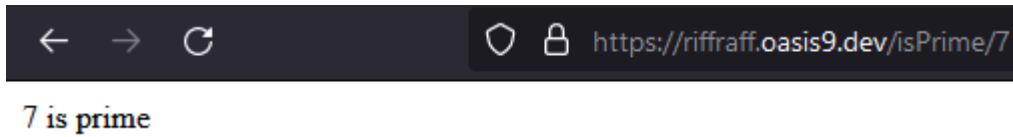
Before `/isPrime/<int:number>` is requested for a prime number and its value stored in the cache, the cache is empty, as shown by this call to `/primesStored`.



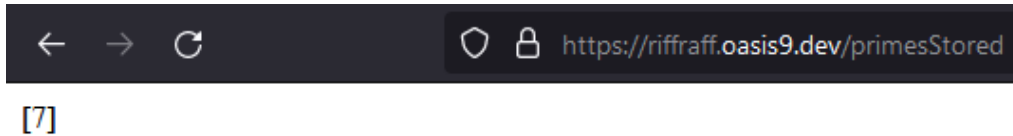
[]

After a call to `/isPrime/7`, `/primesStored` returns `[7]`. A request for the number `16` does not result in the number being added to the list (`/primesStored` still returns `[7]`). A request for the number `17` results in the number being added to the list (`/primesStored` now returns `[7, 17]`). This demonstrates the caching functionality is working as intended and that `isPrime` works correctly for prime numbers 7 and 17, and correctly doesn't consider 16 a prime number.

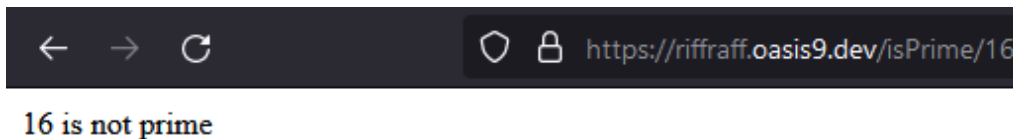
Requesting `/isPrime/7`:



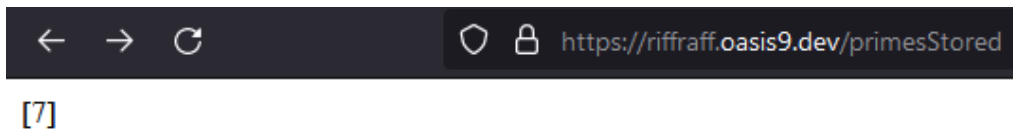
The above request results in the expected list change:



Requesting `/isPrime/16`:



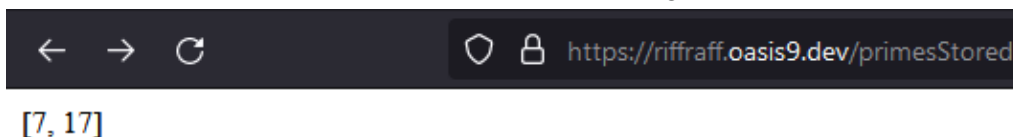
The above request does not result in a list change:



Requesting `/isPrime/17`:



The above request results in the expected list change:



`/isPrime/<int:number>` could be tested further using a list of primes from 0-100 at least, to better determine the validity of its output.