



Property Based Testing with TypeScript & React

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**Properties are laws that subjects
under test must obey**

Some examples:

- never throws errors,**
- always returns positive integers,**
- returns array of length equal to input**

**Property based testing aims to
check those properties**

**You declare those properties
and the library check those
against (not so) random data**

—

It all started with QuickCheck &
Haskell (FP )

```
yarn add fast-check
```



fast-check
Property-based testing



How does it look like?

1. Find out what the variables are
2. Create **arbitraries** aka generators those values
3. Create **properties** based on those arbitraries
4. Assert that those properties are adhered to



Example: Let's test a simple function

```
const reverse = <T>(array: T[]): T[] => {  
  const copy = array.slice()  
  return copy.reverse()  
}
```



Example: Let's test a simple function

```
import fc from 'fast-check'

it('when reversed should equal original', () => {
  const arrayArbitrary = fc.array(
    fc.anything()
  )

  const reversedReverseEqualsOriginal = fc.property(
    arrayArbitrary,
    (array) => expect(reverse(reverse(array))).toEqual(array)
  )

  fc.assert(reversedReverseEqualsOriginal)
})
```



Example: Let's mess up

```
const reverse = <T>(array: T[]): T[] => {  
  const copy = array.slice()  
  
  if (array.length === 8) {  
    return array.slice(1)  
  }  
  return copy.reverse()  
}
```



Example: Let's mess up

FAIL src/registration/__tests__/example.ts
× when reversed should equal original (98ms)

- when reversed should equal original

Property failed after 9 tests

```
{ seed: -1651074760, path: "8:4:6:9:12:15:17:19:20", endOnFailure: true }
```

```
Counterexample: [[[],{}],[],{}],false,"",[],[]]
```

```
Shrunk 8 time(s)
```

```
Got error: Error: expect(received).toEqual(expected) // deep equality
```



Example: fast-check is deterministic

```
fc.assert(reversedReverseEqualsOriginal, {  
  seed: -1651074760,  
  path: "8:4:6:9:12:15:17:19:20",  
  endOnFailure: true  
})
```



Example: fast-check shrinks (and does it well)

FAIL src/registration/__tests__/example.ts
✗ when reversed should equal original (14ms)

- when reversed should equal original

```
Property failed after 3 tests
{ seed: -724242980, path: "2", endOnFailure: true }
Counterexample: [[true,0.659151591115403,["I,2?", "1!~"],{"sC`pD":{"{},"U$48/":{"zYc P@z`%":undefined,"Xe":"XY","3Z":""}},[],{"_tY":
:[true,false,false],";n+":[-105757044,0.8085733412311057,515591603],"W*>72":{"fw4cjJ","05D81<":{"?>4tT~b0h":undefined,"":"67", "<)fKR:v
HY*":null,"WRyg7Nus$4":"dx3","o|%M3[Zni("<:",%&Ik6v3?y"}},{},{" x-gB":false,"%&." :false}]]
Shrunk 0 time(s)
Got error: Error: expect(received).toEqual(expected) // deep equality
```









Example: fast-check shrinks (and does it well)

FAIL src/registration/__tests__/example.ts
✗ when reversed should equal original (81ms)

- when reversed should equal original

Property failed after 36 tests
{ seed: -38383590, path: "35:4:6:9:12:15:17:19:20", endOnFailure: true }
Counterexample: [[[],[],[],[],[],[],{}],0,[]]
Shrunk 8 time(s)
Got error: Error: expect(received).toEqual(expected) // deep equality

Where to use property based testing?

-
- Algorithms 
 - Smoke testing (as in  )
 - State machines 
 - Random interactions 
 - Fuzz testing 

Doesn't replace other tests !!

Examples

@ dubzzz/fast-check



- Random interactions with a music players
(play / pause / next / prev)
- Fuzz testing of API *(never returns 5xx)*
- Race conditions *(Autocomplete / ToDo list)*

Prevent real world bugs


Spotify

1. Turn on playlist repeat
2. Prepare playlist with one track
3. Press play
4. Add a track to playlist
5. Click next
 - 💥 First track plays again




Gitlab

 GitLab.org / GitLab Enterprise Edition 


This project Search

Created by  Seán McGivern 7 minutes ago

The changes were not merged into **master**.


 0  0 


Discussion 2 Commits 1 Pipelines 2 Changes 6


 Seán McGivern @smcgivern added 155 commits about an hour ago


- b71e3d37...0f3e8693 - 154 commits from branch **master**
- 384b8272 - Don't treat anonymous users as owners when group has pending invites

[Compare with previous version](#)

 Seán McGivern @smcgivern mentioned in merge request [gitlab-ce!13037 \(merged\)](#) about an hour ago

 Valery Sizov @vsizov commented 14 minutes ago
[@smcgivern](#) As I already picked your commit to !2514, can we close this?

 Seán McGivern @smcgivern commented 9 minutes ago
[@vsizov](#) sure, it's also needed for stable, but I'll pick directly.

 Seán McGivern @smcgivern closed 9 minutes ago

JIRA / GT Dashboard / Others

1. Post a message with emoji



MySQL throws an error



Real world examples

github.com/rkostrzewski/property-based-testing

Morse code aka testing
untestable

Forms aka testing validation

Q & A

Thanks!