Jest

Jest Overview

- "a delightful JavaScript Testing Framework with a focus on simplicity"
  - https://jestjs.io/
- Supports unit tests
- Uses jsdom to simulate browser environment
  - "A JavaScript implementation of the WHATWG DOM and HTML standards, for use with node.js"
  - https://github.com/jsdom/jsdom
- Can install Jest plugin through Vue CLI
  - to add to an existing application: **`vue add @vue/unit-jest`**
  - adds several **`devDependencies`**, including **`@vue/test-utils`** https://vue-test-utils.vuejs.org/
  - creates **`jest.config.js`** that configures the Jest plugin
  - creates **`tests/unit/example.spec.js`** containing an example test

Test Files

- Tests can be written in any **`.spec.js`** file under **`tests/unit`**
  - file extensions can also be **`.jsx`**, **`.ts`**, or **`.tsx`**
- To colocate tests with source files they test, change **`testMatch`** property in **`jest.config.js`**

```
"testMatch": [
  "**/src/**/*.spec.js"
],
```

- Can delete **`tests`** directory
  - if this is done, modify **`package.json`** to add **`"jest": true,`** in **`"eslintConfig" "env"`**

Jest API Highlights

- **`describe(name, fn)`**
  - describes a "test suite"
- **`describe.only(name, fn)`**
  - alias `fdescribe`
- **`describe.skip(name, fn)`**
  - alias `xdescribe`
- **`beforeAll(fn)`**
  - run once before all tests in suite begin
- **`beforeEach(fn)`**
  - run before each test in suite begins
- **`afterEach(fn)`**
  - run after each test in suite begins
- **`afterAll(fn)`**
  - run once after all tests in suite finish

`test` calls are not required to be inside a `describe`

- **`test(name, fn)`**
  - alias `it`
- **`test.only(name, fn)`**
  - alias `fit`
- **`test.skip(name, fn)`**
  - alias `xit`

- **`expect(value)`**
  - chain a matcher call onto this
  - see next two slides

Jest Matchers ...

https://jestjs.io/docs/en/using-matchers

- **.not** - can be prepended to any matcher
- **.toBe(*value*)** - uses ===
- **.toEqual(*value*)**
  - deep object comparison
- **.toBeTruthy()**
- **.toBeFalsy()**
- **.toBeDefined()**
- **.toBeUndefined()**
- **.toBeNull()**
- **.toMatch(*regexp*)**
- **.toMatchObject(*object*)**
  - all properties in ***object*** match those in receiver
- **.toBeCloseTo(*number, digits*)**
- **.toBeGreaterThan(*number*)**
- **.toBeGreaterThanOrEqual(*number*)**
- **.toBeLessThan(*number*)**
- **.toBeLessThanOrEqual(*number*)**
- **.toBeInstanceOf(*Class*)**
- **.toContain(*item*)** for arrays
- **.toContainEqual(*item*)**
  - deep object comparison
- **.toHaveLength(*number*)**

... Jest Matchers

- `.toHaveBeenCalled()`
  - alias is `.toBeCalled`
- `.toHaveBeenCalledTimes(number)`
- `.toHaveBeenCalledWith(arg1, arg2, ...)`
  - alias is `.toBeCalledWith`
- `.toHaveBeenLastCalledWith(arg1, arg2, ...)`
  - alias is `.lastCalledWith`

- `.toThrow()`
- `.toThrowError(error)`

- `.toMatchSnapshot()`
- `.toThrowErrorMatchingSnapshot()`

To Run Tests

- To run tests
  - **`npm run test:unit`**
- For verbose output
  - shows result of each test, not just each suite
  - add "**`verbose: true,`**" in **`jest.config.js`**
  - **`console.log`** output is suppressed when **`verbose`** is **`true`**!

Watch Mode

- Can watches source and test files and automatically reruns tests when they change
- Can run all tests or only ones that failed in last run
- To enable, add **`--watch`** to npm script

```
"test:unit": "vue-cli-service test:unit --watch"
```

Example Tests

- The following tests are for the Todo app shown in the “Vuex” section

Todo.spec.js ...

```
import {shallowMount} from '@vue/test-utils';
import Todo from '../../src/components/Todo';

describe('Todo', () => {
  const text = 'buy milk';
  const todo = {text, done: false};

  test('should render', () => {
    const wrapper = shallowMount(Todo, {
      propsData: {onDeleteTodo() {}, onToggleDone() {}, todo}
    });
    const checkbox = wrapper.find('input[type="checkbox"]');
    expect(checkbox).not.toBeNull();
    const html = wrapper.html();
    expect(html).toContain(text); // the todo text
    expect(html).toContain('Delete'); // the button
  });
```

... Todo.spec.js

```
  test('should handle Delete button', () => {
    const onDeleteTodo = jest.fn();
    const wrapper = shallowMount(Todo, {
      propsData: {
        onDeleteTodo,
        onToggleDone() {},
        todo
      }
    });
    const deleteBtn = wrapper.find('button');
    deleteBtn.trigger('click');
    expect(onDeleteTodo).toHaveBeenCalled();
  });

  test('should toggle done', () => {
    const onToggleDone = jest.fn();
    const wrapper = shallowMount(Todo, {
      propsData: {
        onDeleteTodo() {},
        onToggleDone,
        todo
      }
    });
    const checkbox = wrapper.find('input[type="checkbox"]');
    checkbox.trigger('click');
    expect(onToggleDone).toHaveBeenCalled();
  });
});
```

TodoList.spec.js ...

```
import {mount} from '@vue/test-utils';
import TodoList from '../../src/components/TodoList';

describe('TodoList', () => {
  const PREDEFINED_TODOS = 2;

  function expectTodoCount(wrapper, count) {
    // Each todo has an <li> root element.
    const lis = wrapper.findAll('li');
    expect(lis.length).toBe(count);
  }

  test('should render', () => {
    const wrapper = mount(TodoList);
    const html = wrapper.html();
    expect(html).toContain('To Do List');
    expect(html).toContain('1 of 2 remaining');
    expect(html).toContain('Archive Completed');
    expectTodoCount(wrapper, PREDEFINED_TODOS);
  });
```

searching for descendant elements deeper than direct children requires using **mount** instead of **shallowMount**

... TodoList.spec.js ...

```
test('should add a todo', () => {
  const wrapper = mount(TodoList);
  const input = wrapper.find('.todo-input');
  const text = 'buy milk';
  input.element.value = text;
  input.trigger('input');

  const addBtn = wrapper.find('.add-btn');
  addBtn.trigger('click');

  expectTodoCount(wrapper, PREDEFINED_TODOS + 1);
  const html = wrapper.html();
  expect(html).toContain(text);
});

test('should archive completed', () => {
  const wrapper = mount(TodoList);
  const archiveBtn = wrapper.find('.archive-btn');
  archiveBtn.trigger('click');
  expectTodoCount(wrapper, PREDEFINED_TODOS - 1);
  const html = wrapper.html();
  expect(html).toContain('1 of 1 remaining');
});
```

... TodoList.spec.js

```
  test('should delete a todo', () => {
    const wrapper = mount(TodoList);
    const deleteBtn = wrapper.find('.delete-btn'); // for first todo
    deleteBtn.trigger('click');
    expectTodoCount(wrapper, PREDEFINED_TODOS - 1);
  });

  test('should toggle a todo', () => {
    const wrapper = mount(TodoList);
    const checkboxes = wrapper.findAll('input[type="checkbox"]');
    expect(checkboxes.length).toBe(2);

    checkboxes.at(1).trigger('click'); // second todo
    let html = wrapper.html();
    expect(html).toContain('0 of 2 remaining');

    checkboxes.at(0).trigger('click'); // first todo
    html = wrapper.html();
    expect(html).toContain('1 of 2 remaining');
  });
});
```

checkboxes is not an array

Snapshot Testing

- Snapshot tests assert that ...
  - a component will render same content as last successful test
- In first run ...
  - `toMatchSnapshot` matchers save a representation of rendered output in subdirectory of test file named `__snapshots__`
    - mostly, but not exactly HTML

`__snapshot__` directories should be checked into version control!

- In subsequent runs ...
  - same representation is generated again and compared to what was saved in last successful run
- When snapshot tests fail ...
  - scroll back to review differences in rendered output
  - if changes are correct, press "u" to accept them
    - overwrites previous snapshot files with new ones
  - if changes are incorrect, fix code and run tests again

Snapshot Test Example

```
import {mount} from '@vue/test-utils';

...

  test('should match snapshot', () => {
    const wrapper = mount(Todo, {
      propsData: {onDeleteTodo() {}, onToggleDone() {}, todo}
    });
    expect(wrapper.element).toMatchSnapshot();
  });
```

Asynchronous Tests

- Four approaches
- 1) Function passed to `test` or `it` has `done` parameter that is a function
  - call `done` when test is finished
  - test fails if `done` is never called

```
test('some name', done => {
  const callback = result => {
    expect(result).toBe(expectedValue);
    done();
  };
  someAsyncFn(callback)
});
```

can also call `done.fail(error)` to explicitly cause test to fail

- 2) Return a `Promise`
  - test passes if `Promise` resolves and fails if it rejects

```
test('some name', () => {
  const args = ...;
  return someAsyncFn(args);
});
```

- 3) Use `Promise` matchers
  - `expect(someAsyncFn()).resolves.toBe(goodValue);`
    `expect(someAsyncFn()).rejects.toBe(badValue);`
- 4) Use `async/await`
  - test fails if a `Promise` throws

```
test('some name', async () => {
  const result = await someAsyncFn();
  expect(result).toBe(expectedValue);
});
```

My favorite!