https://codesandbox.io/s/lecture-17-9d6jzz?file%253D%252Fsrc%252FApp.js

Async in Redux

- What are three Redux principles?
- If the update of state need to involve async operations, how to do it?
- Why difficult?
  - Async and Promise -> Unpredictable

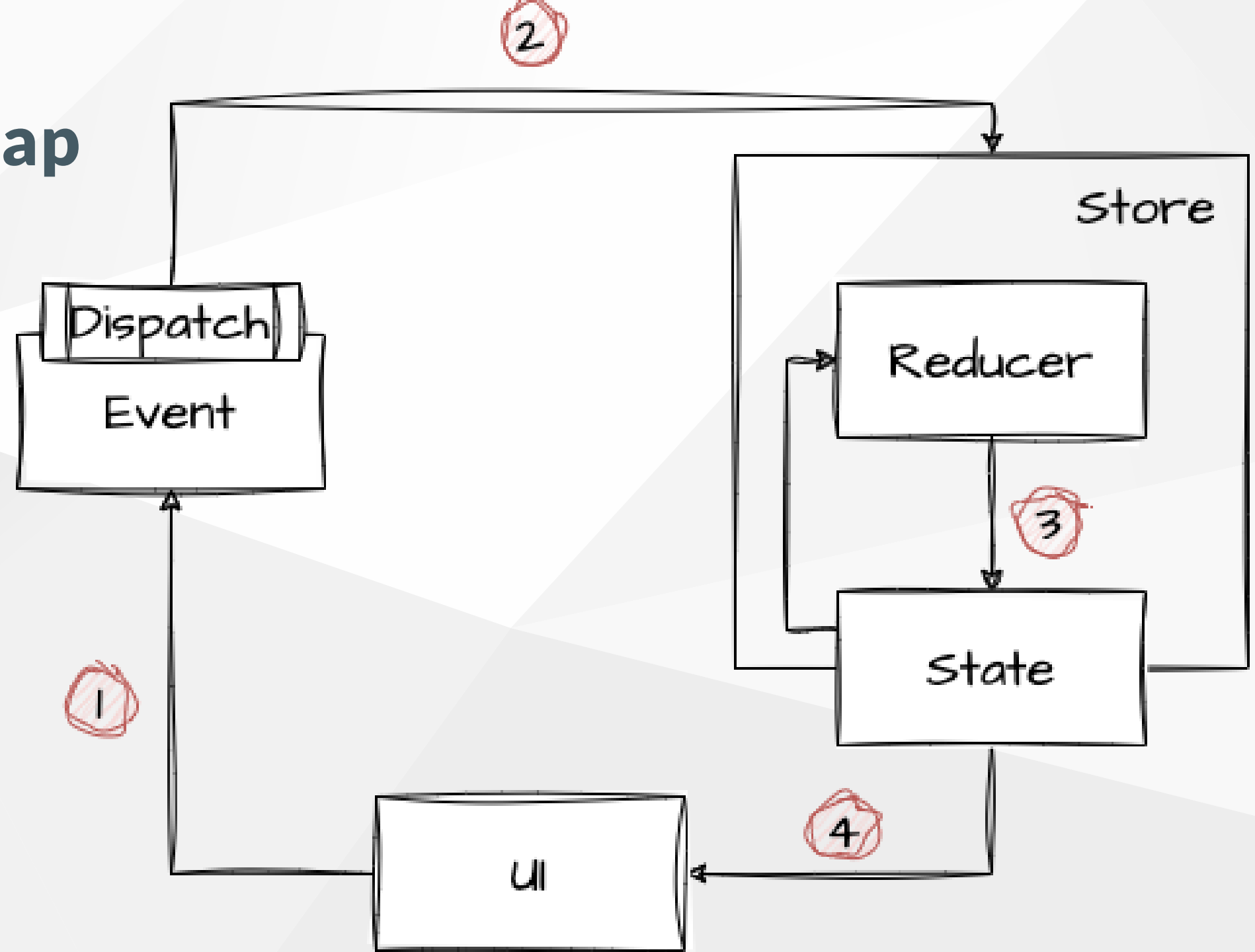
REST API with React

- `fetch` API / `axios`
- `useEffect` hook / event handler
- lifecycle methods, i.e. `componentDidMount`

REST API with Redux

- Redux Thunk
- Redux Saga

Recap



Action Creator

```
// sync action creator
const fetchUser = () => {
  const users = getUsersSync();
  return {
    type: 'FETCH_USER',
    payload: users
  };
};
```

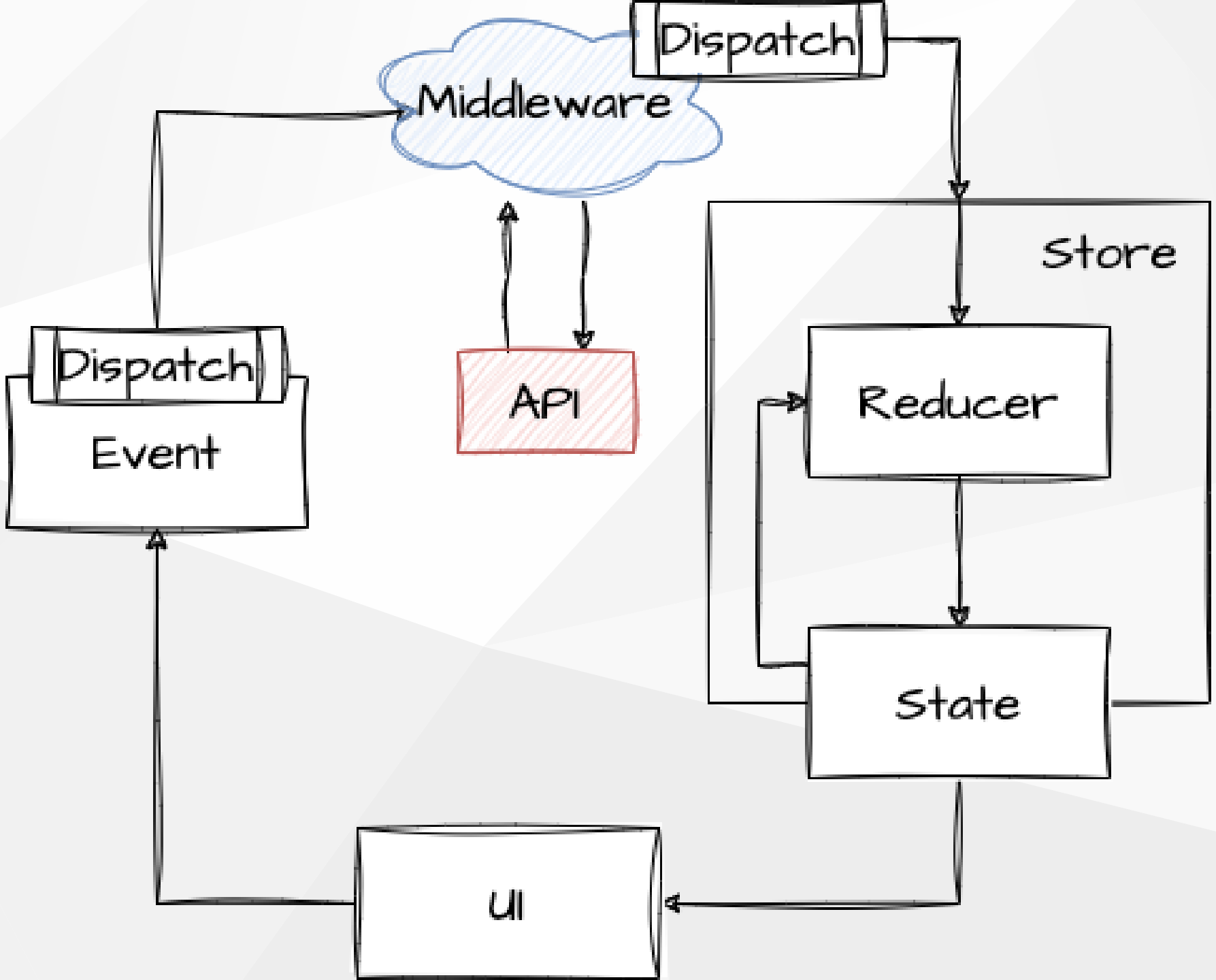
```
// async action creator
const fetchUser = async () => {
  const users = await getUsersAsync();
  return {
    type: 'FETCH_USER',
    payload: users
  };
};
// Not possible with native Redux
```

Redux Thunk

- Redux Thunk is a middleware that allows you to return functions, not just actions, within Redux
- `redux-thunk`

Redux Middleware

- Redux middleware is a function that is able to intercept, and act accordingly, our actions, before they reach the reducer
- Executed between dispatching an action and the moment it reaches the reducer
- Multiple middleware can be chained together


Dispatch
Middleware
Store
Dispatch
Event
API
Reducer
State
UI

Middleware Example

```
const logger = store => next => action => {
  console.log('dispatching', action);
  let result = next(action);
  console.log('next state', store.getState());
  return result;
};
```

Thunk

```
function createThunkMiddleware(extraArgument) {
  const middleware =
    ({ dispatch, getState }) =>
    next =>
    action => {
      // The thunk middleware looks for any functions that were passed to `store.dispatch`.
      // If this "action" is really a function, call it and return the result.
      if (typeof action === 'function') {
        // Inject the store's `dispatch` and `getState` methods, as well as any "extra arg"
        return action(dispatch, getState, extraArgument);
      }

      // Otherwise, pass the action down the middleware chain as usual
      return next(action);
    };
  return middleware;
}
```

Refactor Action Creator

```
const fetchUser = () => {
  const users = getUsersSync();
  return {
    type: 'FETCH_USER',
    payload: users
  };
};
```

```
const fetchUser = () => {
  return async (dispatch, getState) => {
    const users = await getUsersAsync();
    dispatch({
      type: 'FETCH_USER',
      payload: users
    });
  };
};
```

Hanlde Promise Status

- `pending`
- `fulfilled`
- `rejected`
- how to handle them with UI and Redux?

Redux Thunk with RTK

RTK Query vs React Query

- RTK Query and React Query is a data fetching and caching tool
- RTK Query is built on top of Redux, while React Query is built on top of React Hooks
- RTK Query is more opinionated, while React Query is more flexible

RTK Query

- `createApi`
- `useGetQuery`
- `useMutation`

Additional Thoughts

- React state still needed?
  - Yes, for local state, i.e. form input
  - Redux is for global state management
- What data should be put in Redux?
  - Data that is shared across components
  - Any piece of data that changes over time
- How to structure Redux store / reducers and their dispatch?
  - Redux Style Guide

Redux Recap

1. Create a `store` (single source of truth)
2. Link `store` to root component (`Provider`)
3. Create `reducer`s (pure functions)
4. Create `action creator`s (functions that return actions)
5. Connect `action creator`s to `dispatch` (dispatch actions)

Note: In class component, we need to use `connect` to connect `store` to specific components. In functional component, we use `useSelector` and `useDispatch` hooks, instead.

Testing in React

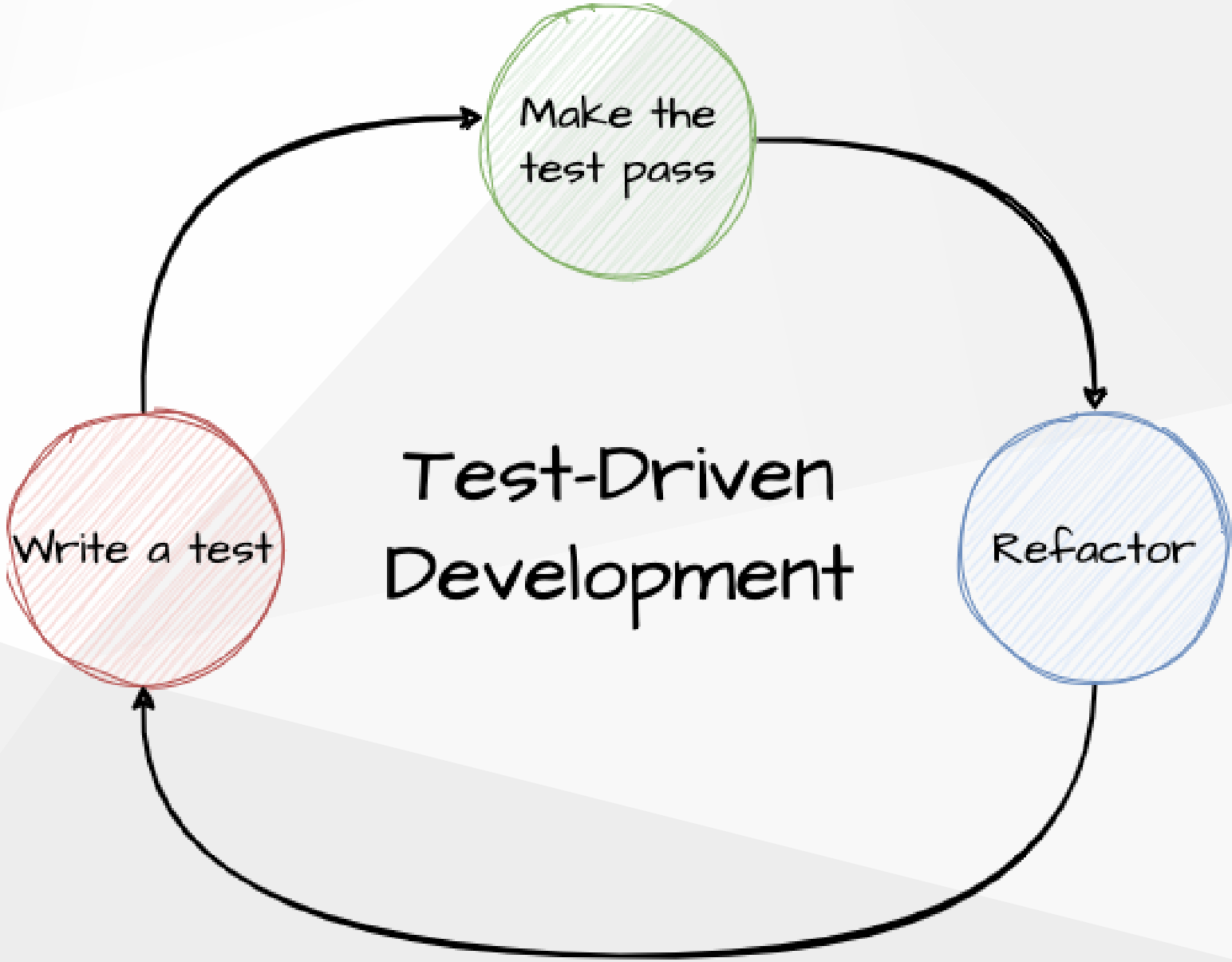
- What is testing?
- Why testing?
- How to test?

What is testing?

- Testing is the process of evaluating a system or its component(s) with the intent to find whether it satisfies the specified requirements or not
- Unit testing
- Integration testing
- End-to-end testing
- Regression testing

Test-Driven Development (TDD)

1. Write tests first
2. Write code to pass the tests
3. Refactor



Why testing?

- Reduce bugs in existing/new features
- Improve code quality
- Reduce cost of change
- Improve design
- Improve team confidence

How to test

- Unit testing
  - React Testing Library
  - Enzyme
  - Jest
- E2E testing
  - Cypress
  - Playwright