# Vuex

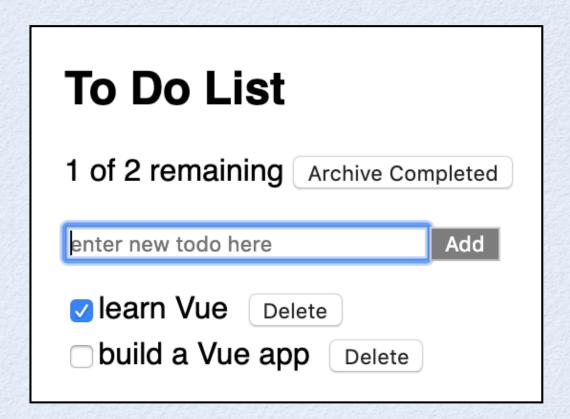# Vuex Overview

- Most popular state management library for Vue

- Developed by and maintained by the Vue team

- Somewhat similar to Redux

  - uses a single store to hold application state

- Vue CLI can install and configure Vuex

- To install when not using Vue CLI,
  ```
  npm install vuex
  ```

# Demo App

- To demonstrate use of Vuex, we'll build a simple Todo app
- Source files to review
    - `store.js`
    - `App.vue`
    - `TodoList.vue`
    - `Todo.vue`



**To Do List**

1 of 2 remaining [Archive Completed]

[enter new todo here] [Add]

☑ learn Vue [Delete]

☐ build a Vue app [Delete]

# Store Setup

- Typically done in `src/store.js`

- Vue CLI creates this file

- Store has four parts

  - **state** - stores application data

  - **mutations** - modify state

  - **getters** - compute values based on state

  - **actions** - perform asynchronous actions (like REST calls) and invoke mutations

# Mutations

- Only way to modify state

- Defined by a set of synchronous methods (no REST calls)

- Invoked in components by calling `this.$store.commit`, not direct calls

- Within a mutation there are two ways to update a state property

  - for example, to change property `foo.bar` to `'baz'` use
    `state.foo.bar = 'baz'`
    or
    `Vue.set(state.foo, 'bar', 'baz')` ← Why would this form ever be preferred?

- Mutations do not need to treat state as immutable

  - except to set a specific array element

  - rather than using syntax like `state.colors[2] = color`
    use `Array splice` method like `state.colors.splice(2, 0, color)`
    or Vue-supplied method `$set` like `state.colors.$set(2, color)`

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# store.js …

```
import Vue from 'vue';
import Vuex from 'vuex';

Vue.use(Vuex);

let lastId = 0;
const createTodo = (text, done = false) => ({id: ++lastId, text, done});

export default new Vuex.Store({
  strict: true, // throws if state is modified outside a mutation
  state: {
    todoText: '',
    todos: [
      createTodo('learn Vue', true),
      createTodo('build a Vue app')
    ]
  },
```

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# ... store.js

```
mutations: {
  addTodo(state) {
    const todo = createTodo(state.todoText);
    state.todos.push(todo);
    state.todoText = '';
  },
  archiveCompleted(state) {
    state.todos = state.todos.filter(t => !t.done);
  },
  deleteTodo(state, todoId) {
    state.todos = state.todos.filter(t => t.id !== todoId);
  },
  toggleDone(state, todo) {
    const todoToToggle = state.todos.find(t => t.id === todo.id);
    todoToToggle.done = !todoToToggle.done;
  },
  updateTodoText(state, todoText) {
    state.todoText = todoText;
  }
},
getters: {
  uncompletedCount: state => state.todos.filter(t => !t.done).length
}
});
```

just removes completed todos

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# App.vue

- Registers store which "injects" access to it into all descendant components

```
<template>
  <TodoList/>
</template>

<script>
import TodoList from './components/TodoList';
import store from './store';

export default {
  name: 'App',
  components: {TodoList},
  store
};
</script>

<style>
body {
  font-family: sans-serif;
  padding-left: 10px;
}
</style>
```

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# State

- Any component can access with `this.$store.state`

- When many items are needed from the state,
  it is convenient to use `mapState` to
  make them accessible via computed properties

- `mapState` returns an object that should
  be spread into the `computed` object

- Example

```
computed: {
  ...mapState({
    todos: state => state.todos,
    todoText: state => state.todoText
  })
},
```

will appear in
`TodoList.vue`

# Committing Mutations

- To commit mutations from a component, call
  `this.$store.commit(mutationName, arg)`

- Example `this.$state.commit('toggleDone', todo);`

- Only a single argument can follow mutation name

- To supply more than one value,
  pass an array or object containing all the values

- Any components that use state
  affected by the mutation will be updated

Vuex

# mapMutations

- Another option is to use **mapMutations** to generate methods that make these calls for you

- Returns an object that should be spread into the **methods** object

- Example

```
methods: {
    ...mapMutations([
        'addTodo',
        'archiveCompleted',
        'deleteTodo',
        'toggleDone',
        'updateTodoText'
    ])
}
```

will appear in **TodoList.vue**

- Allows **this.$state.commit('toggleDone', todo)** to be replaced by **this.toggleDone(todo)**

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# Getters

- Set of methods defined in the store
  that compute derived state from stored state

- Earlier we saw this one

in `store.js`

```
getters: {
  uncompletedCount: state => state.todos.filter(t => !t.done).length;
}
```

- To retrieve value of this getter in a component, call
  `this.$store.getters.uncompletedCount()`

# mapGetters

- Can create computed properties from getters
so they can be referred to with computed property names
instead of explicit calls

- **mapGetters** returns an object that
should be spread into the **computed** property

  - takes an array of getter method names

- Example

```
computed: {
   ...mapGetters(['uncompletedCount'])
},
```

> will appear in
> **TodoList.vue**

# Todo.vue

```html
<template>
  <li>
    <input type="checkbox" :checked="todo.done" @change="onToggleDone">
    <span :class="doneClass">{{todo.text}}</span>
    <button @click="onDeleteTodo">Delete</button>
  </li>
</template>

<script>
export default {
  name: 'Todo',
  props: {
    done: Boolean,
    onDeleteTodo: {
      type: Function,
      required: true
    },
    onToggleDone: {
      type: Function,
      required: true
    },
    todo: {
      type: Object,
      required: true,
      validator(obj) {
        return obj.text &&
          obj.done !== undefined;
      }
    }
  },
  computed: {
    doneClass() {
      return 'done-' + this.todo.done;
    }
  }
};
</script>

<style scoped>
button {
  margin-left: 10px;
}

li {
  margin-top: 5px;
}

.done-true {
  color: gray;
  text-decoration: line-through;
}
</style>
```

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# TodoList.vue ...

```html
<template>
  <div>
    <h2>To Do List</h2>
    <div>
      {{uncompletedCount}} of {{todos.length}} remaining
      <button class="archive-btn" @click="archiveCompleted">
        Archive Completed
      </button>
    </div>
    <form @submit.prevent>
      <input
        class="todo-input"
        type="text"
        size="30"
        autofocus
        placeholder="enter new todo here"
        :value="todoText"
        @input="updateTodoText($event.target.value)"
      >
      <button
        class="add-btn"
        :disabled="!todoText"
        @click="addTodo"
      >Add</button>
    </form>
      <ul class="unstyled">
        <Todo v-for="todo in todos"
          :key="todo.id"
          :todo="todo"
          :onDeleteTodo="() => deleteTodo(todo.id)"
          :onToggleDone="() => toggleDone(todo)"
        />
      </ul>
  </div>
</template>
```

> **todos** and **todoText** are mapped from state

> **updateTodoText**, **addTodo**, **deleteTodo**, and **toggleDone** are all mutations

> passing mutation functions to **Todo** component

# ... TodoList.vue

```
<script>
import {mapGetters, mapMutations, mapState} from 'vuex';
import Todo from './Todo.vue';

export default {
  name: 'TodoList',
  components: {Todo},
  computed: {
    ...mapGetters(['uncompletedCount']),
    ...mapState({
      todos: state => state.todos,
      todoText: state => state.todoText
    })
  },
  methods: {
    ...mapMutations([
      'addTodo',
      'archiveCompleted',
      'deleteTodo',
      'toggleDone',
      'updateTodoText'
    ])
  }
};
</script>
```

```
<style scoped>
button:disabled {
  background-color: gray;
  color: white;
}

ul.unstyled {
  list-style: none;
  margin-left: 0;
  padding-left: 0;
}
</style>
```

# Actions

- Set of methods that support asynchronous mutations

- Can make any number of REST calls
  and commit any number of mutations

- Invoked by calls to `this.$store.dispatch` in components,
  not direct calls

- Example

  - suppose we have REST services that persists todos in a database

  - can implement actions that make the REST calls

  - on success, they can commit mutations

# Action Examples

```
actions: {
  async addTodo(context) {
    const todo = createTodo(context.state.todoText);
    const res = await fetch(SERVER_URL, {
      method: 'POST',
      headers: {'Content-Type': 'application/json'},
      body: JSON.stringify(todo)
    });
    if (res.ok) {
      context.commit('addTodo', todo);
    } else {
      alert('Error adding todo');
    }
  },
  async deleteTodo(context, todoId) {
    const res = await fetch(SERVER_URL + todoId, {method: 'DELETE'});
    if (res.ok) {
      context.commit('deleteTodo');
    } else {
      alert('Error deleting todo');
    }
  }
}
```

add in `store.js`

change `addTodo` mutation to use the passed `todo` instead of creating a new one

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# mapActions

- An alternative to calling `this.$state.dispatch` is to use `mapActions` to generate methods that make these calls for you

- Returns an object that should be spread into the `methods` object

- Example
  ```
  methods: {
    ...mapActions([
      'addTodo',
      'deleteTodo'
    ])
  }
  ```

- Allows `this.$state.dispatch('addTodo', todo)` to be replaced by `this.addTodo(todo)`

# Are Actions Needed?

- Any asynchronous processing, such as calling a REST service,
  can be done in an event handling method instead of an action

- When the asynchronous part completes,
  a synchronous Vuex `commit` can be performed

- If common event handling code is needed across multiple components,
  it can be implemented as a plain function
  that is imported into each of the components
  and invoked from their event handling methods

- This is **simpler than using Vuex actions**

# Modules

- The Vuex store can be split into multiple "modules"

- Each of these have their own state, getters, mutations, and actions

- Modules can be further divided into sub-modules

- But **using a single store is far easier**

# vuex-easy

- Acts as a layer above VueX library

  - so the Vue devtools Vuex tab can still be used

- Makes it unnecessary to implement any mutations

- Based on the battle-tested React libraries redux-easy and context-easy

  - https://www.npmjs.com/package/redux-easy

  - https://www.npmjs.com/package/context-easy  best option for React

- In npm at https://www.npmjs.com/package/vuex-easy

  - README provides simple setup instructions