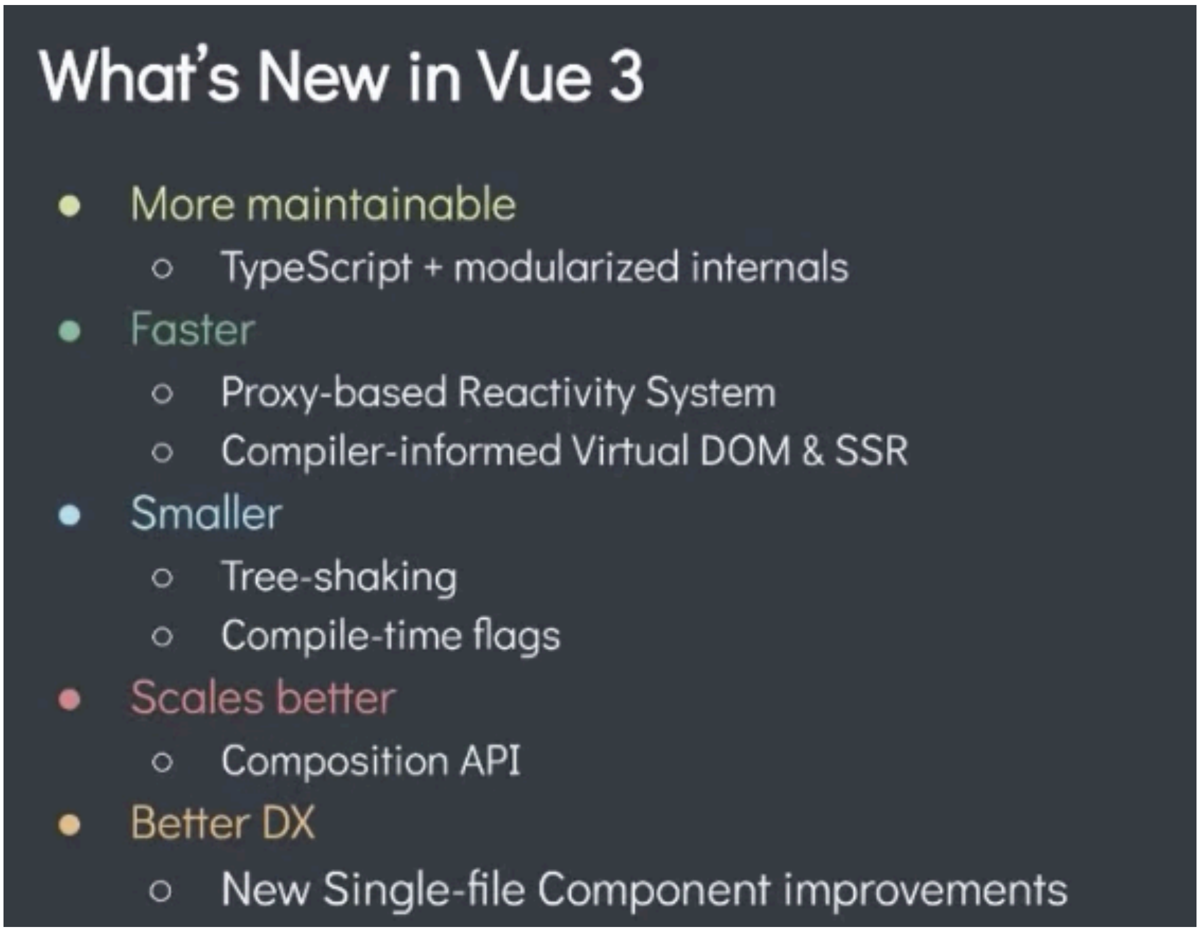
构建工具第三天 - Rollup与Tree-sharking



What's New in Vue 3

- More maintainable
  - TypeScript + modularized internals
- Faster
  - Proxy-based Reactivity System
  - Compiler-informed Virtual DOM & SSR
- Smaller
  - Tree-shaking
  - Compile-time flags
- Scales better
  - Composition API
- Better DX
  - New Single-file Component improvements

试用Rollup 体验Tree-sharking 树摇

index.js

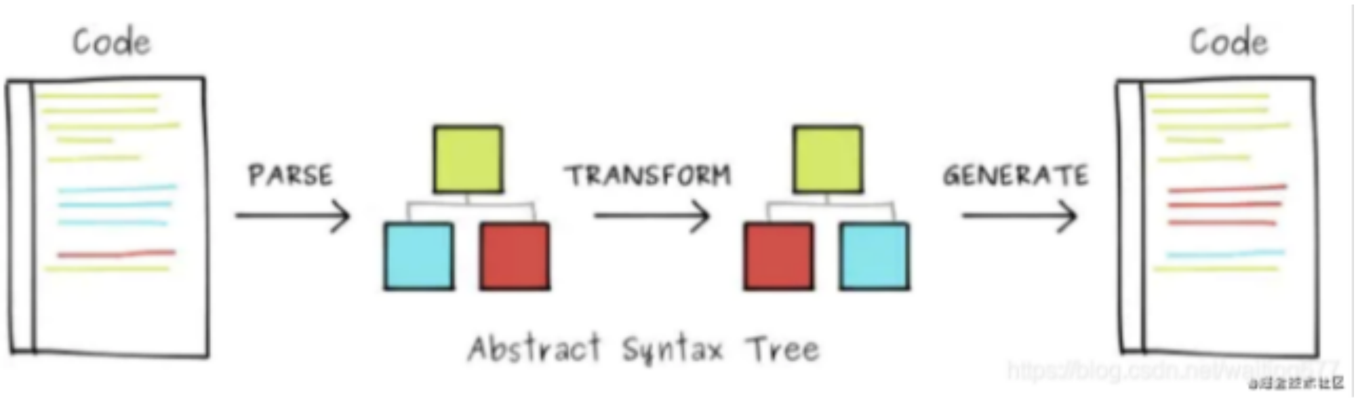
```
import { add } from "./add.js";
console.log(add(2, 4));
```

add.js

```
export const add = (a,b) => a + b
```

```
rollup src/case01/index.js
```

编译经典过程



> AST （Abstract Syntax Tree）抽象语法树 在计算机科学中，或简称语法树（Syntax tree），是源代码语法结构的一种抽象表示。它以树状的形式表现编程语言的语法结构，树上的每个节点都表示源代码中的一种结构。（
> https://astexplorer.net/）

准备工具

1. Magic-string

```
var MagicString = require( 'magic-string' );

const s = new MagicString('export var answer = 42;')

console.log('s',s.snip(7).toString())

var bundle = new MagicString.Bundle();

bundle.addSource({
  filename: 'foo.js',
  content: new MagicString( 'var answer = 42;' )
});

bundle.addSource({
  filename: 'bar.js',
  content: new MagicString( 'console.log( answer )' )
});

// options are as per `s.generateMap()` above
var map = bundle.generateMap({
  file: 'bundle.js',
  includeContent: true,
  hires: true
});
```

```
console.log('map',map)
```

code =》 报错

Sourcemap => sentry => 异常监控平台

webpack插件

2. 编译器acorn

   https://astexplorer.net/

   https://www.npmjs.com/package/acorn

```
const acorn = require("acorn");

const walk = require("./walk");
const code =
`
import { a } from "./foo";
console.log("Hello" + a);
console.log("World");
export const b = 1

`

let ast = acorn.parse(code, {
  locations: true, // 索引位置
  ranges: true,
  sourceType: "module",
  ecmaVersion: 7,
});
```

3. 语法树访问者

```

```

```
/**
 * AST语法树遍历
 */
function walk(ast, { enter, leave }) {
  visit(ast, null, enter, leave);
}

/**
 * 访问者
 * @param {*} node
 * @param {*} parent
 * @param {*} enter
 * @param {*} leave
 * @returns
 */
function visit(node, parent, enter, leave) {
  if(!node) return
  // 先执行enter
  if (enter) {
    enter.call(null, node, parent);
  }

  let childkeys = Object.keys(node).filter(
    (key) => typeof node[key] === "object"
  );

  childkeys.forEach((childKey) => {
    let value = node[childKey];
    if (Array.isArray((val) => visit(val, node, enter, leave))) {
      value.forEach((val) => visit(val, node, enter, leave));
    } else {
      visit(value, node, enter, leave);
    }
  });

  if (leave) {
    leave(node, parent);
  }
}

module.exports = walk;
```

Ast 遍历

```
let indent = 0;
const padding = () => " ".repeat(indent);
```

```
// 遍历语法树中的每一条语句   由walk遍历子元素
// 深度优先原则
ast.body.forEach((statement) => {
  walk(statement, {
    enter(node) {
      if (node.type) {
        console.log(padding() + node.type + ' enter');
        indent += 2;
      }
    },
    leave(node) {
      if (node.type) {
        indent -= 2;
        console.log(padding() + node.type+ ' leave');
      }
    },
  });
});
```

4. 作用域描述对象Scope

```
/**
 * 模拟作用域链
 */
class Scope {
  constructor(options = {}) {
    this.parent = options.parent // 父作用域
    this.depth = this.parent ? this.parent.depth + 1 : 0 // 作用域层级
    this.names = options.params || [] // 作用域内的变量
    this.isBlockScope = !!options.block // 是否块作用域
  }

  /**
   * 将变量添加到作用域
   * @param {*} name
   * @param {*} isBlockDeclaration
   */
  add(name, isBlockDeclaration) {
    if (!isBlockDeclaration && this.isBlockScope) {
      // it's a `var` or function declaration, and this
      // is a block scope, so we need to go up
      this.parent.add(name, isBlockDeclaration)
    } else {
      this.names.push(name)
    }
  }
  /**
   * 判断变量是否被声明
   * @param {*} name
   * @returns
   */
  cantains(name) {

    return !!this.findDefiningScope(name)
  }

  /**
   * 返回变量坐在的作用域
   * @param {*} name
   * @returns
   */
  findDefiningScope(name) {
    if (this.names.includes(name)) {
      return this
    }
    if (this.parent) {
      return this.parent.findDefiningScope(name)
    }
    return null
  }
}

module.exports = Scope
```

原型系统

Parse阶段

```
const acorn = require("acorn");

const walk = require("../../lib/ast/walk");
const Scope = require("../../lib/ast/scope");
const MagicString = require("magic-string");

const code = {
  index: `
  import { add } from "./add.js";
  console.log(add(2, 4));
  `,
  add: `
  export const add = (a,b) => a + b
  `,
};
```

Import 分析

```
function getImports(ast) {
  console.log("========分析import=======");
  const imports = {};
  ast.body.forEach((node) => {
    if (node.type === "ImportDeclaration") {
      console.log("import:", node._source.toString());
      // ex: import { a : b } from 'foo'
      // let source = node.source.value;
      const source = "";
      let specifiers = node.specifiers;
      specifiers.forEach((specifier) => {
        const name = specifier.imported.name; // a
        const localName = specifier.local.name; // b
        console.log("specifiers", name, localName);
        imports[localName] = { name, localName, source };
      });
    }
  });
  return imports;
}
```

Export 分析

```

```

语法分析

- 变量定义
- 变量依赖
- 语句

```

// 分析函数
function analyse(ast, magicString) {
  console.log("======analyse=====");
  // 创建全局作用域
  let scope = new Scope();
  // 遍历当前语法树
  ast.body.forEach((statement) => {
    /**
     * 给作用域内添加变量
     * @param {*} declaration
     */
    function addToScope(declaration) {
      var name = declaration.id.name; // 获取声明的变量
      scope.add(name);
      if (!scope.parent) {
        // 如果此变量作用域不在父级作用域 即当前作用域
        // 如果当前是全局作用域的话
        // 在全局作用域下声明全局变量
        statement._defines[name] = true;
      }
    }

    Object.defineProperties(statement, {
      // 变量定义
      _defines: { value: {} },

      // 变量依赖
      _dependsOn: { value: {} },

      // 此语句是否被打包Bundle 防止多次打包Bundle
      _included: { value: false, writable: true },

      // 变量语句
      _source: { value: magicString.snip(statement.start, statement.end) },
    });

    // 作用域链遍历
    // 分析变量定义的
    // 构造作用域链
    walk(statement, {
      enter(node) {
        let newScope;
        // 防止空节点和空数组
        if (node === null || node.length === 0) return;
        switch (node.type) {
          // 变量声明
          case "VariableDeclaration":
            declarations.push(node);
            node.declarations.forEach(addToScope);
            break;
        }
        if (newScope) {
          console.log("newScope", newScope);
          // 当前节点声明的新作用域
          // 如果此节点生成一个新作用域
          Object.defineProperties(node, { _scope: { value: newScope } });
          scope = newScope;
        }
      },
      leave(node) {
        if (node._scope) {
          // 如果此节点离开退回父作用域
          scope = scope.parent;
        }
      },
    });
  });
  ast._scope = scope;

  // 找出外部依赖关系 dependsOn
  ast.body.forEach((statement) => {
    walk(statement, {
      enter(node) {
        if (node._scope) {
          scope = node._scope;
        }
        // 遇到导出节点
        if (node.type === "Identifier") {
          // 遇到 exports const a => node.name = 'a'

          // 向上递归
          const definingScope = scope.findDefiningScope(node.name);
          if (!definingScope) {
            console.log("Identifier:", node.name);
            statement._dependsOn[node.name] = true; // 表示属于外部依赖变量
          }
        }
      },

      leave(node) {
        if (node._scope) scope = scope.parent;
      },
    });
  });
}
```

语句扩展添加声明

```
let declarations = [];
analyse(add, new MagicString(code.add));
analyse(index, new MagicString(code.index));
// 追加
const statments = expandAllStatements(index);
```

```
/**
 * 展开所有语句节点
 * @returns
 */
function expandAllStatements(ast) {
  console.log("=========expandAllStatements=============");
  const allStatements = [];

  ast.body.forEach((statement) => {
    // 忽略所有Import语句
    if (statement.type === "ImportDeclaration") {
      return;
    }

    allStatements.push(...declarations, statement);
  });
  return allStatements;
}
```

generate阶段

```
function generate(statments) {
  console.log('======generate=====')
  // statments.forEach(v => console.log(magicString.snip(v.start, v.end)))
  let v = statments[0]
  console.log(new MagicString(code.add).snip(v.start, v.end).toString())
  v = statments[1]
  console.log(new MagicString(code.index).snip(v.start, v.end).toString())
}
```