Advancing the Chrome Reactive Inspector

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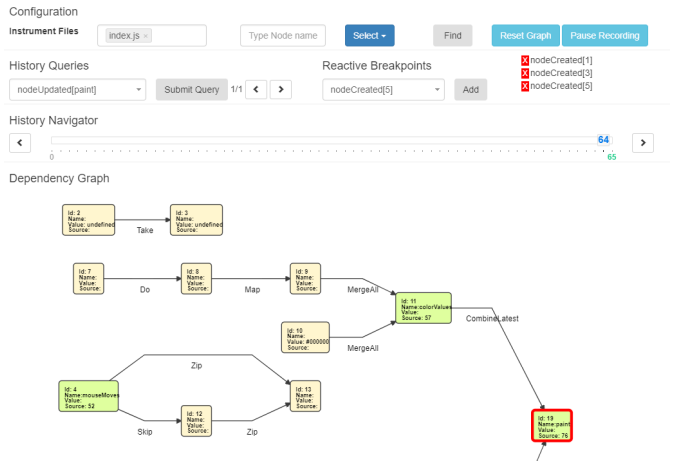

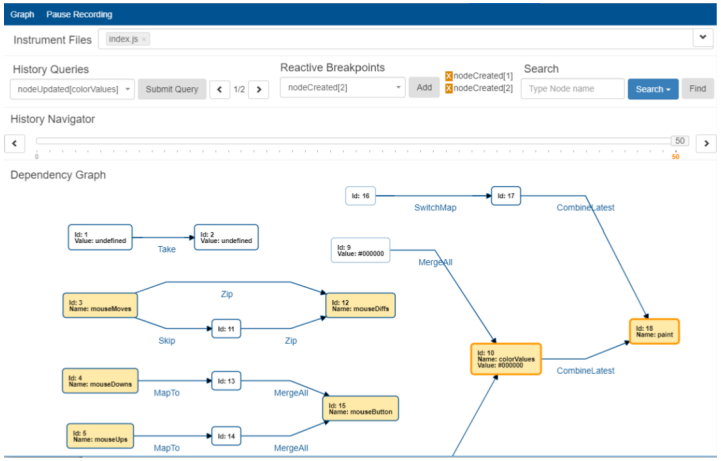

Reactive Programming

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- multiple values over time
- observables
- event streams
- Implementations in all major programming languages

ReactiveX
source: http://reactivex.io/

Bacon.js
source: https://baconjs.github.io/

Traditional Debugging

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- breakpoints
- step by step execution
- event logging
- stack trace inspection
- *printf-debugging*

Debuggin Reactive Code

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- do-debugging
- abstraction of dependencies
- limited number of tools
- Reactive Inspector for Scala
- Chrome Reactive Inspector
- RxFiddle

Debuggin Reactive Code - RxFiddle

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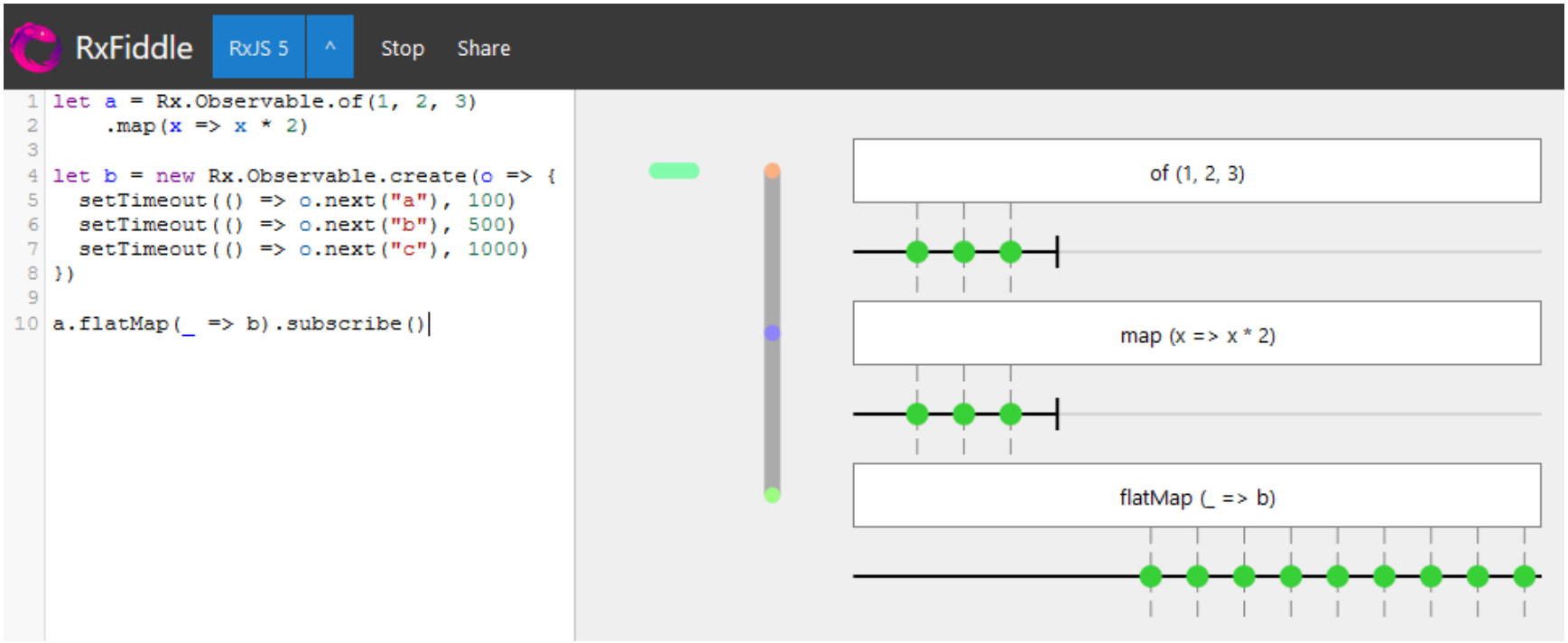
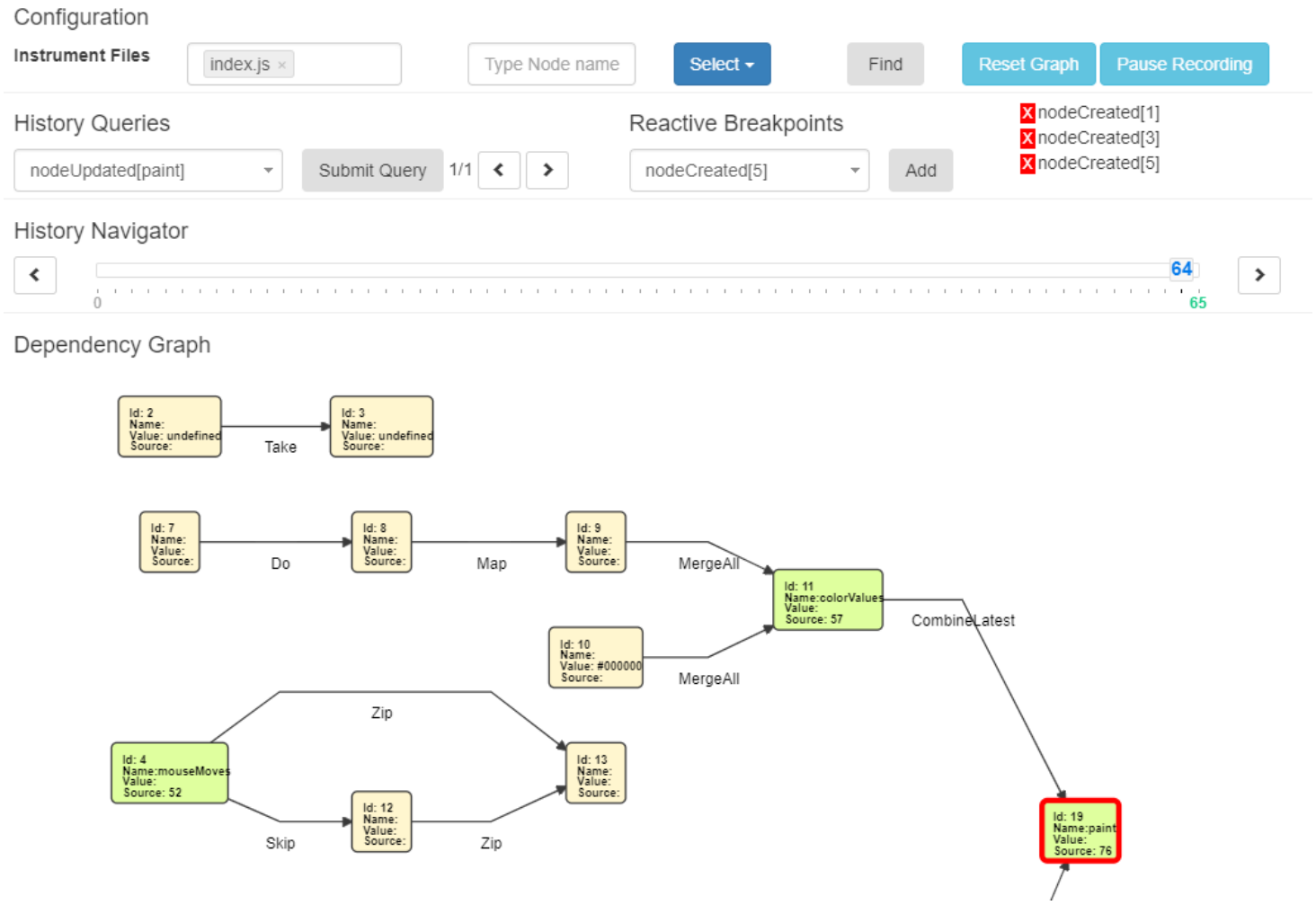


Screenshot of the RxFiddle Demo

Source: https://rxfiddle.net/

The Chrome Reactive Inspector

The previous User Interface



The new User Interface

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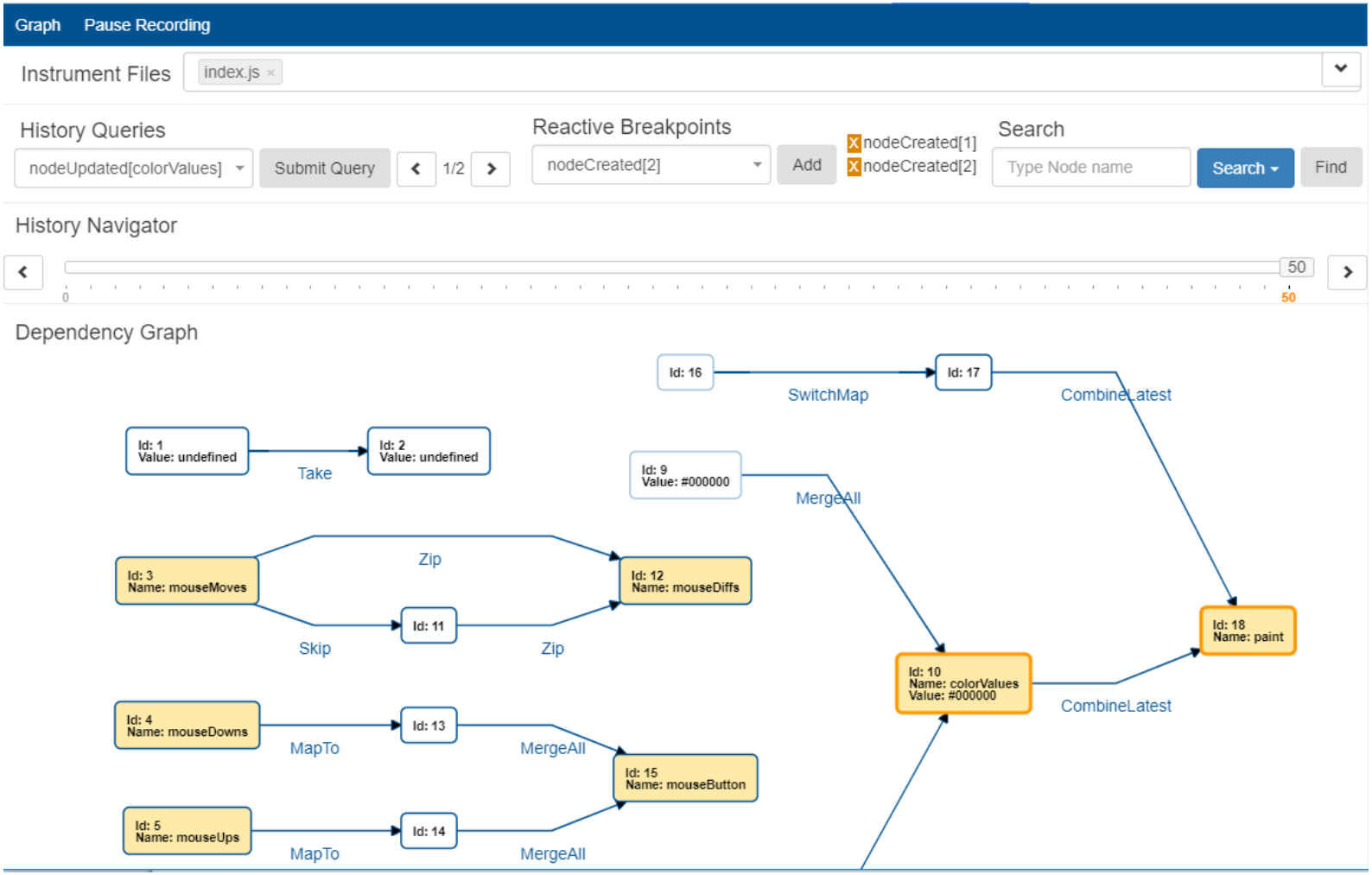

Advancing the User Interface

Reducing the cognitive load

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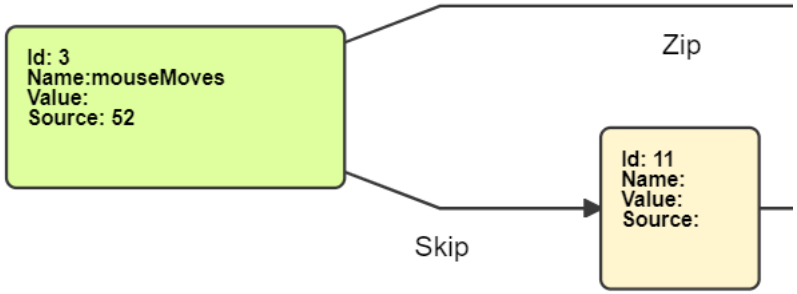

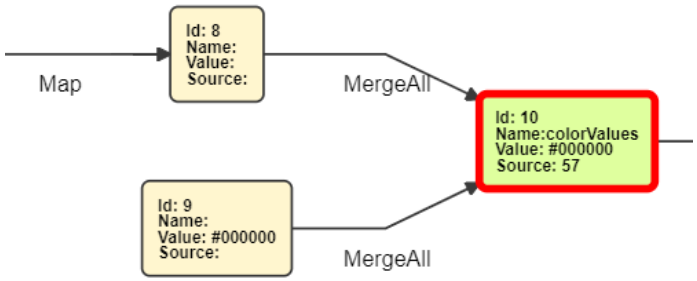

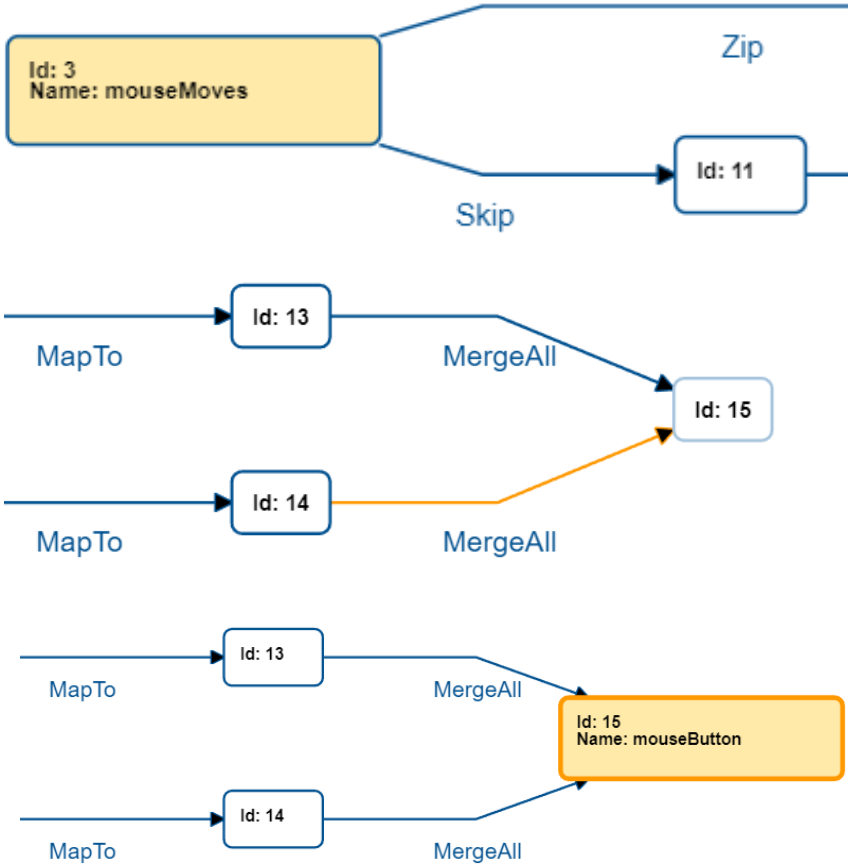

Advancing the User Interface

Reducing the cognitive load

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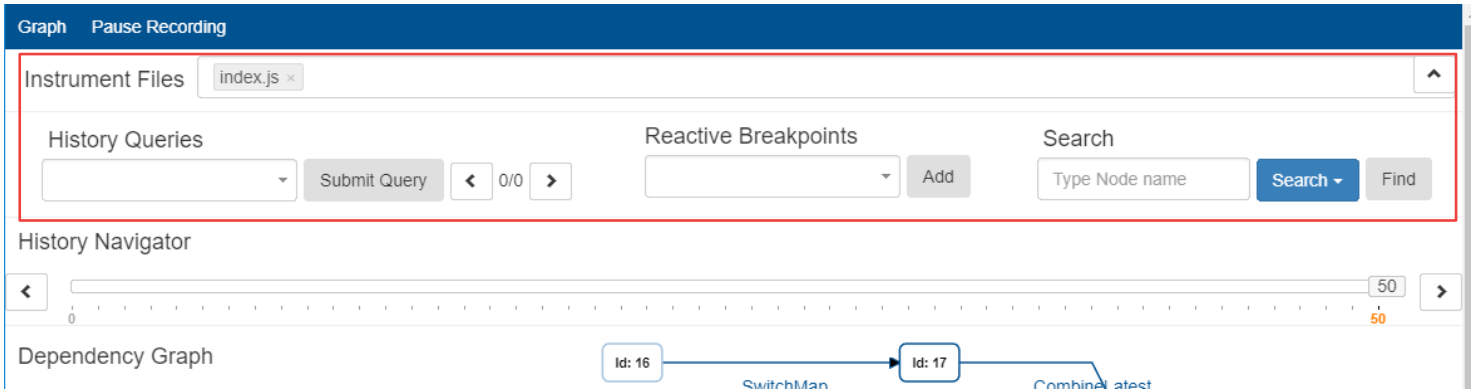

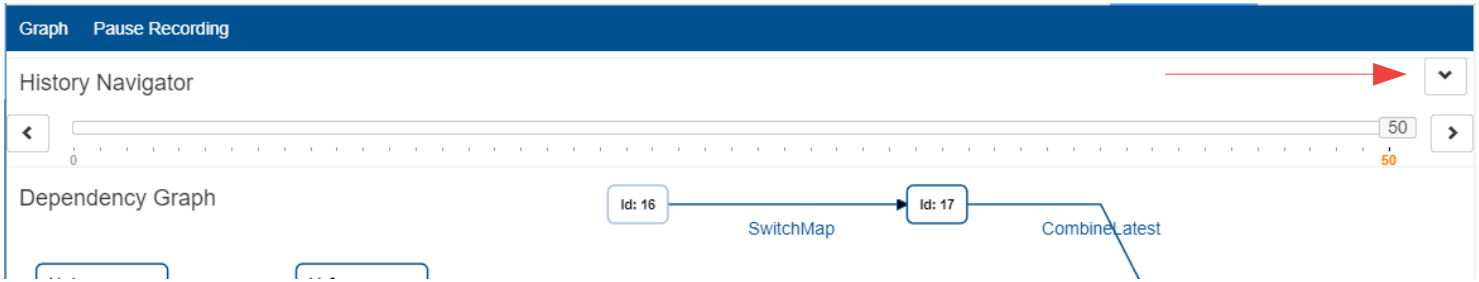

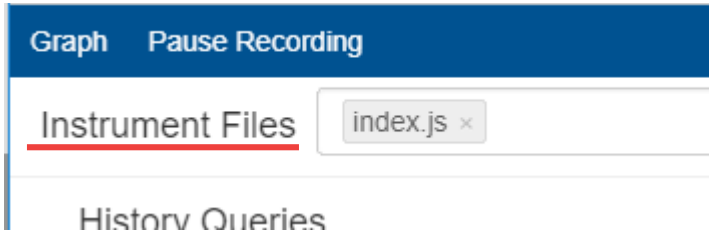

Connecting abstract graph with JavaScript code

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- provide additional context
- merge both views

Method Chaining:

```
var intervalObservable = Rx.Observable.interval(5)
    .timestamp()
    .bufferCount(2, 1)
    .map(function (w) {
        return w[1].timestamp - w[0].timestamp;
    })
    .share();
```

Connecting abstract graph with JavaScript code

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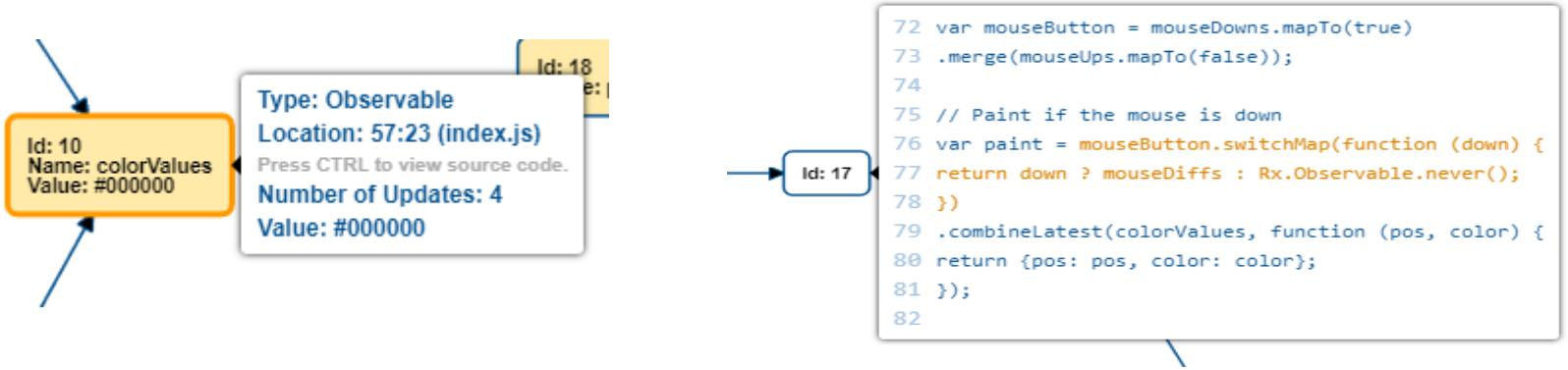
- difficulty: instrumented JavaScript code

```
$sonWallet = J$.W(593, '$sonWallet', J$.F(585, J$.I(typeof $ === 'undefined'
    ? $ = J$.R(569, '$', undefined, true, true) : $ = J$.R(569, '$', $, true,
     true)), false)(J$.T(577, '#wallet-son', 21, false)), J$.I(typeof
```

- covers *almost* all nodes



Connecting abstract graph with JavaScript code

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- *Source Code Tooltips*

  Pro

  - compliments dependency graph
  - easily accessible
  - highlight code
  - existing workflow

  Con

  - only snippets
  - no search feature
  - limited when using references to functions

Function reference example:

```
function createFunction(add) {
  return (value) => value + add;
}
let fatherWalletValue = sonWalletValue
  .map(createFunction(10));
```

Rapidly updated Observables

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- timers, mouse movement, network traffic
- generate thousands of steps
- limited by recording performance
- may render CRI useless

Rapidly updated Observables
improving performance

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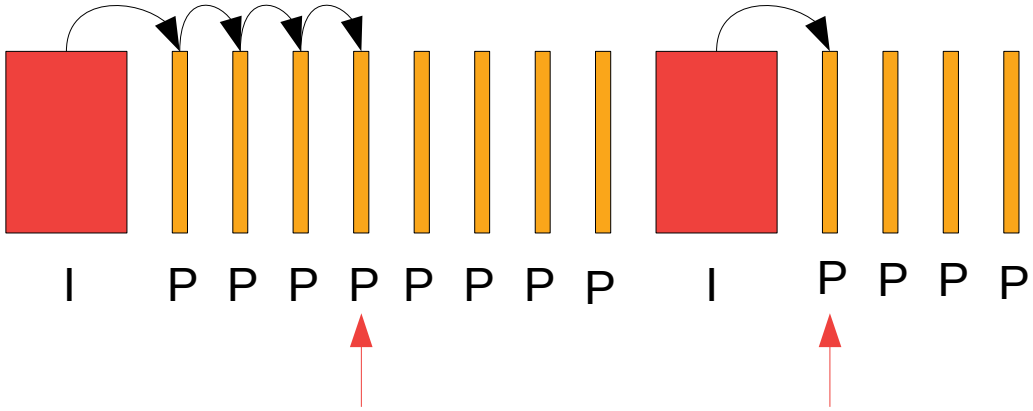
- UI update throttling
- (software) Paging
- Delta Encoding
- improved similar to Video Compression



Excessively created Observables

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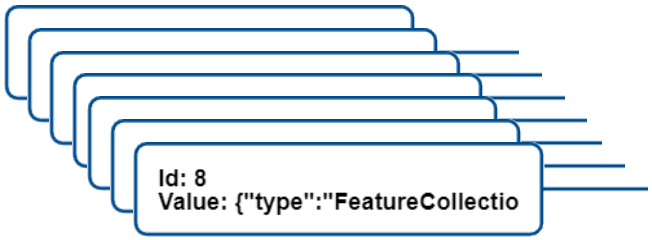
- describes a group of observables
- created as part of a loop
- created multiple times temporarily
- all originating from the same code
- require detection and representation in the graph



Evaluation

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- changes to the UI
- Source Code Tooltips cover 75% of all nodes
- CPU Performance
  - Version 2: 154s
  - Version 3: 5.5s
- Memory
  - Version 2: 54mb - depending on steps
  - Version 3: 15mb - constant

Evaluation
Comparison to RxFiddle

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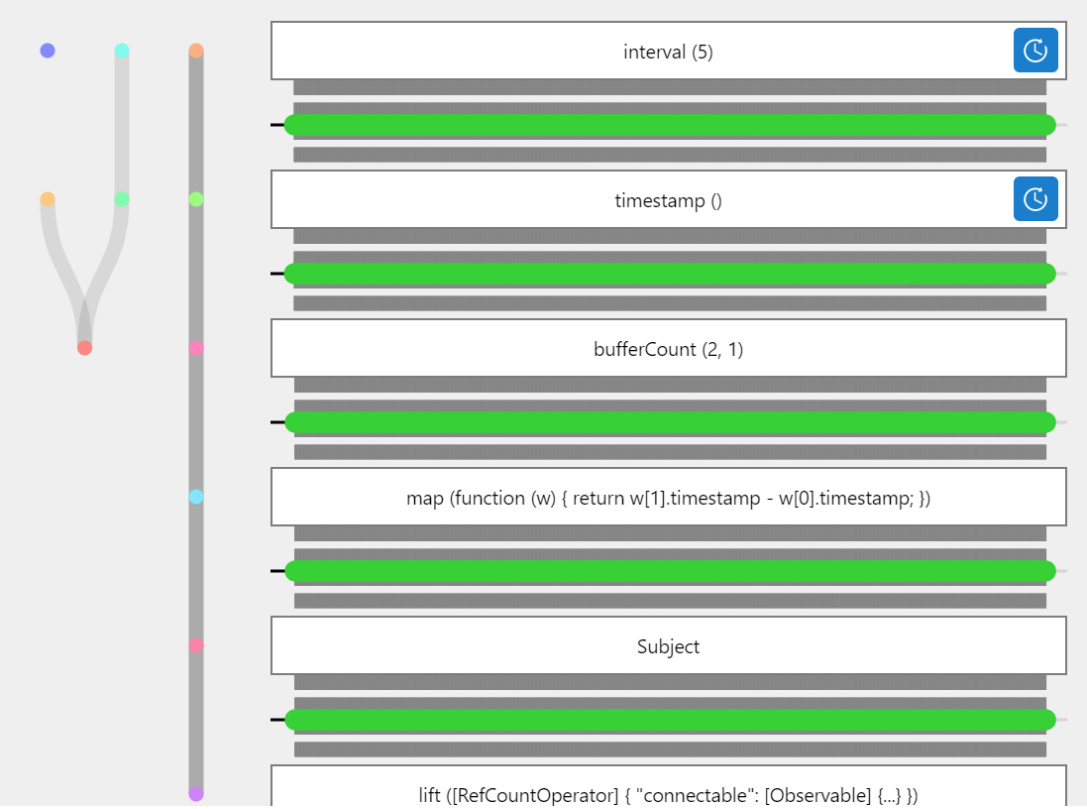

Screenshot of RxFiddle with the test application

Evaluation
Test Applications

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- verify robustness
- state of the project
- 9 specifications tested for each applicaiton
- 388 of 420 checks were successful
- notable findings:
  - Ambiguity
  - JavaScript in HTML attributes
  - breakdown of recording for a specific pattern

Future

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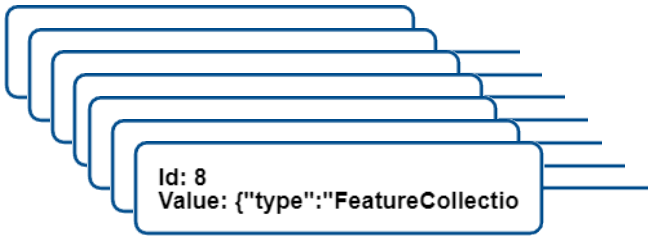
- module loaders
- ES6 and TypeScript support
- extend node exclusion
- excessively created observables

Source: http://requirejs.org/logo.png



Summary – Q and A

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Advancing the Chrome Reactive Inspector

- Reducing the cognitive load on the user
- Connecting the abstract graph with JavaScript code
- Rapidly updated observables
- Excessively created Observables
- Evaluation

Advancing the Chrome Reactive Inspector

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Thank you

Advancing the Chrome Reactive Inspector

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Backup Slides:

Reactive Programming

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- very similar source code

Rx.js

```
addClick = Rx.Observable.fromEvent($addSon, 'click')
    .mapTo(1);
removeClick = Rx.Observable.fromEvent($removeSon, 'click')
    .mapTo(-1);
eventClick = addClick.merge(removeClick);
function plus(a, b) {
    return a + b
}
sonWalletValue = eventClick.scan(plus, 0)
fatherWalletValue = sonWalletValue
    .map(function (value) {
        return value + 10
    })
sonWalletValue.subscribe(
    function (data) {
        $sonWallet.val(data);
    });
```

Bacon.js

```
addClick = $addSon.asEventStream('click');
addClickMap = addClick.map(1);
removeClick = $removeSon.asEventStream('click');
removeClickMap = removeClick.map(-1);
eventClick = addClickMap.merge(removeClickMap);
function plus(a, b) {
    return a + b
}
sonWalletValue = eventClick.scan(0, plus);
fatherWalletValue = sonWalletValue
    .map(function (value) {
        return value + 10
    });
sonWalletValue.assign($sonWallet, "val");
```

Advancing the User Interface
Reducing the cognitive load

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