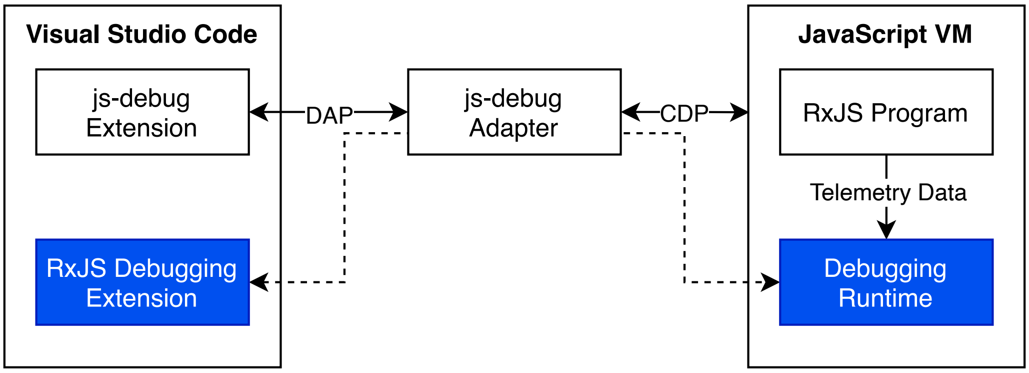
Architecture

Glossary

- *CDP*: Chrome DevTools Protocol. https://chromedevtools.github.io/devtools-protocol/
- *DAP*: Debug Adapter Protocol. https://microsoft.github.io/debug-adapter-protocol/overview
- *VM*: Virtual Machine

Components



RxJS-specific debugging reuses debugging sessions started by *Visual Studio Codes* built-in JavaScript debugging extension (*js-debug*). The *RxJS Debugging Extension* communicates through *js-debug* using CDP with the *Debugging Runtime*. The *Debugging Runtime* interacts with the *RxJS Program*, running in the *JavaScript VM* (e.g., Node.JS or browsers like Google Chrome).

RxJS Debugging Extension

The *RxJS Debugging Extension* integrates with *Visual Studio Code* using its extension API and provides relevant user interfaces and functionalities. It allows developers to use RxJS debugging features like operator log points.

Furthermore, it ensures that, once a *js-debug* debugging session is started, essential hooks are registered in the *JavaScript VM* using CDP Bindings.

The communication protocol to exchange data with the *Debugging Runtime* is implemented in the extension's TelemetryBridge.

Debugging Runtime

A *Debugging Runtime* interfaces with the live *RxJS Program* and forwards relevant *Telemetry Data* (e.g. a value emitted by an Observable) to the *RxJS Debugging Extension*. A *Debugging Runtime* runs in the same process as the *RxJS Program*.

Specific *JavaScript VM*s require specific *Debugging Runtimes*. E.g., runtime-nodejs enables debugging of *RxJS Programs* executed in Node.JS. Web application bundled with Webpack require the runtime-webpack plugin likewise.

Independently from "how" a *Debugging Runtime* finds its way to the *JavaScript VM*, all of them fulfil following tasks:

- Use hooks registered using CDP Bindings to establish communication with the *RxJS Debugging Extension*
- Patch RxJS to provide required *Telemetry Data*
- Communicate with the *RxJS Debugging* Extension using the runtimes TelemetryBridge

CDP Bindings

A binding is a function available in a *JavaScript VM* global scope. It is created using the Runtime.addBinding function of a CDP client (i.e. the *RxJS Debugging Extension*). Once the *Binding* function is called, a callback in the CDP client is executed.

RxJS Debugging for Visual Studio Code uses this form of remote procedure calls (RPC) to communicate with the *Debugging Runtime* in a *JavaScript VM*.

Once the *RxJS Debugging Extension* detects a new *js-debug* debugging session, following bindings are registered:

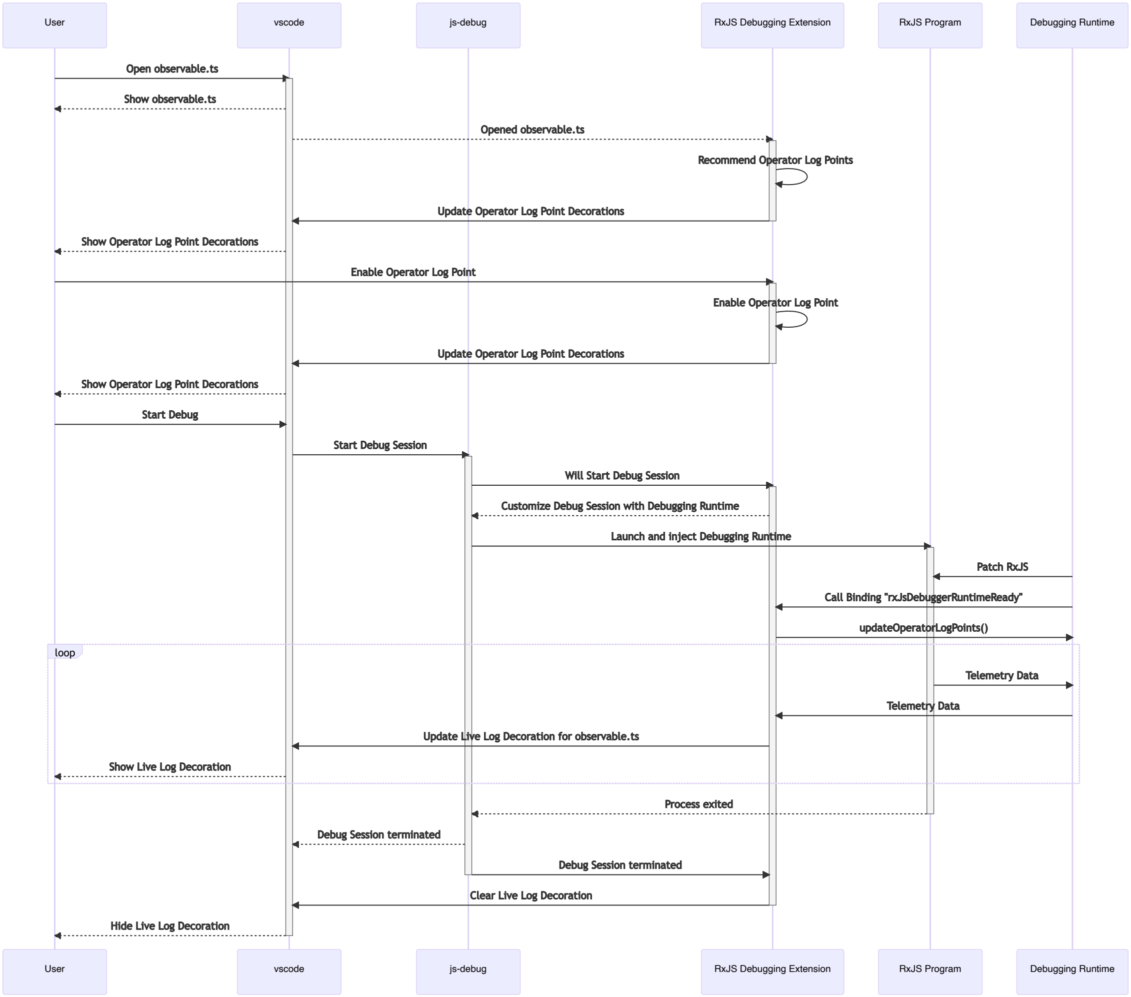
Name	Payload	Notes
`rxJsDebuggerRuntimeReady`	None	A *Debugging Runtime* is expected to call this binding once it is ready to debug an *RxJS Program*.
`sendRxJsDebuggerTelemetry`	`string`	Sends a JSON-encoded TelemetryEvent to the *RxJS Debugging Extension*.

Both the *RxJS Debugging Extension* as well as the *Debugging Runtime* use a well defined communication protocol implemented by their respective telemetry bridges.

Example System Interaction

Based on testbench-nodejs, the following sequence diagram shows typical interactions between the presented system components.

The JavaScript VM component is omitted for clarity.


User
vscode
js-debug
RxJS Debugging Extension
RxJS Program
Debugging Runtime
Open observable.ts
Show observable.ts
Opened observable.ts
Recommend Operator Log Points
Update Operator Log Point Decorations
Show Operator Log Point Decorations
Enable Operator Log Point
Enable Operator Log Point
Update Operator Log Point Decorations
Show Operator Log Point Decorations
Start Debug
Start Debug Session
Will Start Debug Session
Customize Debug Session with Debugging Runtime
Launch and inject Debugging Runtime
Patch RxJS
Call Binding "rxJsDebuggerRuntimeReady"
updateOperatorLogPoints()
loop
Telemetry Data
Telemetry Data
Update Live Log Decoration for observable.ts
Show Live Log Decoration
Process exited
Debug Session terminated
Debug Session terminated
Clear Live Log Decoration
Hide Live Log Decoration
User
vscode
js-debug
RxJS Debugging Extension
RxJS Program
Debugging Runtime