WebDriver Extension API for Generic Sensors

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Problem

Testing Sensor APIs...

- Is a sensor being created with the right state?
- Are sensor readings correct?
- Is the sensor measuring things at the right frequency?
- Are the right errors being thrown under the right circumstances?

... Without actual sensors

- No hardware = more predictable, easier to integrate in CI workflows
- Tests must work across browsers

https://wpt.fyi

- Runs tests in WPT on Chrome, Edge, Firefox and Safari
- Reports what passes what fails across runs
- Uses WPT's infrastructure to launch **unmodified** browser binaries, controls them via WebDriver (ChromeDriver, Marionette etc)

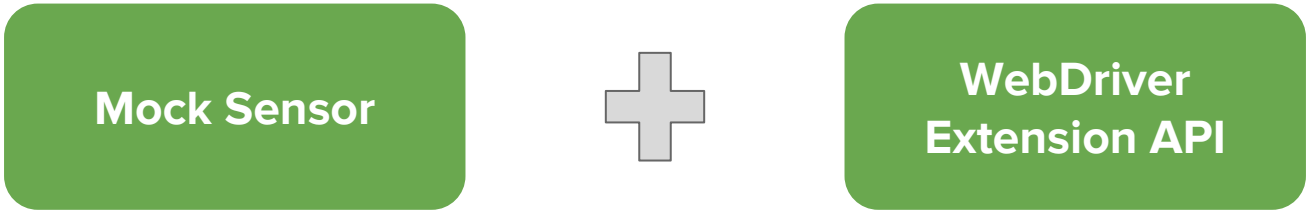
Browser CI

- Gecko, Blink, WebKit have their own WPT copies, periodically synced with upstream
- Tests from WPT often run as part of their CI
- The binary running the tests is often not the browser binary
- Not launched by WPT, no WebDriver

Sensors in web-platform-tests

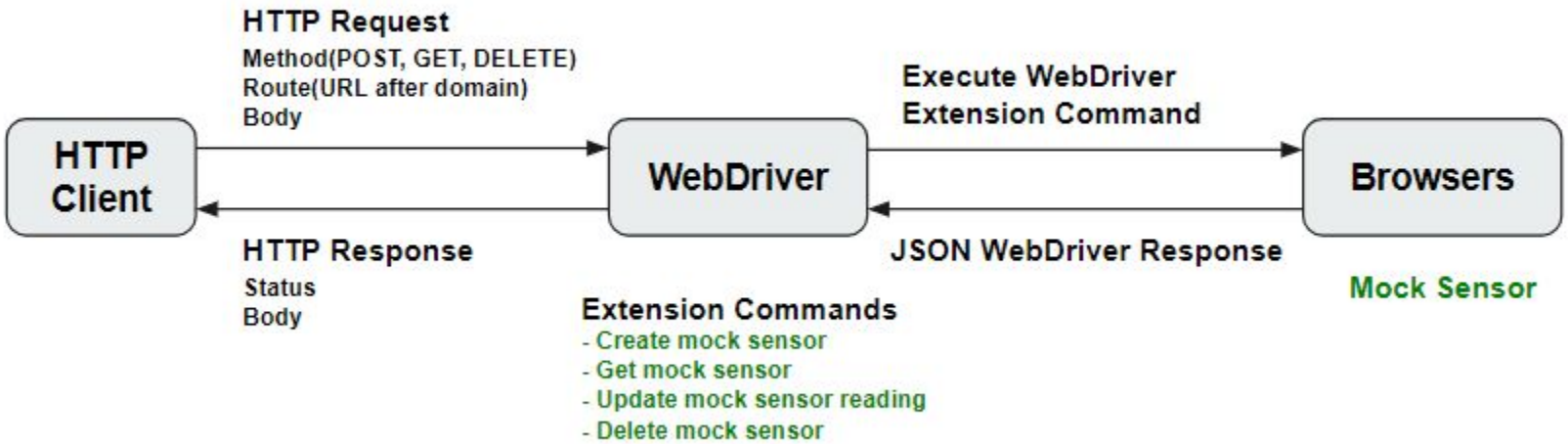
- wpt.fyi 👎
- Blink CI 👍
- Chromium-specific build artifacts checked into WPT (not always used these days, see this Chromium bug)
- “Agnostic” API on top that hardcodes a dependency on the files above for Chromium

Solution



- Specify a WebDriver extension protocol for mocking sensors with specific characteristics and behavior
- Other specs following the same approach: Permissions API, Reporting API

Basic Flow


HTTP Request
Method(POST, GET, DELETE)
Route(URL after domain)
Body
HTTP Client
WebDriver
Execute WebDriver
Extension Command
Browsers
HTTP Response
Status
Body
JSON WebDriver Response
Mock Sensor
Extension Commands
- Create mock sensor
- Get mock sensor
- Update mock sensor reading
- Delete mock sensor

API Design (Mock Sensor)

A mock sensor simulates the behavior of a platform sensor which should have following capabilities:

- Mock sensor type
- Mock sensor readings (modifiable)
- Sampling frequency (upper and lower bounds)
- Connection flag (can be used to create a failing sensor, for example)

API Design (Extension Commands)

Extension Commands	HTTP Method	URI Template
Create mock sensor	POST	/session/{session id}/sensor
Get mock sensor	GET	/session/{session id}/sensor/{type}
Update mock sensor reading	POST	/session/{session id}/sensor/{type}
Delete mock sensor	DELETE	/session/{session id}/sensor/{type}

Create mock sensor

To create an "accelerometer" mock sensor with session ID 21, the local end would send a **POST** request to `/session/21/sensor` with the body:

```
{
  "mockSensorType": "accelerometer",
  "maxSamplingFrequency": 60,
  "minSamplingFrequency": 5,
  "connected": true
}
```

```
dictionary MockSensorConfiguration {
  required MockSensorType mockSensorType;
  boolean connected = true;
  double? maxSamplingFrequency;
  double? minSamplingFrequency;
};
```

Get mock sensor

To get an "accelerometer" mock sensor with session ID 22, the local end would send a **GET** request to `/session/22/sensor/accelerometer` without a body. On success, the remote end returns with serialized mock sensor information:

```
{
  "maxSamplingFrequency": 60,
  "minSamplingFrequency": 5,
  "requestedSamplingFrequency": 30
}
```

```
dictionary MockSensor {
  double maxSamplingFrequency;
  double minSamplingFrequency;
  double requestedSamplingFrequency;
};
```

Update mock sensor reading

To update the mock sensor reading of "accelerometer" mock sensor with session ID 23, the local end would send a **POST** request to `/session/23/sensor/accelerometer` with a body like this:

```
{
  "x": 1.12345,
  "y": 2.12345,
  "z": 3.12345
}
```

```
dictionary AccelerometerReadingValues {
  required double? x;
  required double? y;
  required double? z;
};
```

Delete mock sensor

To delete an "accelerometer" mock sensor with session ID 24, the local end would send a **DELETE** request to `/session/24/sensor/accelerometer` without a body.

Handling Errors

Error Code	*HTTP Status*	*JSON Error Code*	*Description*
no such mock sensor	404	*no such mock sensor*	no mock sensor matching the given type was found.
mock sensor already created	500	*mock sensor already created*	A command to create a mock sensor could not be satisfied because the given type of mock sensor is already existed.

WPT's testdriver.js

- JS API to allow tests to perform human-like interaction via WebDriver
- Current commands include `click`, `send_keys` and a few others
- API is separate from implementation, which can be overridden by vendors
- `test_driver.click(element)`
  - When using WPT's test runner, ends up sending a `Find Element` command, then a `Click` command, both via the WebDriver protocol
  - Blink's testdriver-vendor.js (used in CI) implements it via `chrome.gpuBenchmarking.pointerActionSequence()`, not WebDriver

Obstacles/Gaps

- Long process
  - Spec
  - Browser-specific bits. For Chrome: ChromeDriver changes, Chrome DevTools Protocol changes
  - WPT changes (testdriver.js)
- Does not automatically solve the Browser CI case
  - No WebDriver: same WPT testdriver API needs to be reimplemented
  - Medium/long-term plans ongoing to solve this, at least for Blink
- Security considerations? Web developer use cases? API design?
- WebDriver calls are unidirectional
- The spec introduces new WebDriver errors, but WebDriver support for new error types is pending

What's next?

- Call for broader review of this Extension API (thanks @jugglinmike!)
- Prototyping
- See if our approach can be generalized so other specs can adopt it (e.g. Media Streams, Screen Orientation, Vibration etc.)

Q&A

Merci