Intensive Wake Up Throttling

Summary for Web Developers

This document is public.

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Policy

In a Window whose top Window has been hidden for 5 minutes and which is not opted out from intensive wake up throttling, a timer task with non-zero timeout can run:

- on a 1-second aligned wake up if:
  - the timer task's nesting level is < 5, or,
  - the Window is same-origin with the top Window and at least 1 minute has elapsed since the last timer task with nesting level >= 5 has run in any Window in the tree that is same-origin with the top Window
- on a 1-minute aligned wake up, otherwise.

Any timer task with nesting level >= 5 has a non-zero timeout due to step 11 of the timer algorithm (even if the timeout argument was zero).

Opt-outs

A page is opted-out from intensive wake up throttling if:

- The page was audible in the last 30 seconds.
  - Playing silent audio is not sufficient to opt-out the page -- Chrome checks whether the audio is truly audible.
- The page has an RTCPeerConnection with an 'open' RTCDataChannel or a 'live' MediaStreamTrack.

Examples

Executing the code snippets below on a page with intensive throttling results in 4 invocations of `onTimer` on 1-second aligned wake ups (1 second between each invocation). Then, `onTimer` is invoked on 1-minute aligned wake ups (1 minute between each invocation).

```
function onTimer() {
  setTimeout(onTimer, 10);
 }
setTimeout(onTimer, 10);
```

```
function onTimer() {  }
setInterval(onTimer, 10);
```

How to test?

To assess the impact of this feature on your site, specify the following command line flags when launching Chrome M87 Beta or Stable[1]:

```
--enable-features="IntensiveWakeUpThrottling,OptOutZeroTimeoutTimersFromThrottling,AllowAggressiveThrottlingWithWebSocket"
```

The intended new behavior is to enable intensive throttling for tabs that have been backgrounded for 5 minutes. Since waiting 5 minutes before testing is time-consuming, the following command line flags can be used to enable intensive throttling for tabs that have been backgrounded for 10 seconds:

```
--enable-features="IntensiveWakeUpThrottling:grace_period_seconds/10,OptOutZeroTimeoutTimersFromThrottling,AllowAggressiveThrottlingWithWebSocket"
```

Release Plan

- M87: Beta and Stable experiments.
- M88: Enabled by default.

See Schedule for release dates.

Impact

We conducted tests on a MacBook Air (Retina, 13-inch, 2020, 1.1 GHz Dual-Core Intel Core i3, 8 GB RAM) running macOS Catalina version 10.15.7 and Chrome Beta 87.0.4280.60 (official build).

We opened these pages in background:

- https://www.cnn.com/

[1] It is also possible to use Chrome Canary or Dev 88.0.4284.0+.

- https://www.foodnetwork.com/thanksgiving/thanksgiving-turkey/best-thanksgiving-turkey-recipes
- https://www.google.com/search?q=battery
- https://www.youtube.com/
- https://outlook.live.com/mail/0/inbox (logged in)
- https://stackoverflow.com/questions/33529320/how-to-get-battery-info-on-mac
- https://www.amazon.ca/s?k=battery
- https://slashdot.org/
- https://www.aliexpress.com/
- https://www.nytimes.com/

We opened this page in foreground:

- https://news.ycombinator.com/

We waited 10 minutes to allow most tasks scheduled during page load to execute. Then, we used the `powermetrics` tool to collect power metrics for a 4 hours interval.

- Intensive throttling disabled:
  - 82 ms of CPU usage / second
  - Wakeups: 38 wakeups / second
  - Energy Impact: 8.89
  - Battery discharge in interval: 911 mAh (full charge capacity: 4340 mAh)
- Intensive throttling enabled:
  - 15 ms of CPU usage / second
  - Wakeups: 16 wakeups / second
  - Energy Impact: 1.81
  - Battery discharge in interval: 855 mAh (full charge capacity: 4340 mAh)
    - At this rate, battery lasts an extra 1.25 hours

Results will vary depending on which pages are opened in the background. The Chrome Team is looking forward to reporting real-world data from this intervention.

Experiment setup details:

- We disabled WebRTC in Chrome.
- The laptop was running on battery power.
- *System Preferences* > *Energy Saver* > *Battery*
  - Turn display off after: Never
  - Put hard disks to sleep when possible: yes
  - Slightly dim the display while on battery power: no
  - Optimize video streaming while on battery power: yes
  - Enable Power Nap while on battery power: no
- *System Preferences* > *Display*
  - Brightness: 0.75 (set via script to get an exact value)
  - Automatically adjust brightness: no
  - True Tone: no

- *System Preferences* > *Desktop and Screen Saver*:
    - Desktop: Solid black
    - Screen Saver Start after: Never
- *System Preferences* > *Bluetooth*
    - Off