Tab Discarding in Chrome: A Memory-Saving Experiment

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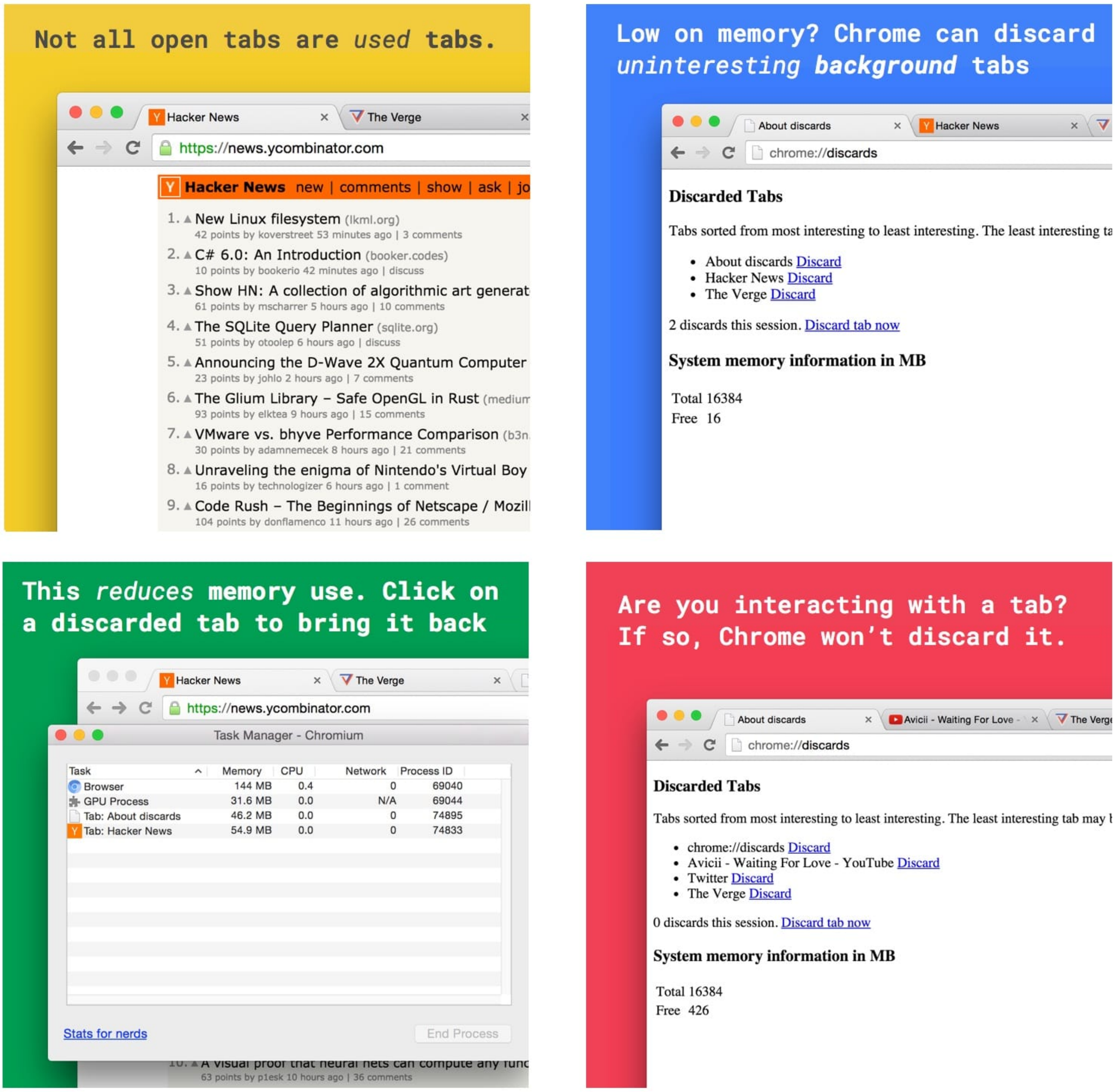
Reducing Chrome's memory footprint is one of the team's top priorities this year. We've already seen up to a 45% reduction in GMail's memory usage thanks to improvements in V8's garbage collection process but we're really just getting started. One of our next experiments in memory use is aimed at tab hoarders (like myself). It's called **Tab Discarding**.


Not all open tabs are *used* tabs.
Hacker News
The Verge
https://news.ycombinator.com
Hacker News new | comments | show | ask | jo
Low on memory? Chrome can discard *uninteresting* **background** tabs
About discards
Hacker News
chrome://discards
This *reduces* memory use. Click on a discarded tab to bring it back
Hacker News
The Verge
https://news.ycombinator.com
Task Manager - Chromium
Stats for nerds
End Process
Are you interacting with a tab? If so, Chrome won't discard it.
About discards
Avicii - Waiting For Love -
The Verge
chrome://discards

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42 points by koverstreet 53 minutes ago | 3 comments
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10 points by bookerio 42 minutes ago | discuss
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Discarded Tabs

Tabs sorted from most interesting to least interesting. The least interesting ta

- About discards Discard
- Hacker News Discard
- The Verge Discard

2 discards this session. Discard tab now

System memory information in MB

Total	16384
Free	16

Task	Memory	CPU	Network	Process ID
Browser	144 MB	0.4	0	69040
GPU Process	31.6 MB	0.0	N/A	69044
Tab: About discards	46.2 MB	0.0	0	74895
Tab: Hacker News	54.9 MB	0.0	0	74833

10. ▲ A visual proof that neural nets can compute any func
63 points by p1esk 10 hours ago | 36 comments

Discarded Tabs

Tabs sorted from most interesting to least interesting. The least interesting tab may l

- chrome://discards Discard
- Avicii - Waiting For Love - YouTube Discard
- Twitter Discard
- The Verge Discard

0 discards this session. Discard tab now

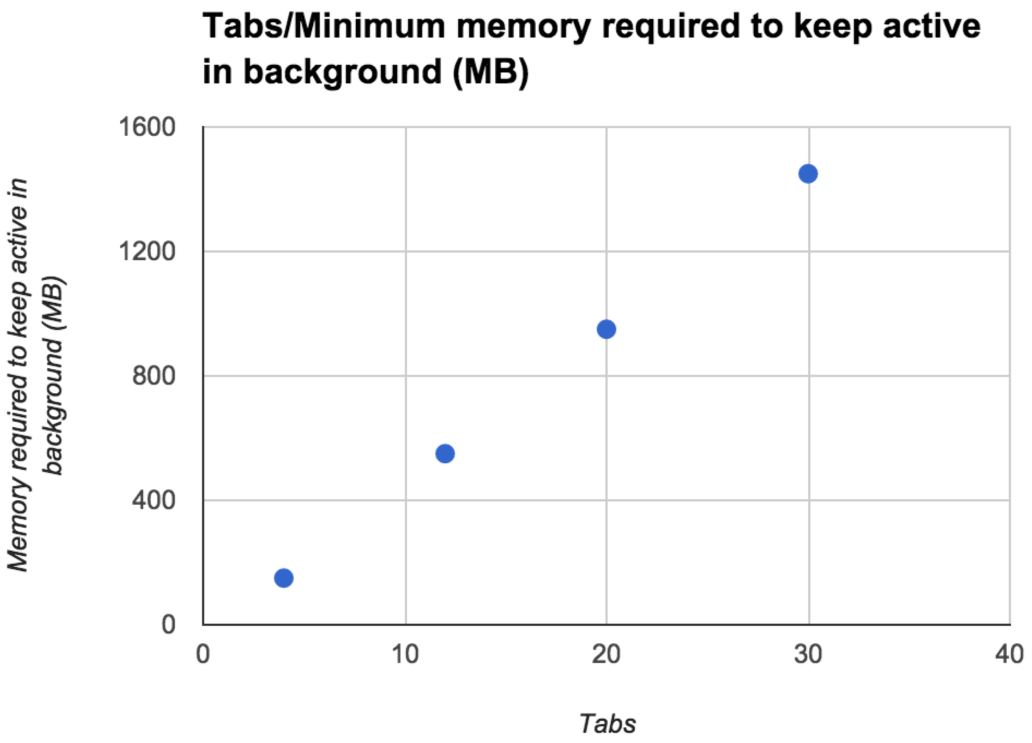
System memory information in MB

Total	16384
Free	426

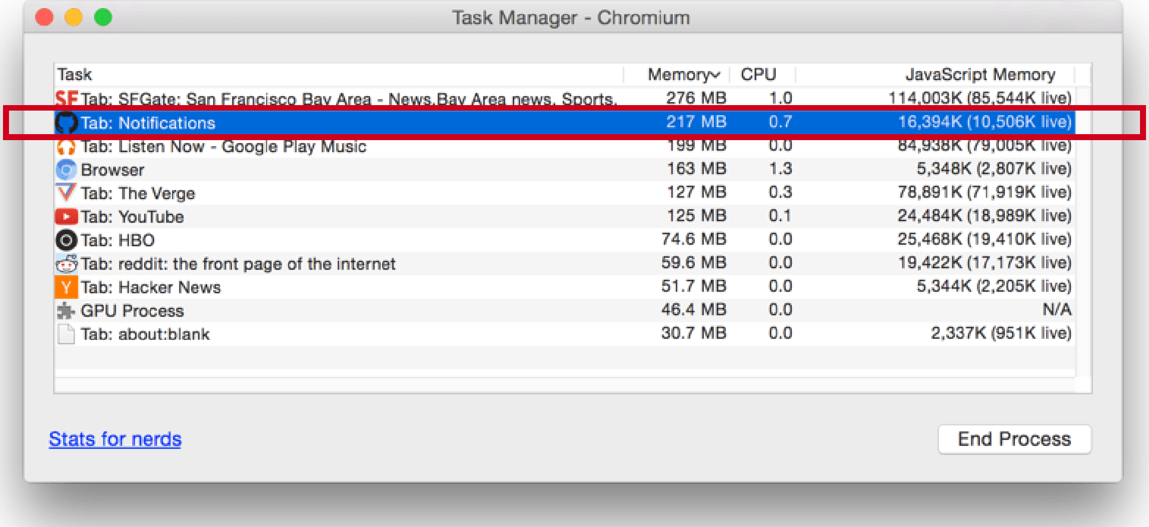
Tab discarding is available as an experiment in Chrome 46 and above.

Background

For every tab you have open our renderer process usually takes around 50MB per tab, even though most people use just a single tab at a time. If you've got 10 tabs open there's at least 450MB of memory being spent just to keep your background tab state. This can get a little unwieldy over time.



One of our goals is to reduce the memory used on tabs you're **not** actually using. If I look at what tabs are consuming my system memory in the Chrome Task Manager, I'm really just 'using' one or two of the sites below whilst the other tabs in the background are unused.



Task	Memory	CPU	JavaScript Memory
Tab: SFGate: San Francisco Bay Area - News,Bay Area news, Sports,	276 MB	1.0	114,003K (85,544K live)
Tab: Notifications	217 MB	0.7	16,394K (10,506K live)
Tab: Listen Now - Google Play Music	199 MB	0.0	84,938K (79,005K live)
Browser	163 MB	1.3	5,348K (2,807K live)
Tab: The Verge	127 MB	0.3	78,891K (71,919K live)
Tab: YouTube	125 MB	0.1	24,484K (18,989K live)
Tab: HBO	74.6 MB	0.0	25,468K (19,410K live)
Tab: reddit: the front page of the internet	59.6 MB	0.0	19,422K (17,173K live)
Tab: Hacker News	51.7 MB	0.0	5,344K (2,205K live)
GPU Process	46.4 MB	0.0	N/A
Tab: about:blank	30.7 MB	0.0	2,337K (951K live)

That's where tab discarding can help reduce our memory usage.

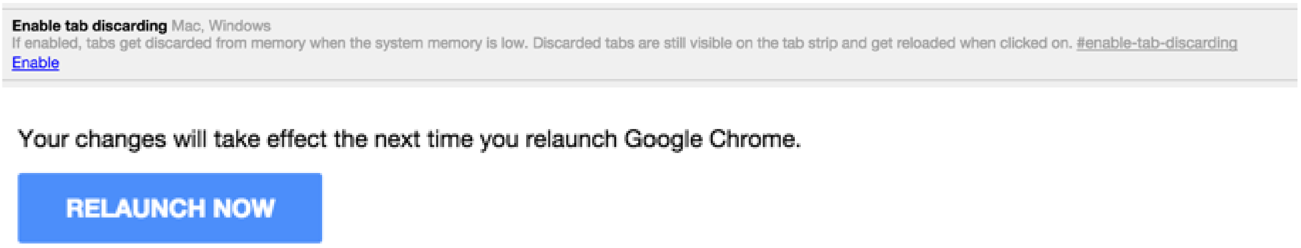
Discarding unused tabs

Tab discarding allows Chrome to automatically discard tabs that aren't of great interest to you when it's detected that system memory is running pretty low. What do we mean by discarding? Well, a discarded tab doesn't go anywhere. We kill it but it's still visible on the Chrome tab strip. If you navigate back to a tab that's been discarded, it'll reload when clicked. Form content, scroll position and so on are saved and restored the same way they would be during forward/backward tab navigation.

Note: The current mechanism is similar to how we tackle tab discarding on ChromeOS. The renderer process is shut down. When the tab gets reactivated we go back to the network and load it like normal.

We also have another new feature that allows caching all tab resources locally which works nicely with tab discarding when you're offline. When the tab is reactivated we offer you the choice to reload the cached version that was previously loaded over the network. To enable page reloading from cache, you can try out another experiment under `chrome://flags/#show-saved-copy`.

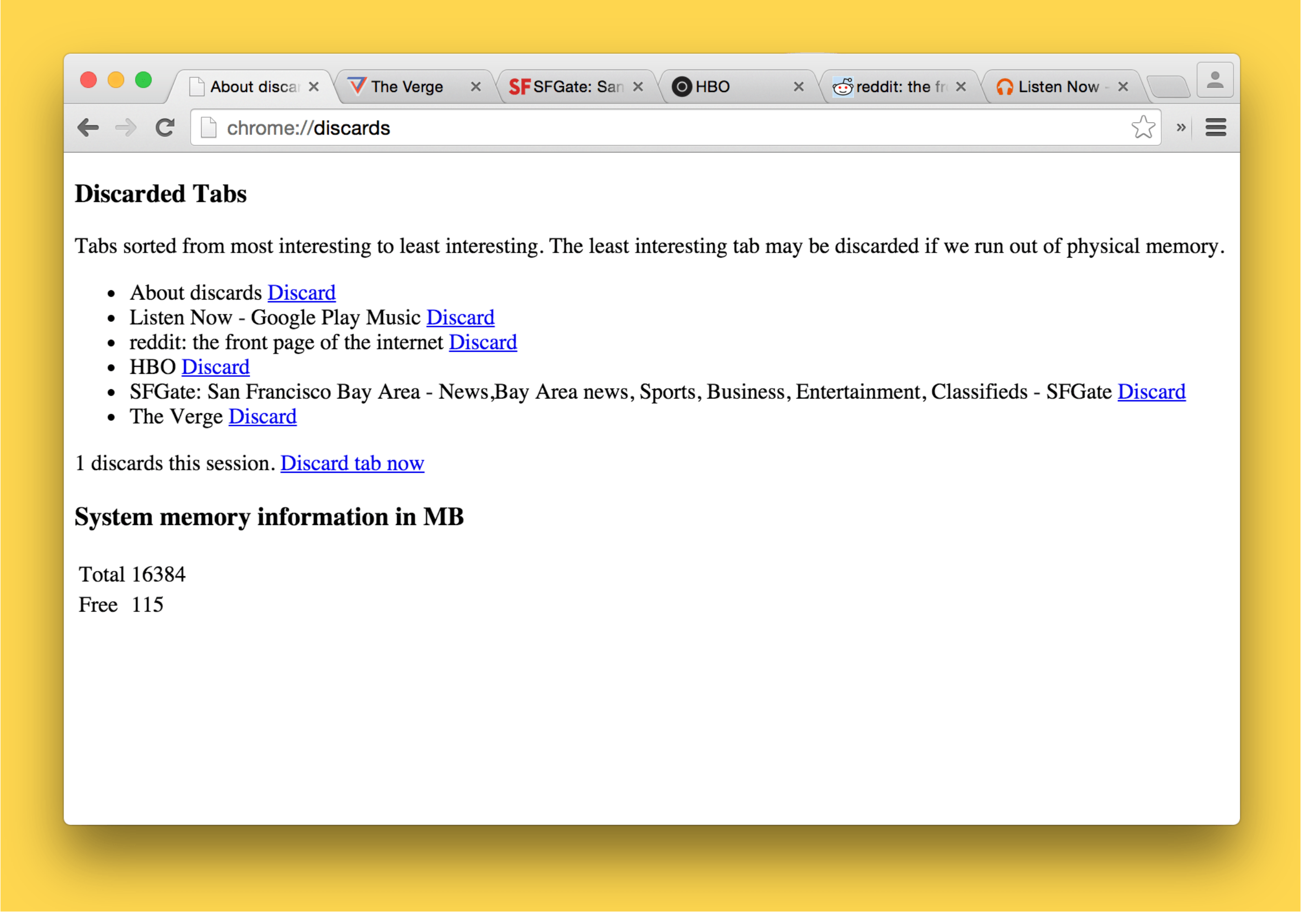
You can try out tab discarding today by enabling it via `chrome://flags/#enable-tab-discarding` and relaunching Chrome. You can control whether it's enabled or disabled via the same Chrome `chrome://flags` page.



Enable tab discarding Mac, Windows
If enabled, tabs get discarded from memory when the system memory is low. Discarded tabs are still visible on the tab strip and get reloaded when clicked on. #enable-tab-discarding
Enable

Your changes will take effect the next time you relaunch Google Chrome.

A new page called `chrome://discards` lets you list what tabs are currently open and we try to share some insight into how interesting (we think) they are to you, from most to least.



Discarded Tabs

Tabs sorted from most interesting to least interesting. The least interesting tab may be discarded if we run out of physical memory.

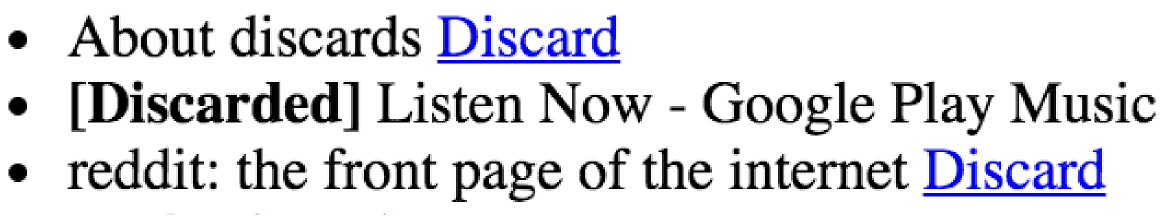
- About discards Discard
- Listen Now - Google Play Music Discard
- reddit: the front page of the internet Discard
- HBO Discard
- SFGate: San Francisco Bay Area - News,Bay Area news, Sports, Business, Entertainment, Classifieds - SFGate Discard
- The Verge Discard

1 discards this session. Discard tab now

System memory information in MB

```
Total 16384
Free  115
```

To test out the feature, you can either carry out your normal browsing behaviour until your system is in a low-memory mode, or alternatively trigger a tab discard from about:discards by clicking 'Discard tab now'. This will discard the last tab in the list. You can also discard a particular tab from the list by clicking its corresponding 'Discard' button. A discarded tab will display with a [Discarded] prefix.



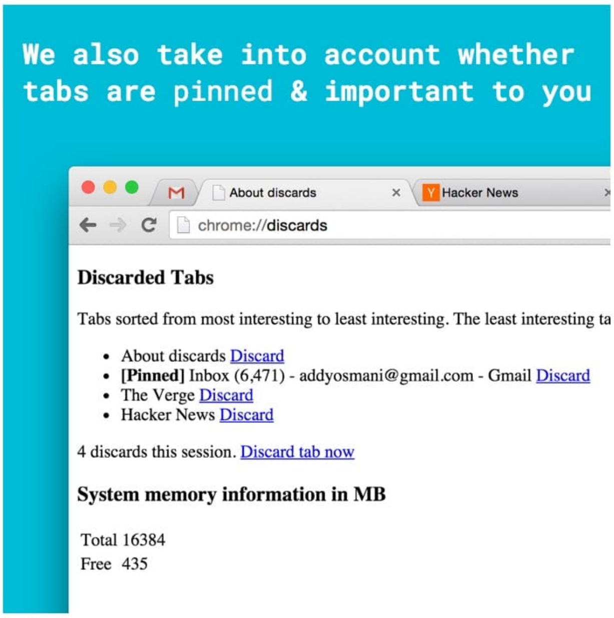
- About discards Discard
- **[Discarded]** Listen Now - Google Play Music
- reddit: the front page of the internet Discard

Tab discarding discards tabs in this order:

- Internal pages like new tab page, bookmarks, etc.
- Tabs selected a long time ago
- Tabs selected recently
- Apps running in a window
- Pinned tabs

- The selected tab

We've enabled the tab discarding experiment in Chrome Canary for Windows and Mac OS, with a Linux implementation coming soon.



We also take into account whether tabs are pinned & important to you

chrome://discards

Discarded Tabs

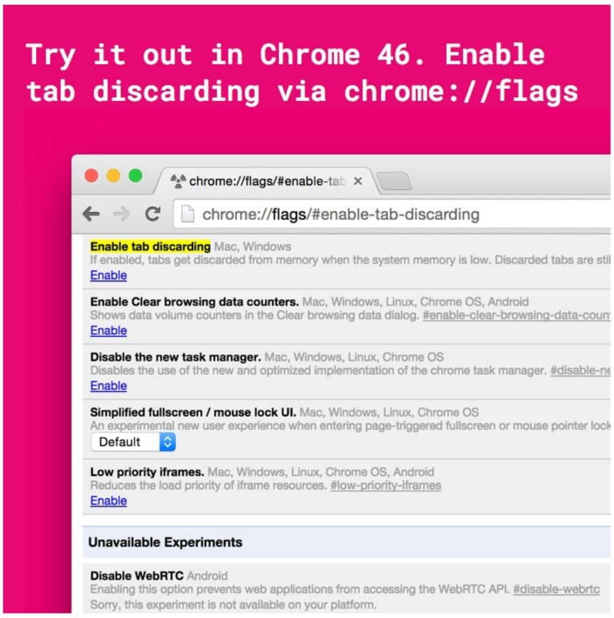
Tabs sorted from most interesting to least interesting. The least interesting ta

- About discards Discard
- **[Pinned]** Inbox (6,471) - addyosmani@gmail.com - Gmail Discard
- The Verge Discard
- Hacker News Discard

4 discards this session. Discard tab now

System memory information in MB

Total 16384
Free 435



Try it out in Chrome 46. Enable tab discarding via chrome://flags

chrome://flags/#enable-tab-discarding

Enable tab discarding Mac, Windows
If enabled, tabs get discarded from memory when the system memory is low. Discarded tabs are stil
Enable

Enable Clear browsing data counters. Mac, Windows, Linux, Chrome OS, Android
Shows data volume counters in the Clear browsing data dialog. #enable-clear-browsing-data-coun
Enable

Disable the new task manager. Mac, Windows, Linux, Chrome OS
Disables the use of the new and optimized implementation of the chrome task manager. #disable-ne
Enable

Simplified fullscreen / mouse lock UI. Mac, Windows, Linux, Chrome OS
An experimental new user experience when entering page-triggered fullscreen or mouse pointer lock
Default

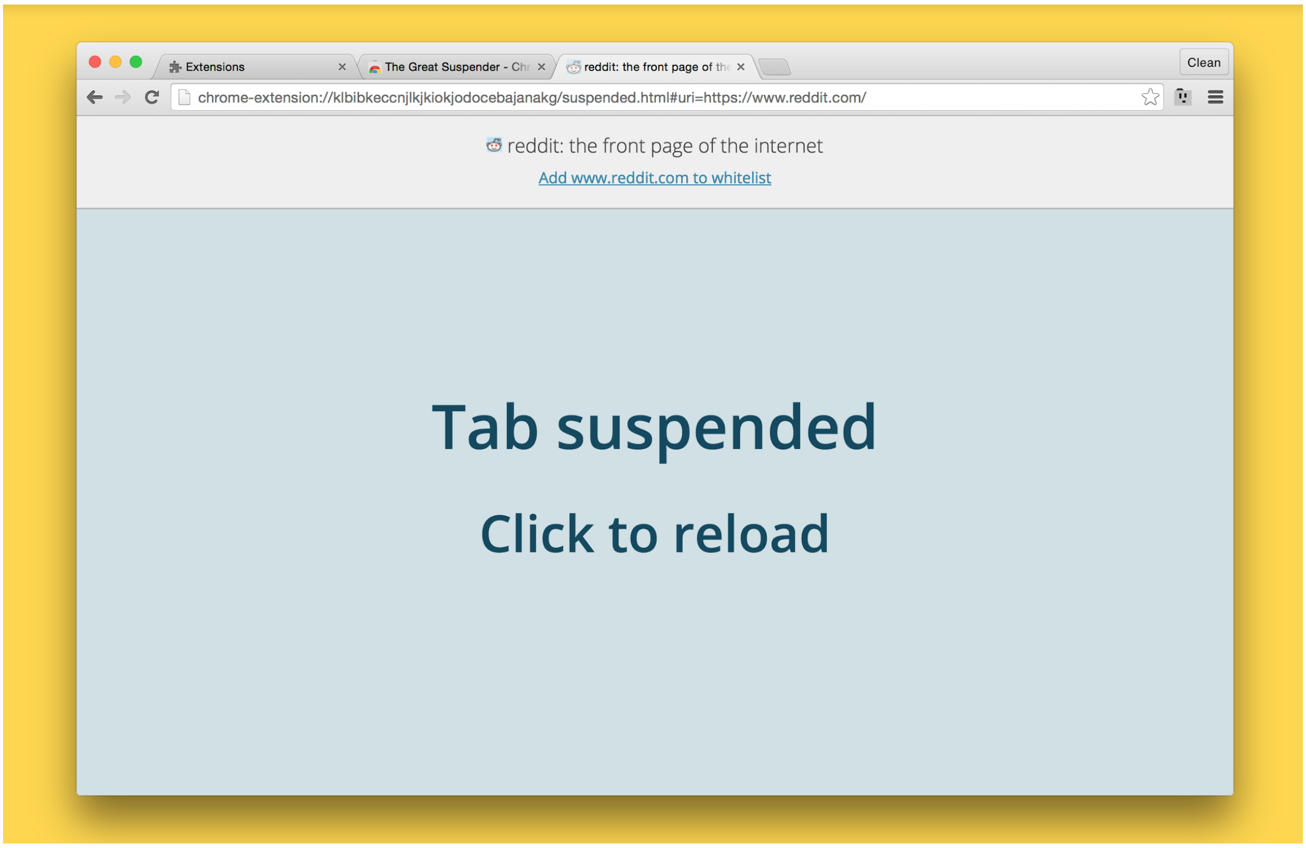
Low priority iframes. Mac, Windows, Linux, Chrome OS, Android
Reduces the load priority of iframe resources. #low-priority-iframes
Enable

Unavailable Experiments

Disable WebRTC Android
Enabling this option prevents web applications from accessing the WebRTC API. #disable-webrtc
Sorry, this experiment is not available on your platform.

Inspiration: hey there, great suspender

If tab discarding sounds familiar, it's because you've probably come across useful Chrome extensions that give you a slightly simpler version of this idea, such as the The Great Suspender. The Great Suspender aims to reduce Chrome's memory and GPU footprint by suspending tabs after a custom period of inactivity.


Extensions
The Great Suspender - Chr
reddit: the front page of the
Clean
chrome-extension://klbibkeccnjlkjkiokjodocebajanakg/suspended.html#uri=https://www.reddit.com/

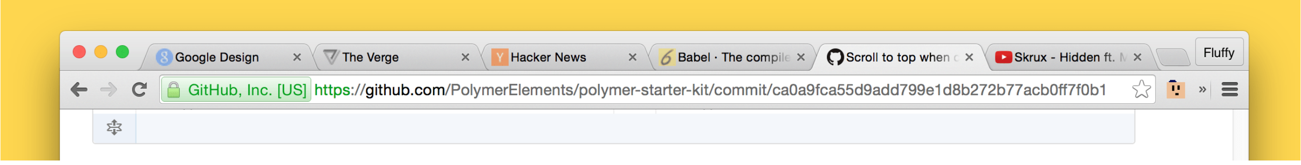
reddit: the front page of the internet

Add www.reddit.com to whitelist

Tab suspended

Click to reload

Similar to tab discarding, tabs can be un-suspended when you need to interact with them again. Great Suspender maintains each tab's title and favicon, showing suspended tabs in a dimmed state, making it straight-forward to navigate back to them any time.



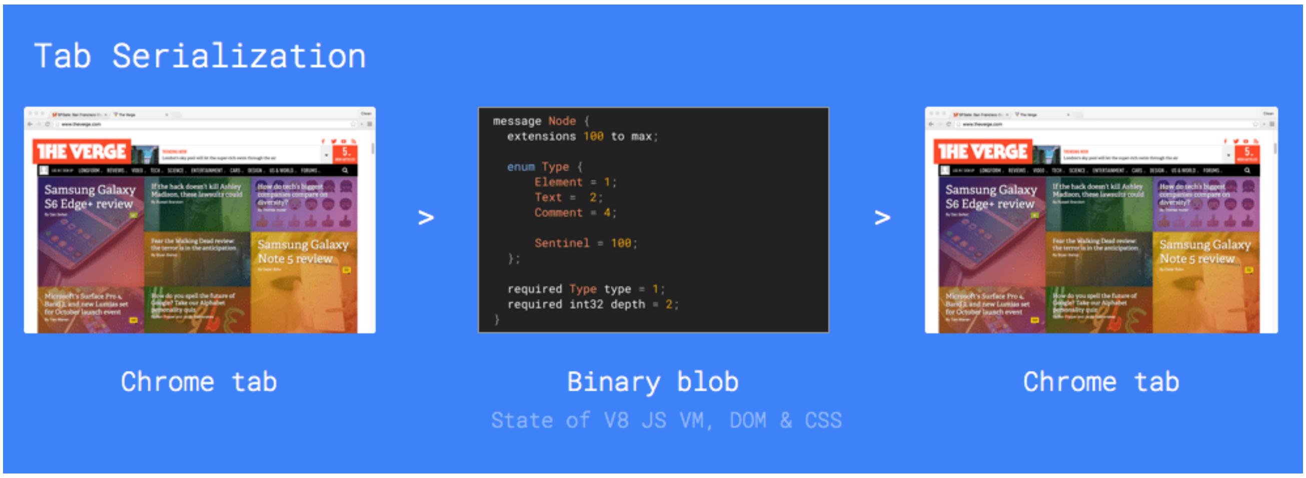
Tabs in the background that I'm not actively using have been suspended, saving on memory. Tabs I am still actively using (GitHub and YouTube) are however still running as normal.

We actually had a great chat with the author of the Great Suspender extension while developing tab discarding and they're glad to see us natively tackling this problem in ways that are more efficient than an extension might be able to, such as losing the state of your user inactions.

Future improvements: the tab serializer

The tab serializer is a future piece of work we think may lead to significant improvements on our current approach to tab discarding. It takes the contents of a Chrome tab and serializes its *current* state into a binary blob. This binary blob can later be deserialized into a tab.

The serializer would serialize almost everything Chrome, Blink and V8 need to properly preserve a tab (something Chrome extensions tackling this problem historically haven't been able to easily achieve). Serialization would include the usual suspects: the DOM (with a lot of WebGL and Canvas included), CSS and the state of the V8 JavaScript VM.



Tab Serialization

```
message Node {
  extensions 100 to max;

  enum Type {
      Element = 1;
      Text =  2;
      Comment = 4;

      Sentinel = 100;
  };

  required Type type = 1;
  required int32 depth = 2;
}
```

If you use Android or ChromeOS, you may know that (similar to the tab discarding experiment covered in this post) we kill background tabs aggressively in order to ensure memory usage is low. The issue with the way we tackle this was that your tab would lose *all* of its state.

When you showed interest in the tab again, we would have to reload it and all your interaction with it would be lost. The tab serializer just approaches this problem in a way that gets you back to almost exactly what you were without requiring going back to the network. We look forward to sharing more information about this work at a later date.

Try out tab discarding and let us know what you think

We'd love to know whether this feature is useful to you and how it could be improved. Try it out, play around with it (especially if you're a tab hoarder!) and let us know what you think in the comments. :) We'd also appreciate it if you file tickets for any bugs you encounter on crbug.com.

Last updated July 2, 2018.