

# Chromium Overview

Kosscon 2017

Deejay Kim (ddonggomung@gmail.com)

# About the instructor

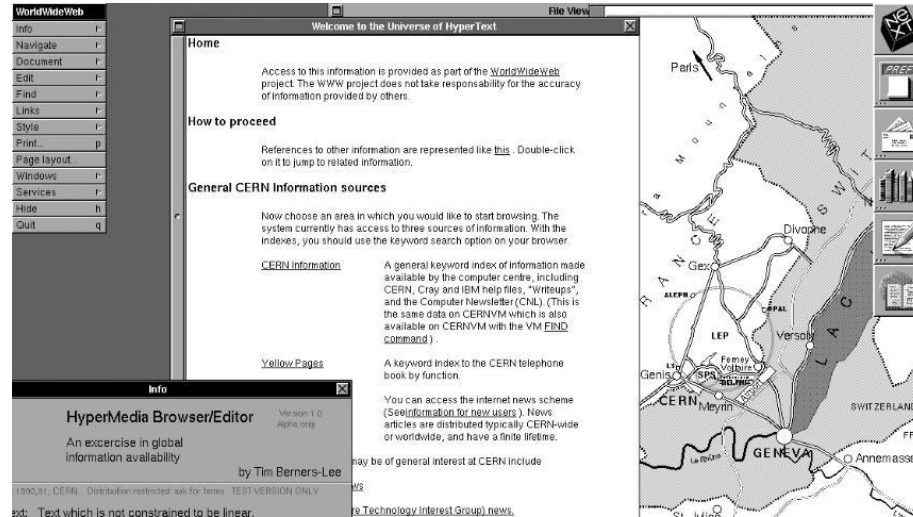
- DongJun Kim (a.k.a DeeJay)
- 10년차 개발자
- Web engine developer (2014 ~)
- Chromium / Blink contributing (2015~) // 16-17 시즌 아웃 :-p
- Kosslab 오픈소스 프론티어 4기 (2017~)

# | Contents

- Introduce chromium / blink
- How browser work
- Contribution process in chromium
- Appendix

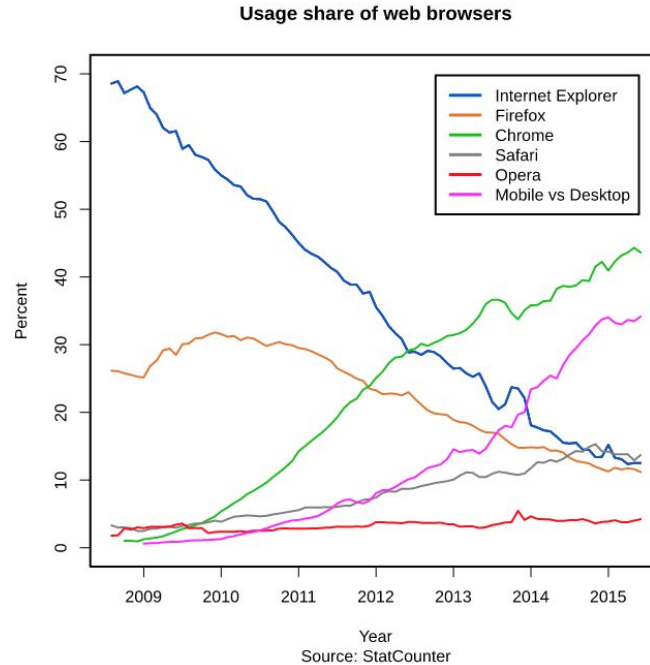
| Introduce chromium

# Timeline of web browsers

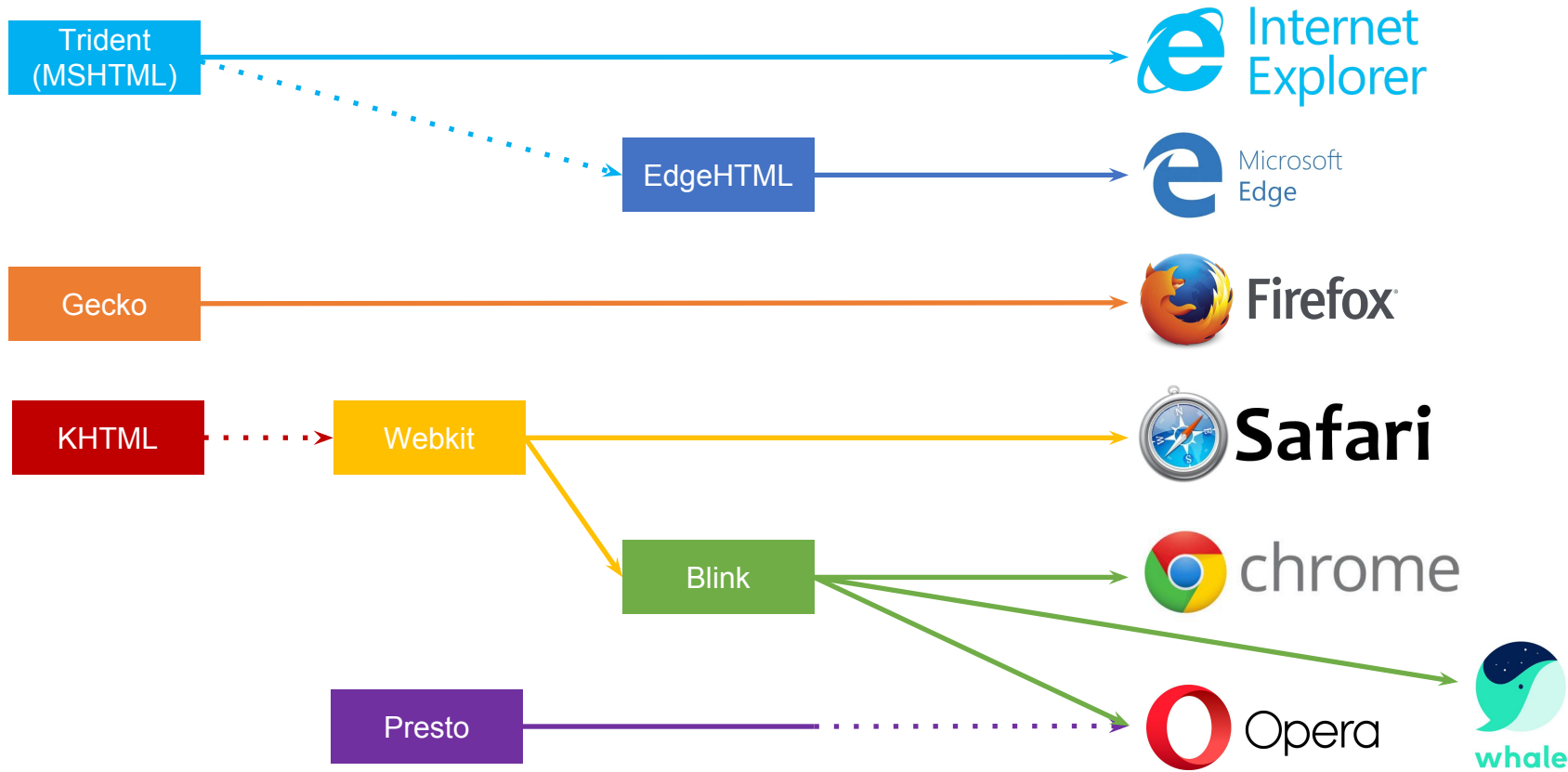


Source : A screen shot of the NeXT computer used by Tim Berners-Lee to browse the World Wide Web at the time became publicly accessible on Aug. 6, 1991.

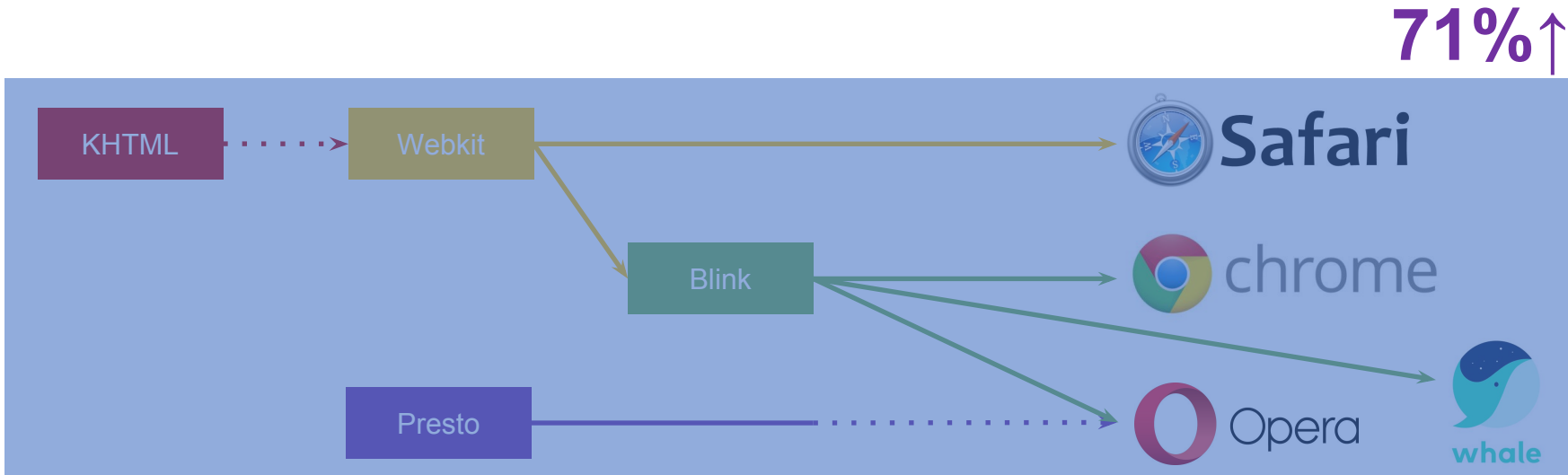
# Timeline of web browsers



# Timeline of web browsers



# Timeline of web browsers





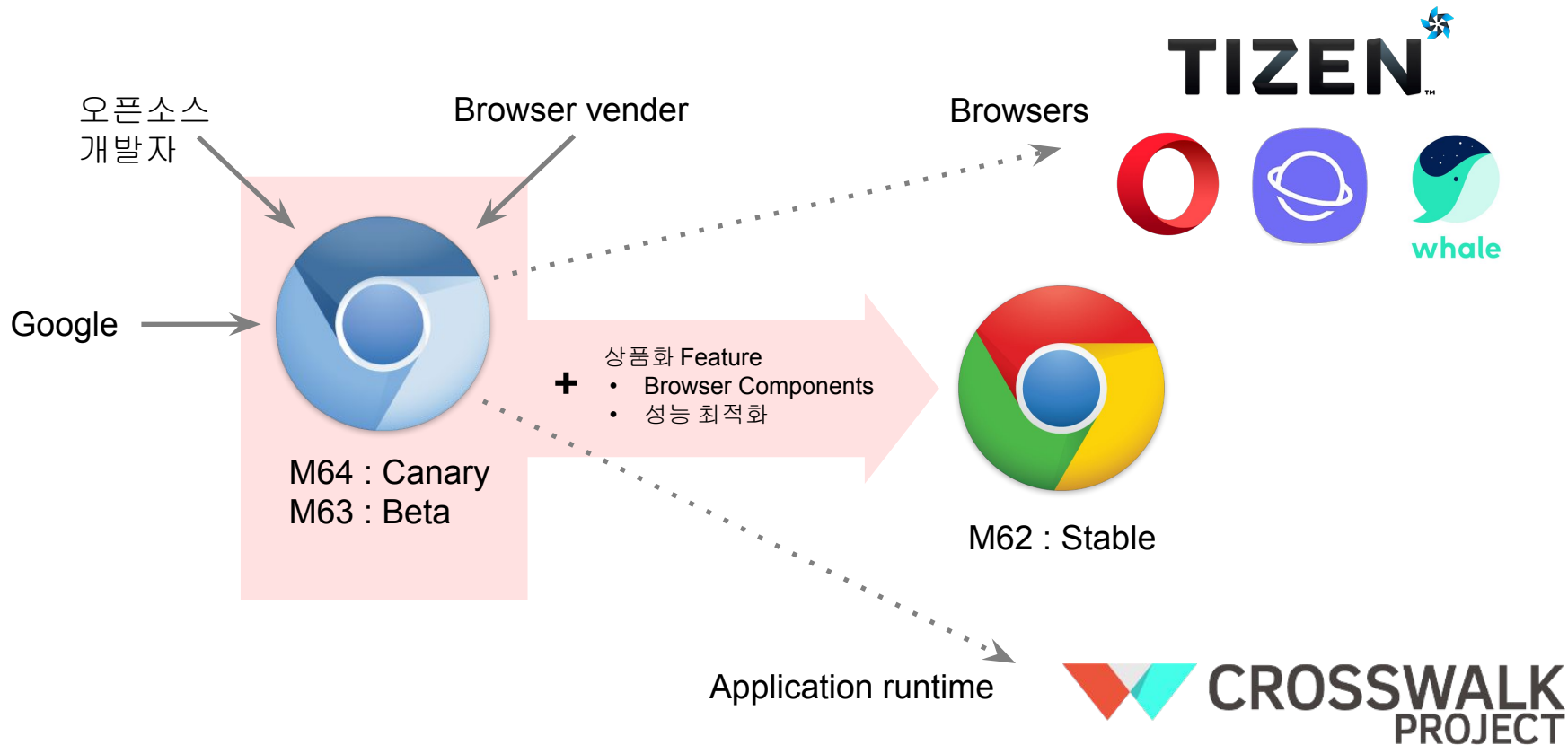
# | Introduce chromium



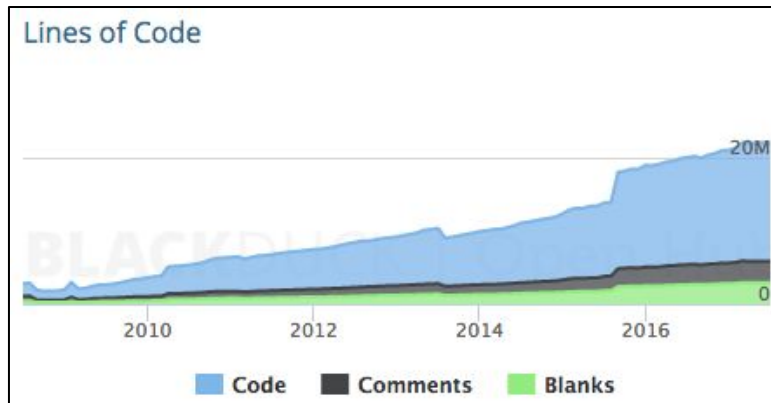
*“Chromium is an open-source browser project  
that aims to build a safer, faster, and more stable way for all Internet users to experience the web.” [1]*

- 웹 브라우저를 만들수 있는 오픈소스 프로젝트
- 더 안전하고, 더 빠르고, 더 안정적으로 웹을 사용하도록 하는데 그 목적이 있음
- Rendering engine : Blink
- Javascript engine : V8

# Chromium VS Chrome



# Project status of chromium



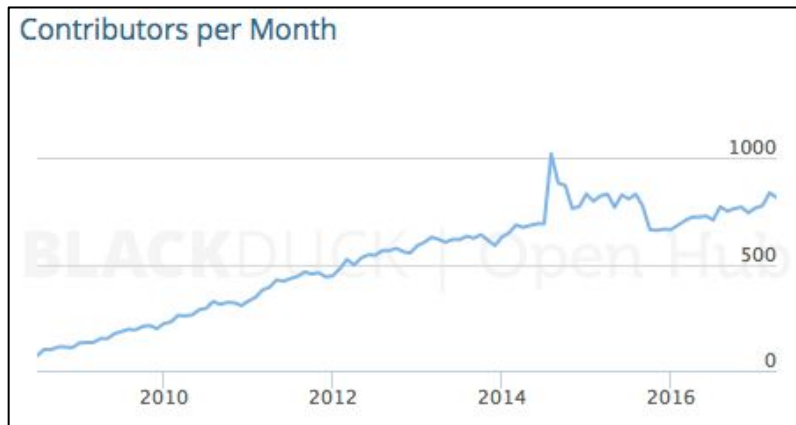
- 총 Code Line : 21,985,453 (2017년 7월 기준)
  - Code : 16,155,697
  - Comments : 2,918,799
  - Blanks : 2,910,957

# Project status of chromium



- 월간 Commit 량 (2017년 5월 기준)
  - 최근 한달 기준 : 7533 Commits / 935 Contributors
  - 12개월 합계
    - 78328 Commits (전년 대비 10% 증가)
    - 1790 Contributors (전년 대비 10% 감소)

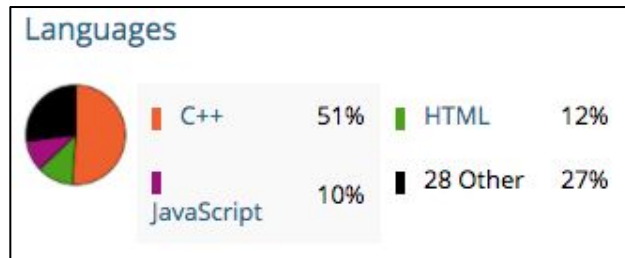
# Project status of chromium



- Webkit에서 Forking 이후에 급격히 증가, 꾸준한 상승세를 유지

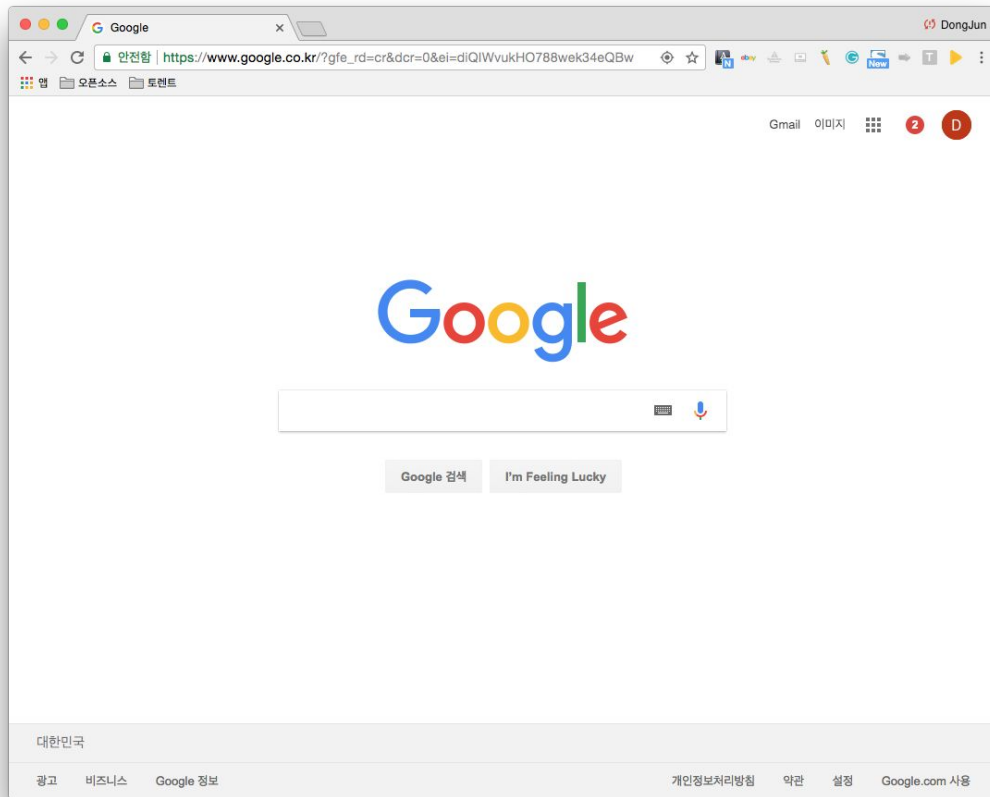
# Project status of chromium

Language	Code Lines	Comment Lines	Comment Ratio	Blank Lines	Total Lines	Total Percentage
HTML	1,331,665	26,631	2.0%	167,854	1,526,150	38.6%
C++	812,321	206,973	20.3%	188,779	1,208,073	30.5%
JavaScript	575,986	184,039	24.2%	114,304	874,329	22.1%
XML	104,522	7,220	6.5%	10,065	121,807	3.1%
CSS	71,607	5,017	6.5%	8,603	85,227	2.2%
Python	66,311	27,335	29.2%	19,252	112,898	2.9%
Objective-C	4,667	990	17.5%	1,017	6,674	0.2%
PHP	3,912	128	3.2%	510	4,550	0.1%
Perl	3,062	433	12.4%	719	4,214	0.1%
Ruby	1,899	89	4.5%	329	2,317	0.1%
Java	1,853	71	3.7%	304	2,228	0.1%
XSL Transformation	1,613	78	4.6%	119	1,810	0.0%
C	1,575	1,022	39.4%	384	2,981	0.1%
XML Schema	621	122	16.4%	165	908	0.0%
OpenGL Shading	434	83	16.1%	27	544	0.0%
Assembly	159	213	57.3%	31	403	0.0%
shell script	140	118	45.7%	40	298	0.0%

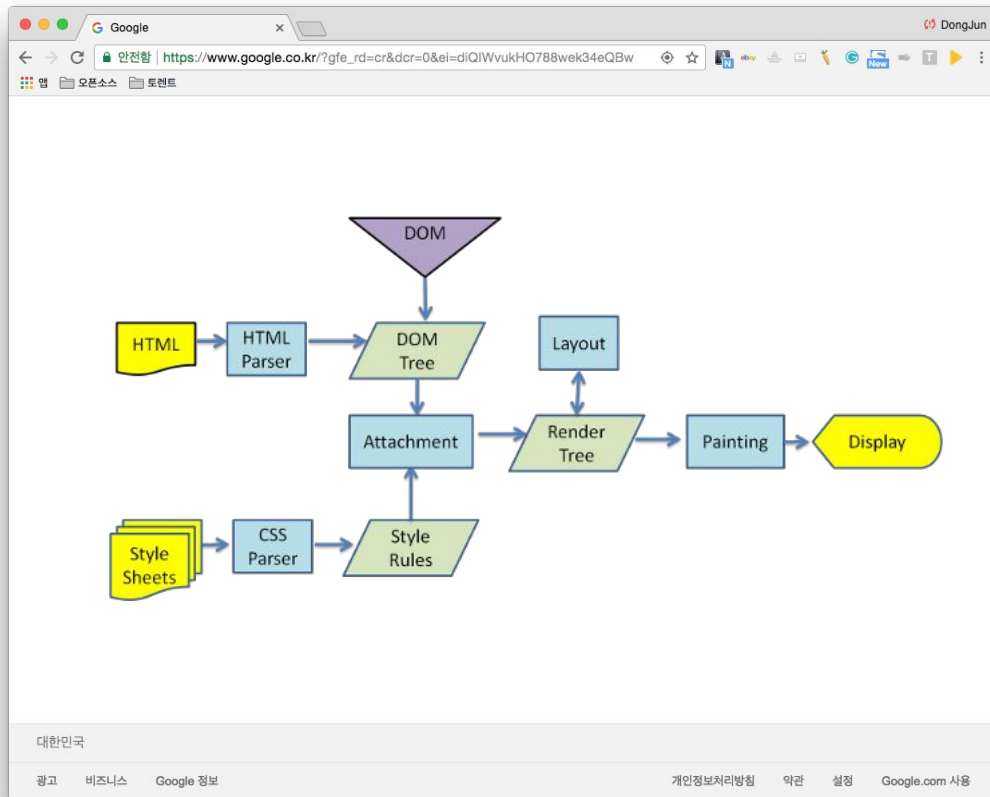


- 대부분 C/C++로 작성,  
그 외 Test를 위한 HTML, JS 등  
으로 구성

# Rendering engine



# Rendering engine



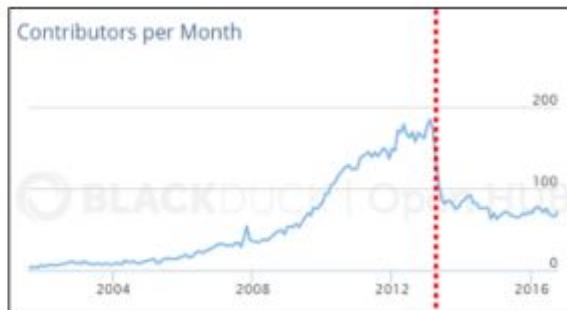


# Blink

- Chromium 이 사용하는 browser rendering engine
- 최초 Chrome 에는 Multi-process Architecture 를 지원 하는 Wekit 을 사용 (2008 년 9 월~)
- Webkit 으로부터 새로운 렌더링 엔진인 Blink 를 forking (2013년 4월~)
- 향후 Webkit 과는 독자적인 노선을 선택 : Web engine VS Web platform



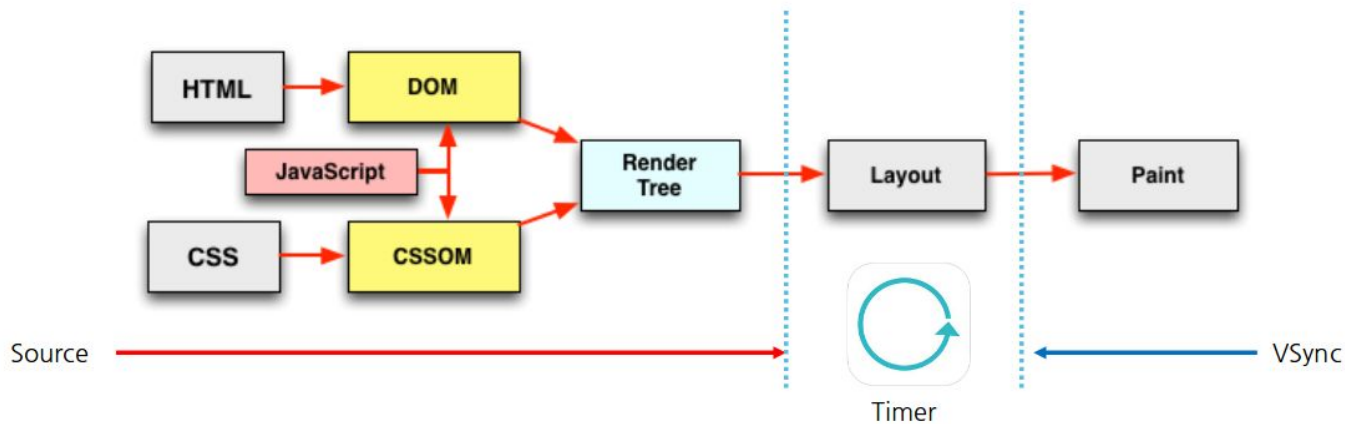
Blink



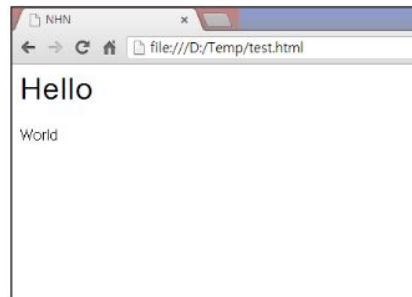
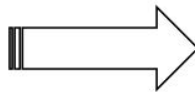
Webkit

# | How browser work

# | How browser work

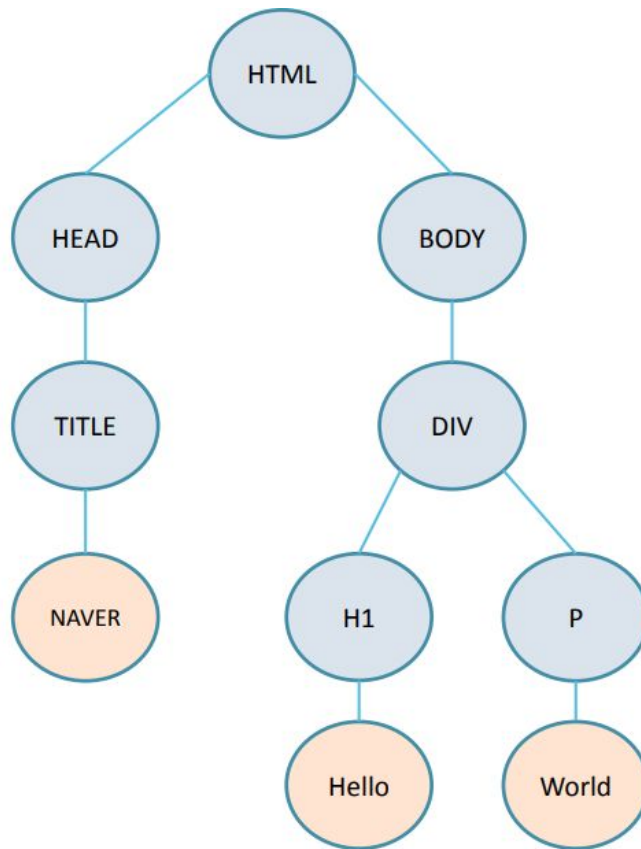


```
<html>
  <head>
    <title> NAVER </title>
  </head>
  <body>
    <div>
      <h1> Hello </h1>
      <p> World </p>
    </div>
  </body>
</html>
```

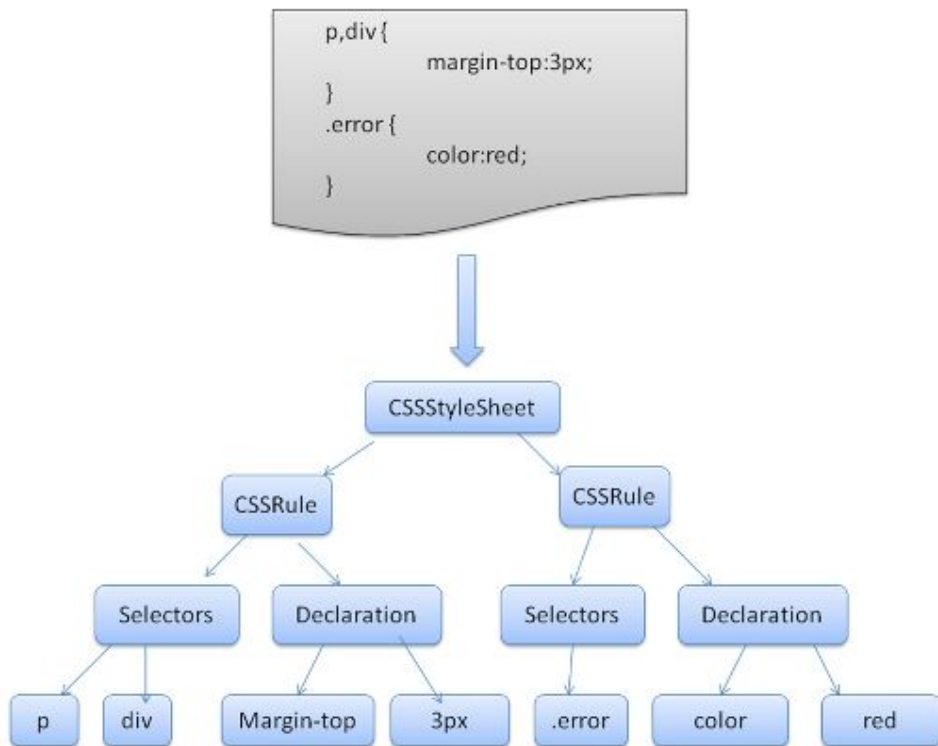


# HTML parsing

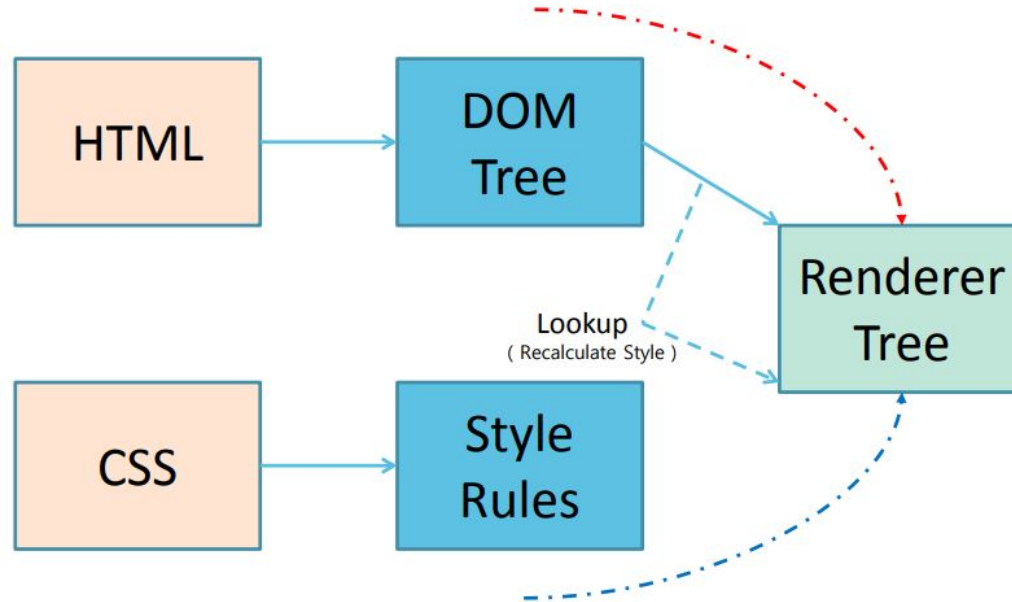
```
<html>  
  <head>  
    <title> NAVER </title>  
  </head>  
  <body>  
    <div>  
      <h1> Hello </h1>  
      <p> World </p>  
    </div>  
  </body>  
</html>
```



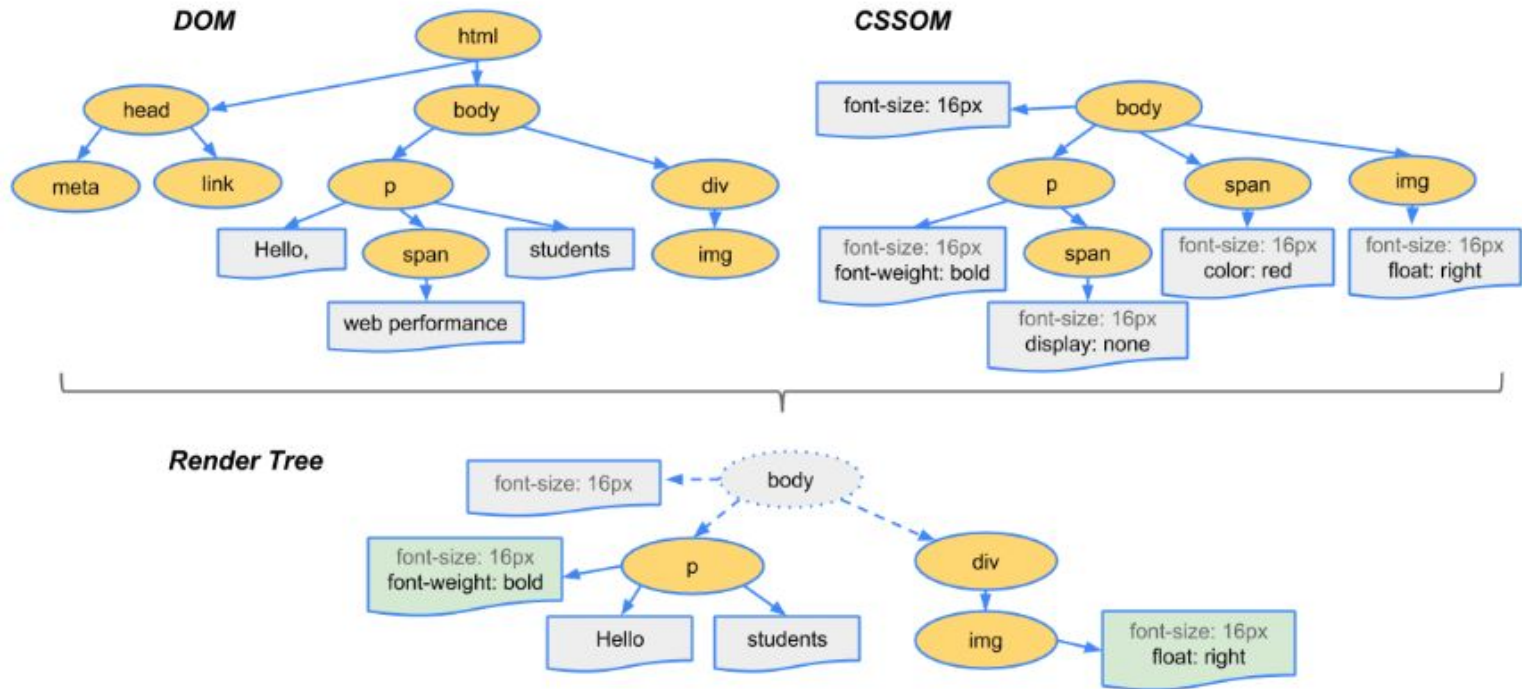
# CSS parsing



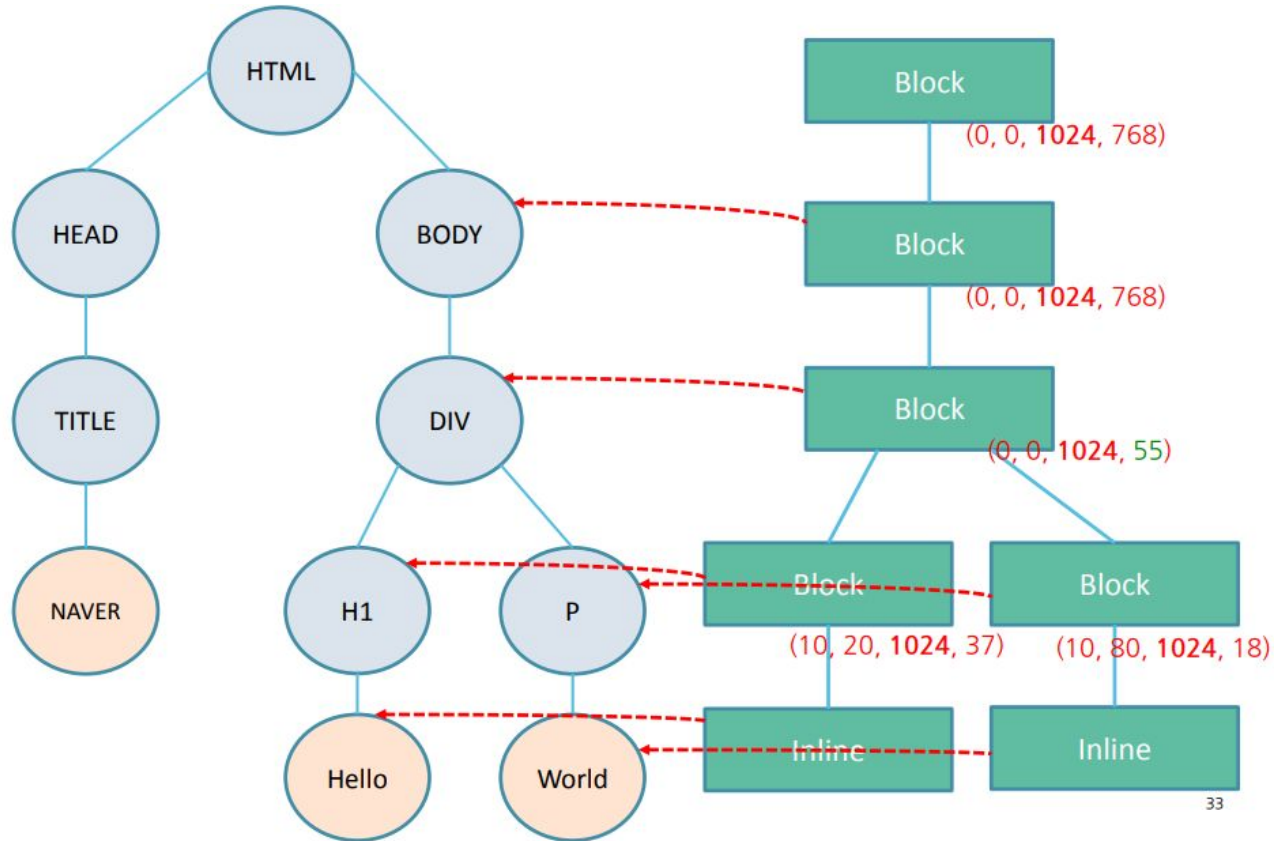
# Render tree



# Render tree

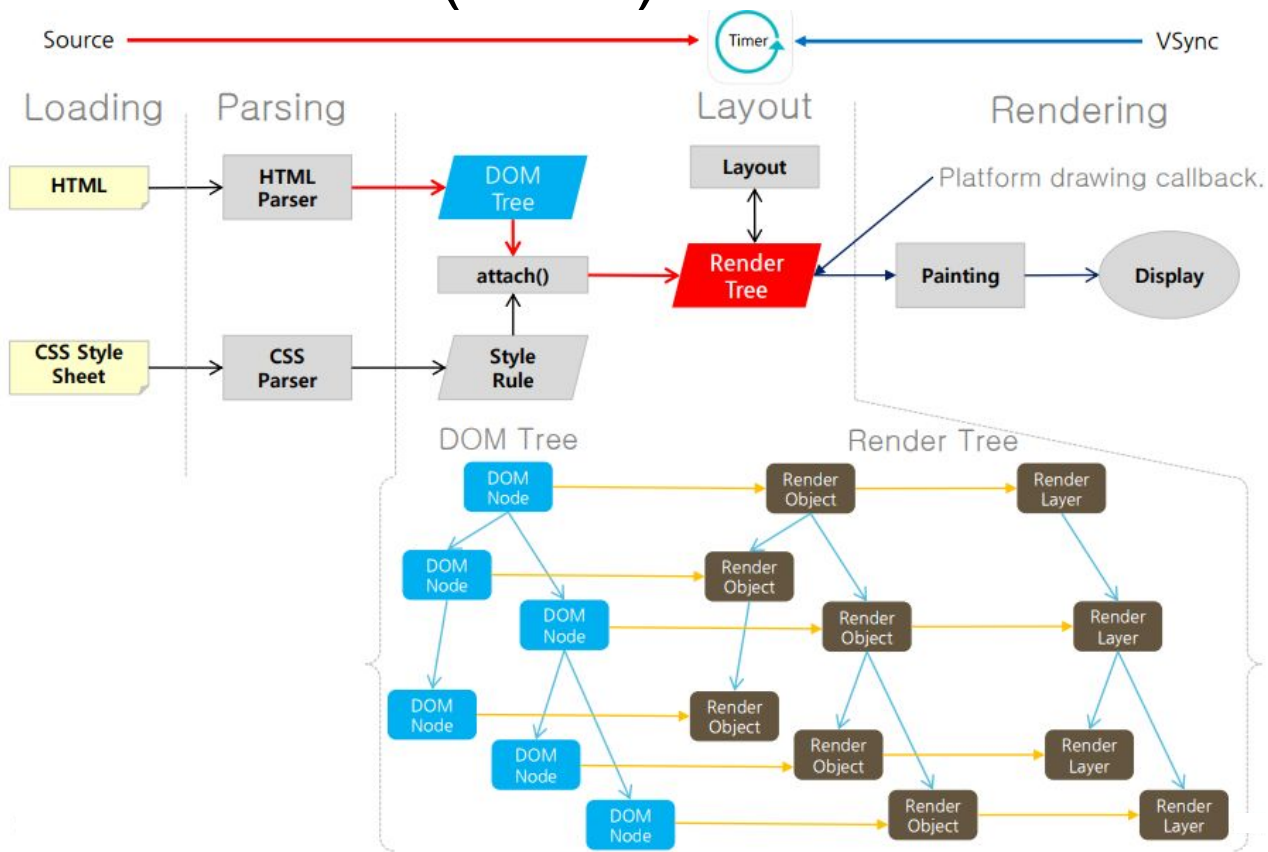


# Layout

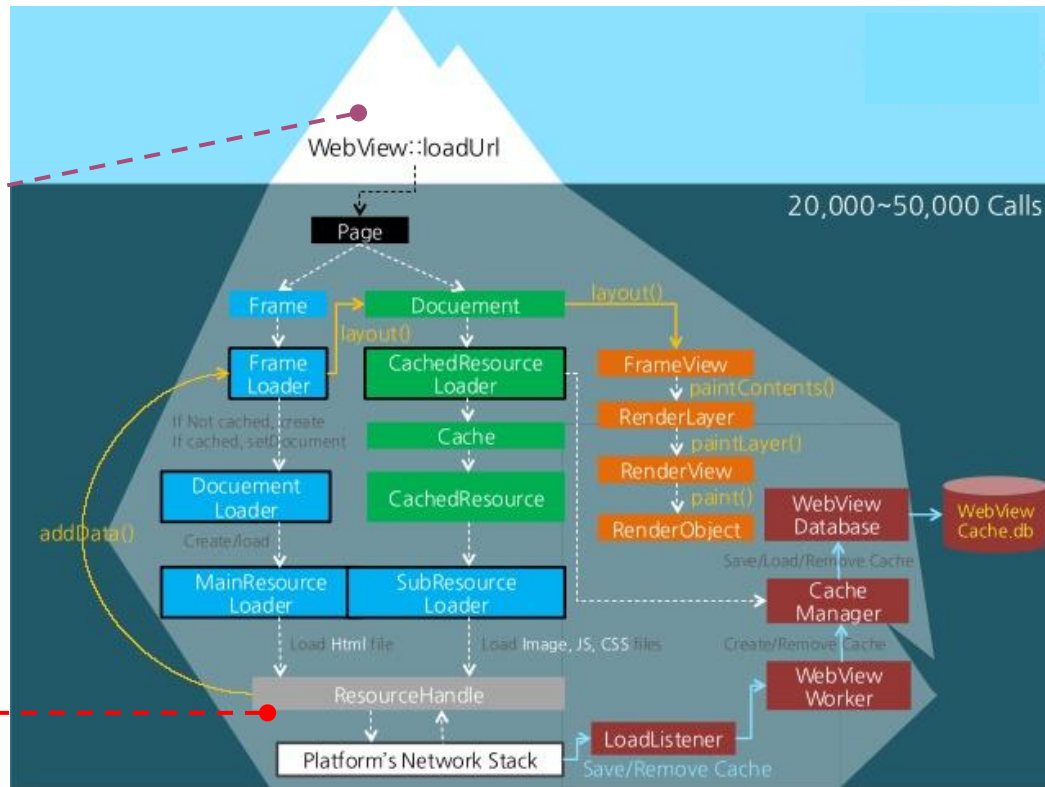
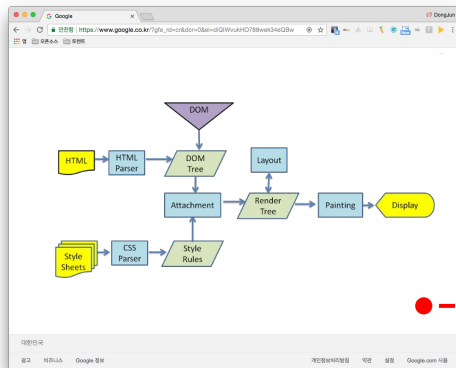
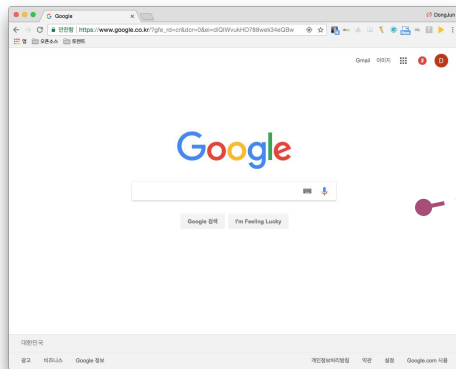




# How browser work (detail)

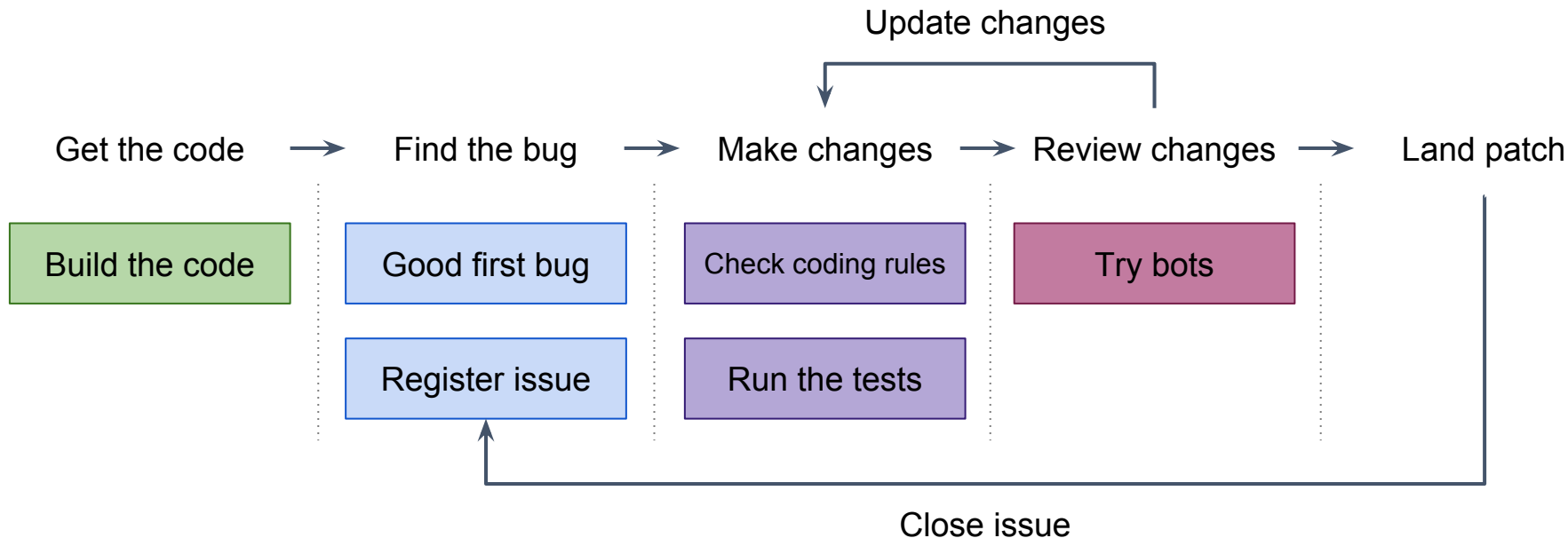


# How browser work






# | Contribution process

# Contribution process

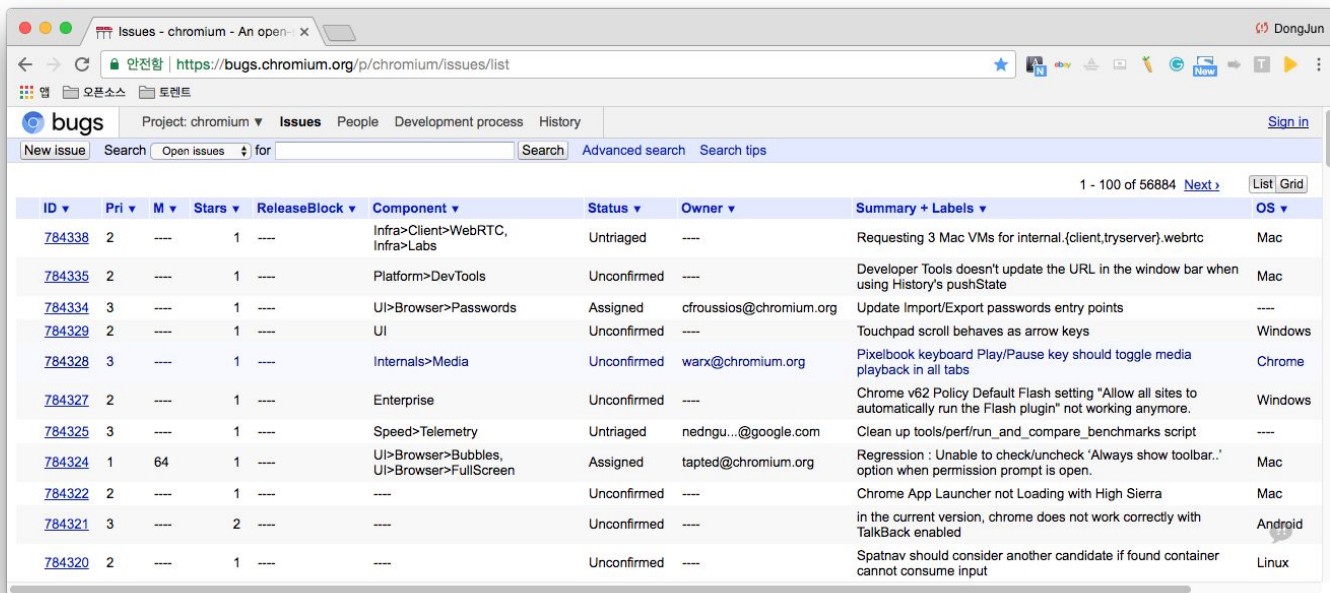


# | Get the code

- 개발 환경 : Linux, Mac, Windows, Android...
  - Linux 나 Mac을 추천하지만, 결국 모든 환경을 셋팅하게 됨
- Install depot tools : `$ git clone https://chromium.googlesource.com/chromium/tools/depot tools.git`
- Get the code
  - `$ mkdir ~/chromium && cd ~/chromium && cd src/`
  - `$ fetch --nohooks chromium`
  - `$ install-build-deps` (최초 1회)
  - `$ gclient runhooks` 
- GN generation : `$ gn gen out/Default`
- Build chromium : `$ ninja -C out/Default chrome`  

# Find the bug

- Issue tracking 시스템을 통해서 이슈 검색
- 직접 발견한 이슈일 경우, Issue 등록 후 진행 [1]



The screenshot shows the Chromium bug tracking system interface. The browser address bar displays the URL <https://bugs.chromium.org/p/chromium/issues/list>. The page header includes navigation links for 'Project: chromium', 'Issues', 'People', 'Development process', and 'History'. Below the header is a search bar with options for 'New issue', 'Search', 'Open issues', and 'Advanced search'. The main content area displays a table of issues with columns for ID, Priority, Milestone, Stars, ReleaseBlock, Component, Status, Owner, Summary + Labels, and OS. The table lists 10 issues, with details such as component names (e.g., 'Infra>Client>WebRTC', 'Platform>DevTools') and summaries (e.g., 'Requesting 3 Mac VMs for internal.{client,tryserver}.webrtc', 'Developer Tools doesn't update the URL in the window bar when using History's pushState').

ID	Pri	M	Stars	ReleaseBlock	Component	Status	Owner	Summary + Labels	OS
<a href="#">784338</a>	2	---	1	---	Infra>Client>WebRTC, Infra>Labs	Untriaged	---	Requesting 3 Mac VMs for internal.{client,tryserver}.webrtc	Mac
<a href="#">784335</a>	2	---	1	---	Platform>DevTools	Unconfirmed	---	Developer Tools doesn't update the URL in the window bar when using History's pushState	Mac
<a href="#">784334</a>	3	---	1	---	UI>Browser>Passwords	Assigned	croussios@chromium.org	Update Import/Export passwords entry points	---
<a href="#">784329</a>	2	---	1	---	UI	Unconfirmed	---	Touchpad scroll behaves as arrow keys	Windows
<a href="#">784328</a>	3	---	1	---	Internals>Media	Unconfirmed	warx@chromium.org	Pixelbook keyboard Play/Pause key should toggle media playback in all tabs	Chrome
<a href="#">784327</a>	2	---	1	---	Enterprise	Unconfirmed	---	Chrome v62 Policy Default Flash setting "Allow all sites to automatically run the Flash plugin" not working anymore.	Windows
<a href="#">784325</a>	3	---	1	---	Speed>Telemetry	Untriaged	nedngu...@google.com	Clean up tools/perf/run_and_compare_benchmarks script	---
<a href="#">784324</a>	1	64	1	---	UI>Browser>Bubbles, UI>Browser>FullScreen	Assigned	taped@chromium.org	Regression : Unable to check/uncheck 'Always show toolbar..' option when permission prompt is open.	Mac
<a href="#">784322</a>	2	---	1	---	---	Unconfirmed	---	Chrome App Launcher not Loading with High Sierra	Mac
<a href="#">784321</a>	3	---	2	---	---	Unconfirmed	---	in the current version, chrome does not work correctly with TalkBack enabled	Android
<a href="#">784320</a>	2	---	1	---	---	Unconfirmed	---	Spatnav should consider another candidate if found container cannot consume input	Linux

[1] <https://www.chromium.org/issue-tracking>

Source : <https://bugs.chromium.org/p/chromium/issues/list>

# | Find the bug

- 오픈소스 입문자를 위하여...
  - Good bug to take to get started with chromium!
  - 쉽게 고칠수 있는 이슈의 경우, GoodFirstBug 로 분류해놓음
  - “Hotlist-GoodFirstBug” label 로 검색 [1]

# | Make changes

- Coding style guide 에 맞게 작성
  - 가장 기본이 되는 작업
  - Chromium C++ style guide [1]
  - Blink Coding Style Guidelines [2]
- Chromium style checker [3]
  - Pre-submit check

```
** Presubmit ERRORS **
check-webkit-style failed
  third_party/WebKit/Source/modules/accessibility/AXMenuList.cpp:119:  Consider using DCHECK_EQ(a, b) instead of DCHECK(a == b)  [readability/check] [2]
Total errors found: 1 in 1 files

Presubmit checks took 12.9s to calculate.
```

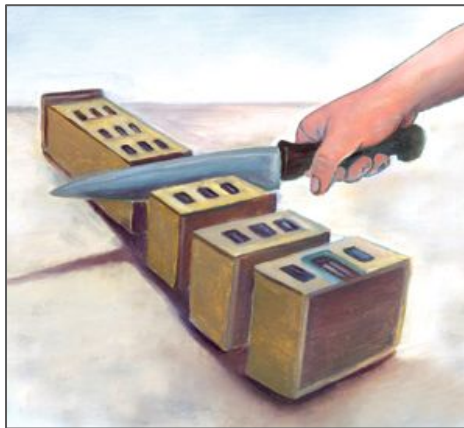
[1] <https://chromium.googlesource.com/chromium/src/+/master/styleguide/c++/c++.md>

[2] <https://www.chromium.org/blink/coding-style>

[3] <https://www.chromium.org/developers/coding-style/chromium-style-checker-errors>



# | Make changes



- 패치 단위는 최소화하여 작성
  - 단일 패치에는 반드시 한가지 수정사항만 포함
  - 여러 수정사항일 경우 패치를 나누자!
  - Devide and conquer...

# Make changes

- Test
  - Chromium development is heavily test driven. [1]
  - TDD(Test-driven development) 로 진행되며, 수많은 테스트 코드가 존재
    - <https://www.chromium.org/developers/testing>
    - Layout Tests
    - Browser Tests
    - Unit Tests... 등등등등등
- 반드시 Review request 전, 기본적인 Test 를 수행할 것



제대로 Test 하지않고 패치 올린자의 최후.jpg

[1] <https://www.chromium.org/developers/testing>

# | Make changes

- Initial git setup
  - `git config --global user.name "My Name"`
  - `git config --global user.email "myemail@chromium.org"`
  - `git config --global core.autocrlf false`
  - `git config --global core.filemode false`
  - `git config --global branch.autosetuprebase always`
  - `git config --local gerrit.host true`
- Save your codes
  - `git commit -a`
- Write commit description

## Summary of change

Longer description of change addressing as appropriate: why the change is made, context if it is part of many changes, description of previous behavior and newly introduced differences, etc.

Long lines should be wrapped to 80 columns for easier log message viewing in terminals.

Bug: 123456

# | Make changes

- Write good commit logs
  - Bad log : “fix bug and refactor”
  - Good log example

[ServiceWorker] Manage lifetime of WebServiceWorkerRegistrationImpl

This CL:

- for service worker global scope execution context, rather than binding on the service worker thread, binds impl of interface ServiceWorkerRegistrationObject on the IO thread, because it's a channel-associated interface which can be bound only on the main or IO thread.
- manages lifetime of WebServiceWorkerRegistrationImpl correctly, destroys the instance after BOTH the following 2 conditions were fulfilled:
  1. all references to it have been released by the JavaScript execution context it lives on.
  2. the ServiceWorkerRegistrationObject Mojo connection has broken.

Before this CL we just delete the WebServiceWorkerRegistrationImpl instance once the above condition 2 was triggered, not aware that maybe some of its references are still held by Blink. This leads to the situation that Blink references to a destroyed instance which may lead to crashes. This CL fixes these crashes.

BUG=[777198,769236](#)

Change-Id: [I06a6ace4fee9b7ec888d78b31c6a6bc4cdf09c22](#)

Reviewed-on: <https://chromium-review.googlesource.com/732998>

Commit-Queue: Han Leon <[leon.han@intel.com](mailto:leon.han@intel.com)>

# Review changes

- Code upload 전 다시 한번 self-review
- 패치를 업로드 하자
  - `git cl upload` (aka. `git push`)

```
** Presubmit Messages **
Missing OWNER reviewers for these files:
  third_party/WebKit/Source/modules/accessibility/AXMenuList.cpp

Suggested OWNERS: (Use "git-cl owners" to interactively select owners.)
  nektar@chromium.org

Missing OWNER reviewers for these files:
  third_party/WebKit/Source/modules/accessibility/AXMenuList.cpp

Suggested OWNERS: (Use "git-cl owners" to interactively select owners.)
  nektar@chromium.org

Presubmit checks took 4.0s to calculate.

Presubmit checks passed.
  third_party/WebKit/Source/modules/accessibility/AXMenuList.cpp | 3 +++
1 file changed, 3 insertions(+)
remote: Processing changes: new: 1, done
remote:
remote: New Changes:
remote:   https://chromium-review.googlesource.com/#/c/chromium/src/+768348 work in progress [WIP]
remote:
To https://chromium.googlesource.com/chromium/src.git
* [new branch]      84afc9e3d5383e48d2a802e6c7dfaa0a25f90374 -> refs/for/refs/heads/master%wip,m=Initial_upload
```

# Review changes

- Chromium 은 code review 시스템으로 **gerrit** 을 사용 [1]
- 최초 update시 아직 review 가 시작되지 않은 상태

Chromium Gerrit				
CHANGES ▾ YOUR ▾ DOCUMENTATION ▾ BROWSE				
Subject	Status	Owner	Assignee	Project
Work in progress				
▶ ★ work in progress	WIP	Deejay Kim		chromium/src
★ work in progress std::find	WIP	Deejay Kim		chromium/src
Outgoing reviews				
★ Change default value for aria-orientation in combobox		Deejay Kim		chromium/src
★ Change default value of aria-valuenow on some roles		Deejay Kim		chromium/src
★ Check null condition for preventing crash		Deejay Kim		chromium/src
★ Add codes for preventing memory leak in sandbox		Deejay Kim		chromium/src
Incoming reviews				
No changes				
Recently closed				
★ Null dereference in AXMenuList::DidUpdateActiveOption	Merged	Deejay Kim		chromium/src
★ Change default value of aria-valuemin on some roles	Merged	Deejay Kim		chromium/src

[1] <https://chromium-review.googlesource.com/>

# Review changes

- Review 요청
  - Gerrit 에서 “Start review” 버튼 선택
  - Reviewer 추가 (수정한 Folder 에 OWNERS 파일을 참고 / 추천 owner)
  - 적당한 comment 와 함께 “Start review” !!

The screenshot shows the Chromium Gerrit web interface. At the top, there are navigation tabs: CHANGES, YOUR, DOCUMENTATION, and BROWSE. Below this, a change is shown with the status 'Work in Progress' and the ID '768348: work in progress'. A blue button labeled 'START REVIEW' is highlighted with an orange box, and an orange arrow points from it to the right-hand panel. The change details include: Updated 12:27 PM, Owner DeeJay Kim, Assignee (Add assignee...), and a list of Reviewers (ADD REVIEWER). The change is currently in the 'work in progress' state, with 'test code' as the description. The bug is listed as 'None', and the change ID is 'I15a349a22422d98436257abbd'. There is also an 'EDIT' link.

The screenshot shows the right-hand panel of the Gerrit interface, which is used for selecting reviewers and adding comments. It includes a list of reviewers with checkboxes, a text area for adding a note for reviewers, a checkbox for 'Preview formatting', and a section for 'Code-Review' with a 'Commit-Queue' button and a 'Not ready' status. The 'START REVIEW' button is highlighted with an orange box.

Owner: DeeJay Kim

Reviewers: Add reviewer...

CC: Dominic Mazzoni X, Alice Boxhall X, Kentaro Hara X, Nektarios Paisios X, Anonymous chromium-reviews@chromium.org X, Jeongeun Kim X, Anonymous aboxhall+watch@chromium.org X, Anonymous aleventhal+watch@chromium.org X, Anonymous blink-reviews@chromium.org X, Anonymous dmazzoni+watch@chromium.org X, Anonymous dount+watch@chromium.org X

Add CC...

Add a note for your reviewers...

☐ Preview formatting

Code-Review You don't have permission to edit this label.

Commit-Queue 0 +1 +2

Not ready

SAVE CANCEL START REVIEW

# Review changes

- Communication channel을 최대한 활용
  - IRC : [irc.freenode.net/#chromium](https://irc.freenode.net/#chromium)
  - Slack [1]
  - Dev forum : [chromium-dev](https://groups.google.com/a/chromium.org/forum/#!forum/chromium-dev) [2], [blink-dev](https://groups.google.com/a/chromium.org/forum/#!forum/blink-dev) [3]
- Global 프로젝트이므로 반드시 Time-zone 을 고려하라
  - California 는 -17시간
  - Europe 는 -9시간

[1] <https://chromiumdev.slack.com/>

[2] <https://groups.google.com/a/chromium.org/forum/#!forum/chromium-dev>

[3] <https://groups.google.com/a/chromium.org/forum/#!forum/blink-dev>



# Land patch

- LGTM !

Code-Review

+1



Dominic Mazzoni

Commit-Queue

+2



Dominic Mazzoni

**Tryjobs** Showing jobs from patch set 4, Last updated at 오후 12:49:51

[CHOOSE TRYJOBS](#)

[SHOW EXPERIMENTAL TRYJOBS](#)

✔ android\_arm64\_dbg\_recipe

✔ android\_clang\_dbg\_recipe

✔ android\_compile\_dbg

✔ android\_cronet

✔ android\_n5x\_swarming\_rel

✔ cast\_shell\_android

✔ cast\_shell\_linux

✔ chromeos-amd64-generic-rel

✔ chromeos\_daisy\_chromium\_compile\_only\_ng

✔ chromium\_presubmit

✔ fuchsia\_x64

✔ ios-simulator

✔ linux\_android\_rel\_ng

✔ linux\_chromium\_asan\_rel\_ng

✔ linux\_chromium\_chromeos\_rel\_ng

✔ linux\_chromium\_compile\_dbg\_ng

✔ linux\_chromium\_headless\_rel

✔ linux\_chromium\_rel\_ng

✔ linux\_chromium\_tsan\_rel\_ng

✔ mac\_chromium\_compile\_dbg\_ng

✔ mac\_chromium\_rel\_ng

✔ win10\_chromium\_x64\_rel\_ng

✖ ✔ win7\_chromium\_rel\_ng

✔ win\_chromium\_compile\_dbg\_ng

✔ win\_clang

# | Appendix

# Reference

- <http://www.chromium.org/developers/contributing-code>
- <https://meowni.ca/posts/chromium-101/>
- <https://github.com/kosslab-kr/kossscon2016/raw/master/assets/track1-07.pdf>
- <https://github.com/kosslab-kr/kossscon2016/raw/master/assets/track2-08.pdf>
- [http://rtcc.hanyang.ac.kr/sitedata/2015\\_2\\_ISP/howbrowserswork\\_20150915.pdf](http://rtcc.hanyang.ac.kr/sitedata/2015_2_ISP/howbrowserswork_20150915.pdf)
- <https://www.slideshare.net/joone/hardware-acceleration-in-webkit>
- <https://devview.kr/2013/detail.nhn?topicSeq=5>
- <https://developers.google.com/web/fundamentals/performance/critical-rendering-path/render-tree-construction?hl=ko>
- <https://www.html5rocks.com/en/tutorials/internals/howbrowserswork/>
- [http://www.oss.kr/index.php?mid=oss\\_repository28&page=2&document\\_srl=660970](http://www.oss.kr/index.php?mid=oss_repository28&page=2&document_srl=660970)
- [http://www.oss.kr/oss\\_repository28/668736](http://www.oss.kr/oss_repository28/668736)
- <https://www.slideshare.net/gyuyoung/soscon-1day-tr32>
- [https://www.slideshare.net/naver-labs/web-kitchromiumcontributionprocess?qid=e1d52237-3718-4b9c-b856-cec366a57579&v=&b=&from\\_search=1](https://www.slideshare.net/naver-labs/web-kitchromiumcontributionprocess?qid=e1d52237-3718-4b9c-b856-cec366a57579&v=&b=&from_search=1)
- <https://www.slideshare.net/SamsungOSG/chromium-contributing-explained-writing-good-patches-54551716>

| Q&A

| 감사합니다