Conceptual Architecture of Chrome

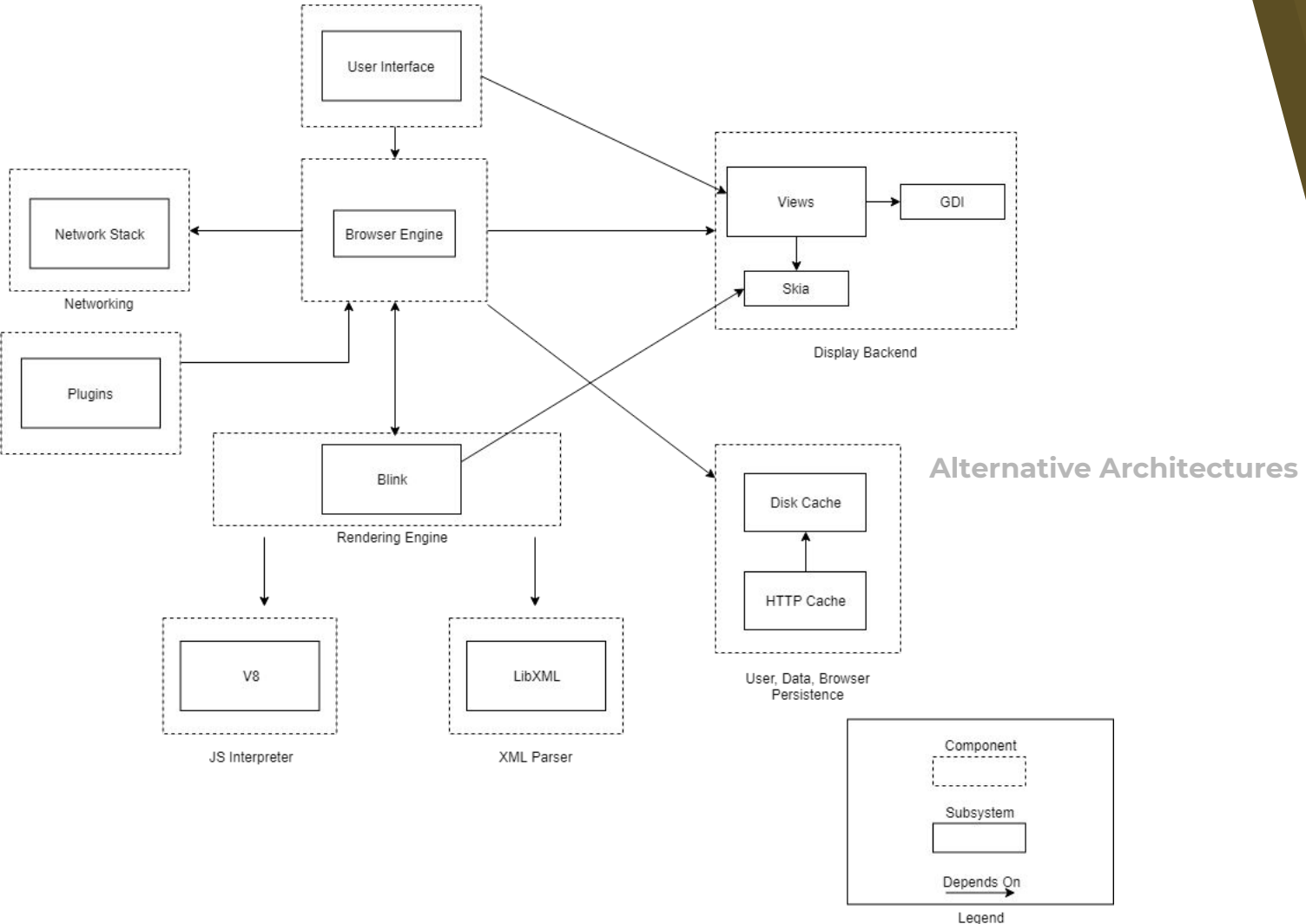
Intro

Cameron Raymond, Chris Molloy, Ross Hill,
Michael Wrana, Brenden Forbes, Brendan Russell

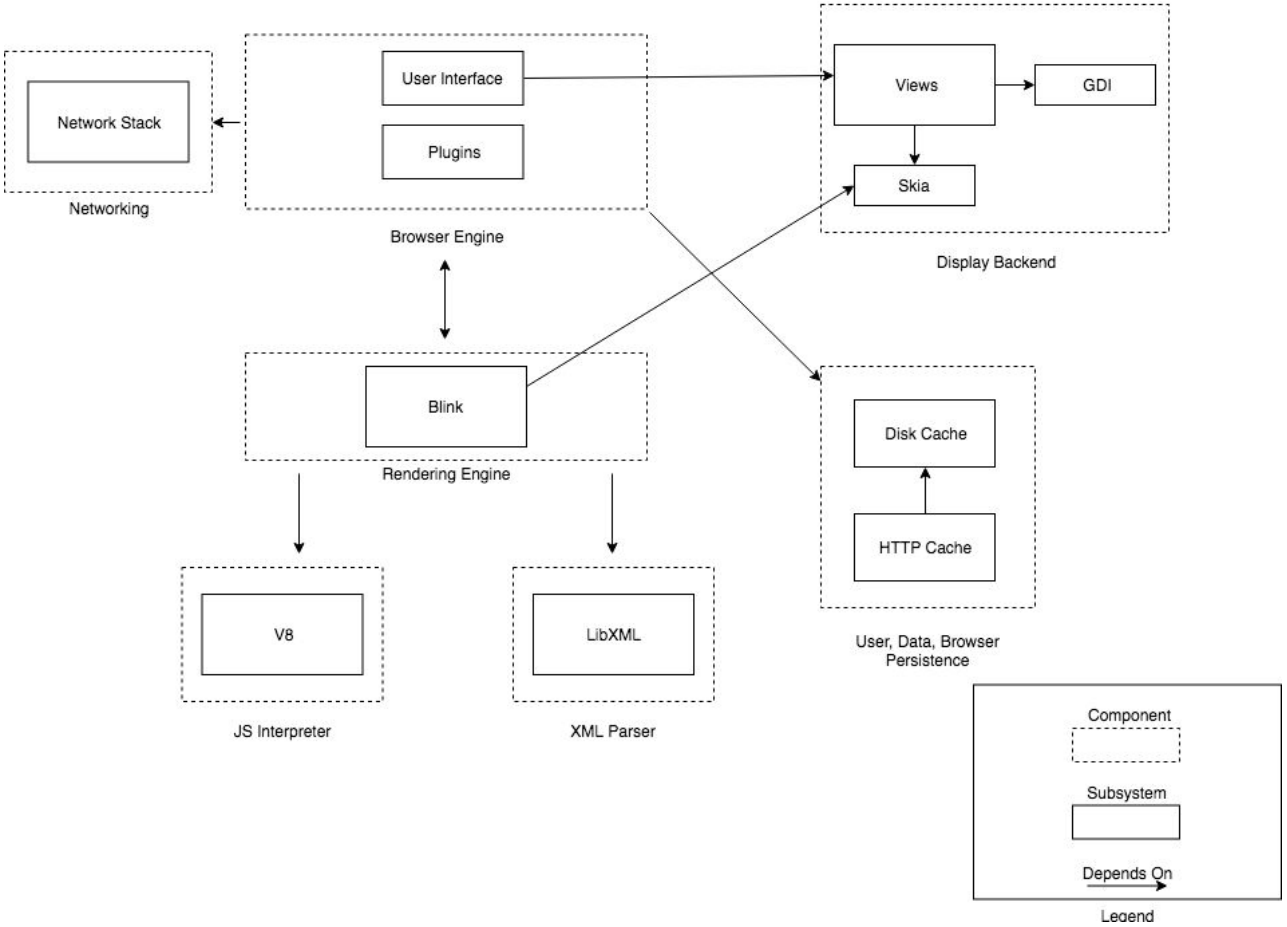
- Chrome first launched in 2008
- 66% worldwide share of desktop web browsers
- Chromium open source project
- Version 70 releasing soon

Derivation Process

- Look at reference architecture
- Look at chromium documentation
- Compare and contrast
- Experiment with different architectures
- Settle on one possibility



Alternative Architectures



Conceptual Architecture: Object Oriented

Walkthrough

Browser Engine

- Browser Process - UI and Plugins

Rendering Engine

- Change to Blink

How Chrome Renders Objects

- Skia and GDI

Networking

- Caching
- Http Requests

Data Persistence

- Disk/HTML Cache

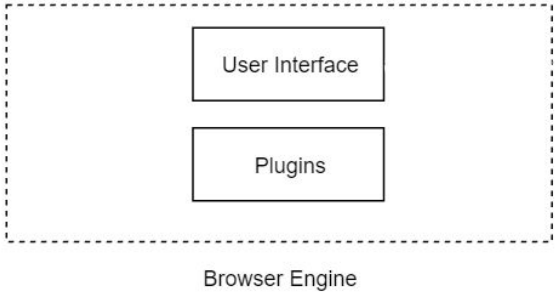
Subsystem One: Browser Subsystem

Components

- User Interface
- Plugins

Dependencies

- Networking
- Display backend
- Rendering Engine
- Persistence



Concurrency and Sandboxing

Browser Process

- Handles all user interaction
- I/O thread
- Manages tab and plugin processes

Render Processes

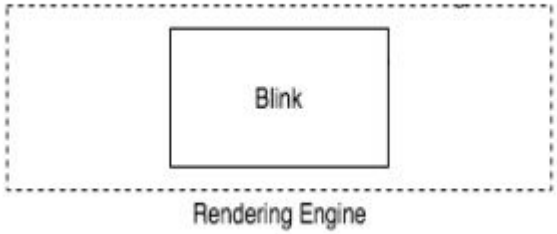
- Tab-specific processes
- Uses Blink to interpret HTML
- Run in a sandbox

"Multi-Process Architecture." The Chromium Projects, www.chromium.org/developers/design-documents/multi-process-architecture.

Subsystem Two: Blink Rendering Engine

Dependencies

- Browser Engine
- Skia
- JS Interpreter
- XML parser

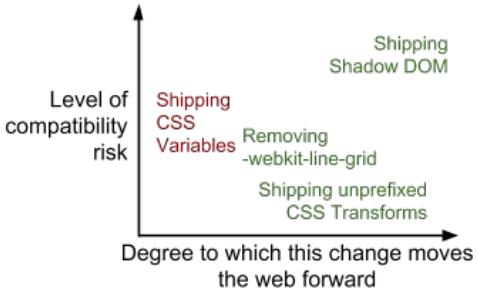


DOM: Document Object Model is an API for HTML/XML documents

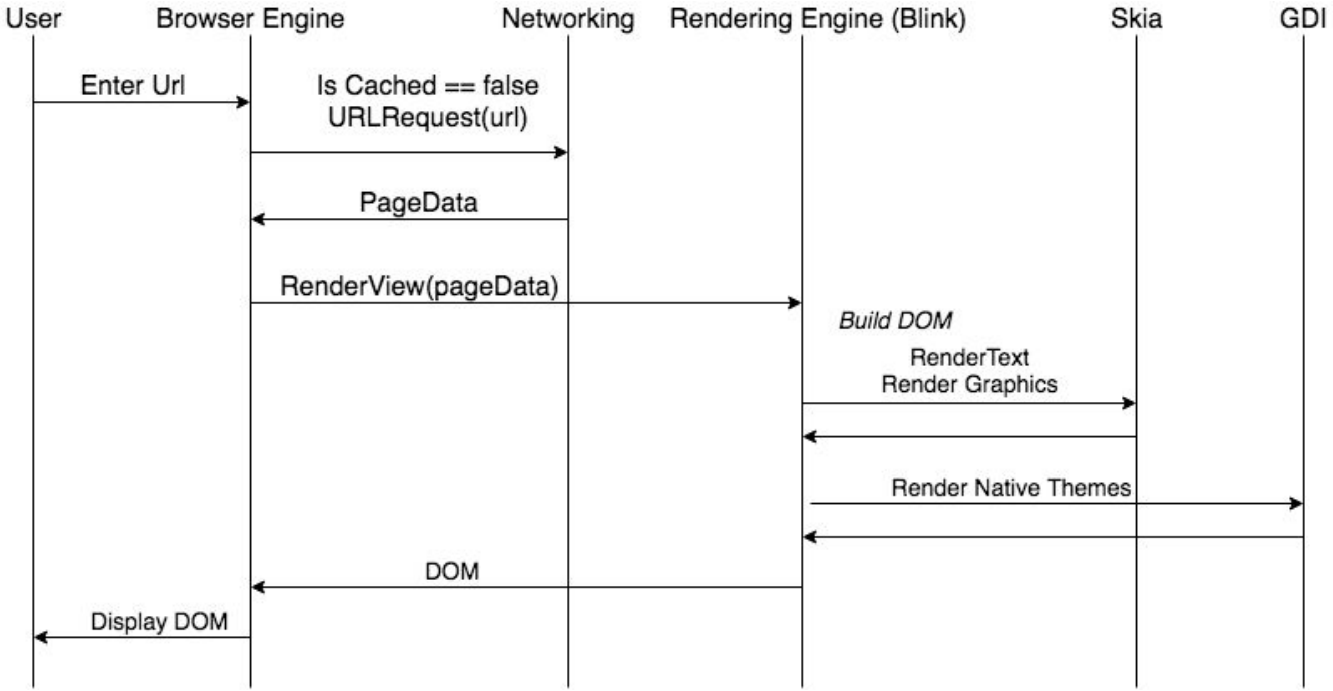
Team Issues and Challenges

Chrome forked part of WebKit (the browser engine in Safari) and made Blink

- Why undertake such a large change?
- Pros:
  - WebKit was getting too complex (**maintainability**!)
  - Engine size reduced by ~4.5M LOC
  - **More control over contributions**



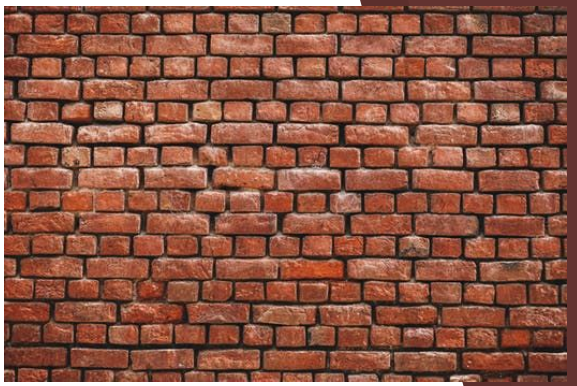
- Cons:
  - More rendering engines for developers to support



Sequence Diagram: Viewing a plain HTML web page with no Javascript (Not Cached)

Lessons Learned and Limitations

- Overload of information
- How to even begin
- Hard to classify subsystems to their parents.
- Up to date info hard to find
- Cross-collaboration = better results



Conclusion

- Conceptual Architecture was difficult to hash out
- Gave us a much better understanding of Chrome and it’s subsystem interactions
- Actually pretty interesting!

THANK YOU FOR LISTENING!!!!

References

- https://www.chromium.org/developers/design-documents/displaying-a-web-page-in-chrome
- http://www.masonchang.com/blog/2016/10/10/a-quick-overview-of-chromes-rendering-path
- https://chromium.googlesource.com/chromium/src/+/master/docs/threading_and_tasks.md
- https://chromium.googlesource.com/chromium/src/+/master/docs/threading_and_tasks.md
- https://www.slideshare.net/cwdoh/overall-chromium-source-tree
- https://pdfs.semanticscholar.org/6662/e4946ed45a94ffda64c7a949437bd7ccef23.pdf
- https://static.googleusercontent.com/media/research.google.com/en//pubs/archive/34924.pdf
- https://blog.chromium.org/2013/04/blink-rendering-engine-for-chromium.html