WebKit

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DEVELOPER CONFERENCE
2013
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Who I am

Leading a WebKit team at Samsung

WebKit reviewer since 2009

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Agenda

- The History of WebKit
- How to get involved with WebKit
- Architecture of WebKit
- Future challenges

Tizen & WebKit

- Tizen is an open source operating system designed to run applications from the web ecosystem.
- The Web engine responsible for executing web application in Tizen 2.1 is based on WebKit (browser + web runtime)
- WebKit is an open source project. It is a layout engine designed to to allow web browsers to render web pages.

The history of WebKit

Speed of development

- **Lifetime of the project (12 years)**
  - ~150,000 commits
  - ~120,000 bugs
- **Last year**
  - ~35,000 commits, ~100 commits a day, 1 commit in every ~15 minutes
  - ~30,000 bugs
- **4 GB size of the repository**
  - 3.2 GB (80%) test and test expectations – test driven development
  - ~ 35,000 tests, 1.7M lines of code
- **No official releases of WebKit, ports have releases**

The history of WebKit (1/2)

- 1998 – KHTML as part of KDE project on Linux (Qt)
- 2003 – Apple Safari based on KHTML on Mac (WebCore, JSC)
- 2005 – WebKit.org
- 2006 – Nokia S60 mobile browser on Symbian
- 2007 – Apple iPhone on iOS
- 2007 – Android browser
- 2007 – QtWebKit

(http://www.youtube.com/watch?v=TIdf1rT0Rn0)

The history of WebKit (2/2)

- 2008 – Google Chrome (Windows)
- 2010 – Samsung Dolfin browser
- 2010 – Blackberry 6
- 2010 – Apple announces WebKit2
- 2011 – Nokia N9 (based on WebKit2)
- 2012 – Google upstream android support
- 2013 – Opera to adopt Chrome port of WebKit
- 2013 – Apple started to upstream iOS port
- 2013 – Google split (Blink)

WebKit ports

- Apple Safari – MacOS (iOS), Windows (Apple)
- EFL – Linux/Tizen (Intel, Samsung)
- BlackBerry – QNX (BlackBerry)
- Qt - Linux, Windows, MacOS (Digia)
- Gtk – Linux, Windows, Mac (Igalia)
- WinCE - WinCE,
- WinCairo - Win
- (Nix) – Linux
- ~~Chromium~~

http://paulirish.com/2013/webkit-for-developers/

Blink impact on WebKit

- **WebKit housekeeping**
  - Removed android, skia, V8 support that were only used by the chromium port
  - Test expectations for chromium
  - About 2GB data has been removed, mostly test expectations
  - ~170k lines of code removed (10%)
- **Key patches are cross-posted/merged between WebKit and Blink**
  - Same or different authors

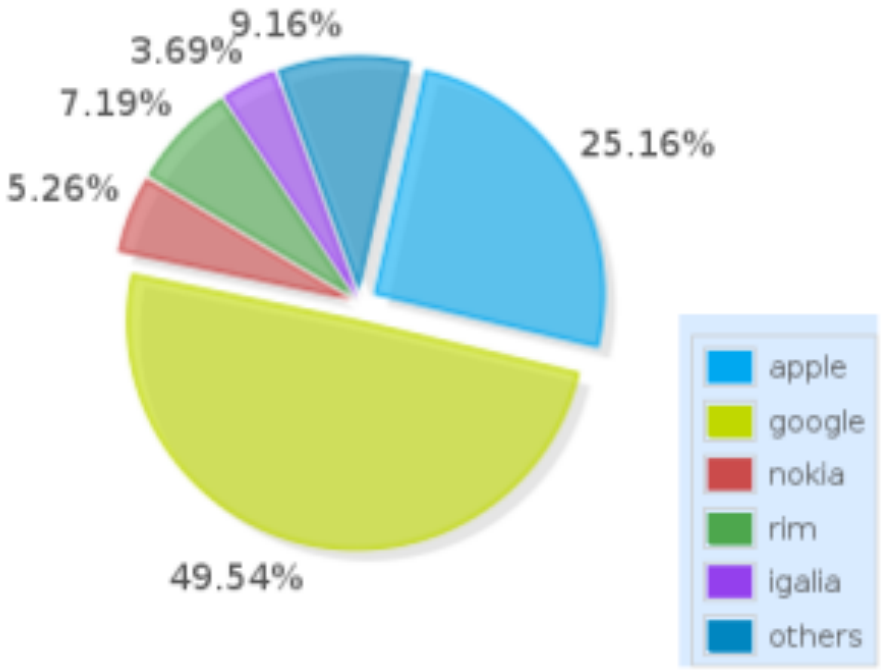
Social layers

- **Committer**
  - 10-20 patches
  - Support of 3 reviewers
  - Good understanding project policies and good collaboration skills
  - ~270 committers (that are not yet reviewers)
- **Reviewer**
  - 80+ patches
  - Support of 4 reviewers from several ports
  - Unofficial reviews
  - ~130 reviewer

http://trac.webkit.org/browser/trunk/Tools/Scripts/webkitpy/common/config/contributors.json

http://www.webkit.org/coding/commit-review-policy.html

Distribution of reviewed commits last year



[data from 2013-Marc]

http://blog.bitergia.com/2013/03/01/reviewers-and-companies-in-webkit-project/

Get involved !

Tests, Tests, Tests

- **W3C**
  - https://github.com/w3c/web-platform-tests/
  - http://www.w3.org/html/wg/wiki/Testing/Authoring, http://testthewebforward.org/
- **WebKit regression test-suite**
  - http://trac.webkit.org/browser/trunk/LayoutTests
  - https://www.webkit.org/blog/1452/layout-tests-theory/, https://www.webkit.org/blog/1456/layout-tests-practice/
- **You can help**
  - Upstream LayoutTests to W3C
  - Remove duplicated tests (after imported from W3C), WebKit bug #111513
  - Convert tests to reftests - http://trac.webkit.org/wiki/Writing%20Reftests

File bugs

Know where and how to file them

1. **bugs.tizen.org – for Tizen**

2. **bugs.webkit.org – for WebKit**

3. **w3.org/Bugs/Public – for W3C**

http://ejohn.org/blog/a-web-developers-responsibility/

http://fantasai.inkedblade.net/style/talks/filing-good-bugs/

Existing WebKit Bugs

- **~17,000 open bugs on bugs.webkit.org**
- **Bugs are still relevant and active back from 2005. Bug #15553 from 2007 just fixed on Feb-2013 (Opera).**

- **You can help**
  - Categorize, prioritize, reproduce, add info, clarify, find a developer, find duplicates, close (check with reporter).

Contribute code

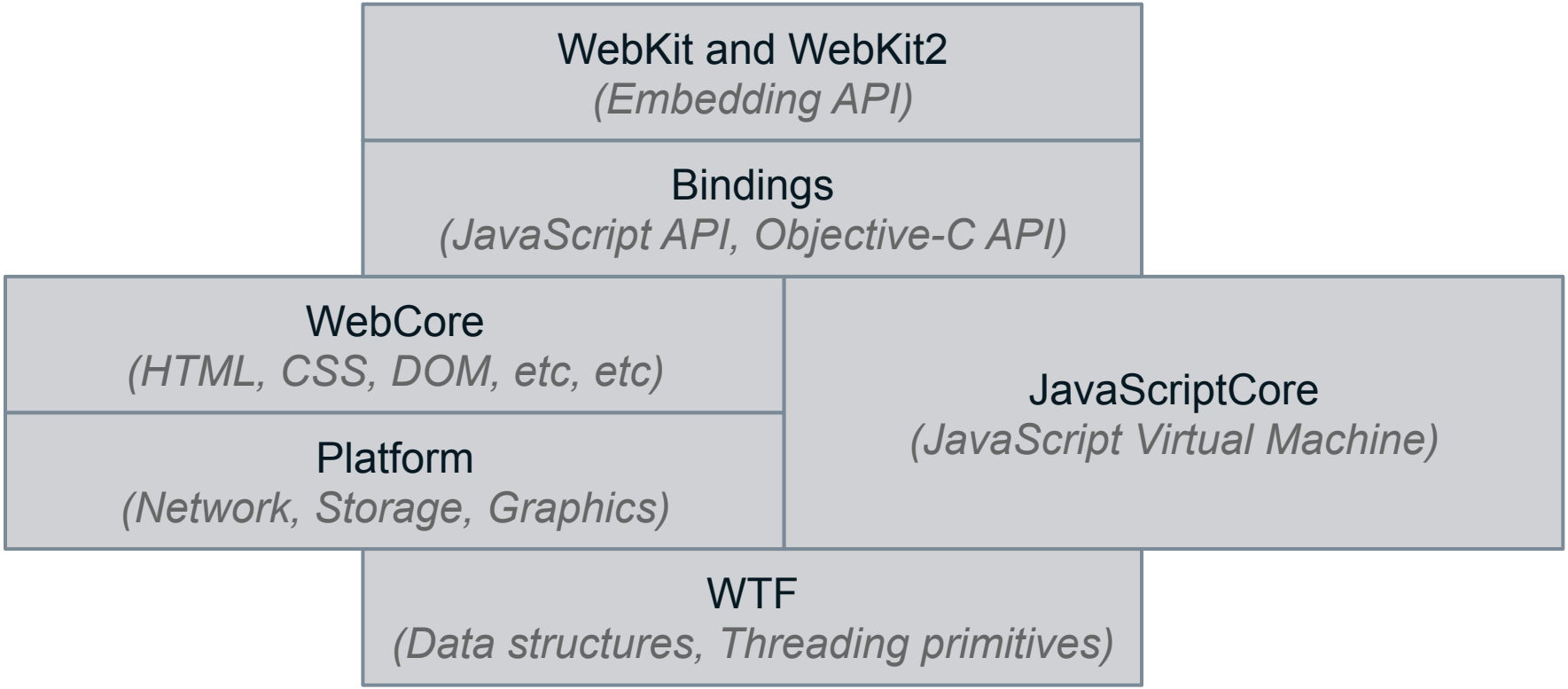
- **Test driven development**
  - Make you changes
  - Built and test (module, LayoutTests) locally
  - Run check-webkit-style and fix style issues - http://www.webkit.org/coding/coding-style.html
  - Upload your patch and check ews (early warning system) – bugs.webkit.org
  - Iterate with the community and get an r+ – irc (#webkit on freenode), webkit-dev
  - Check build bot after it lands and watch for regressions - build.webkit.org
  - http://trac.webkit.org/wiki/CommitterTips

Contribute code

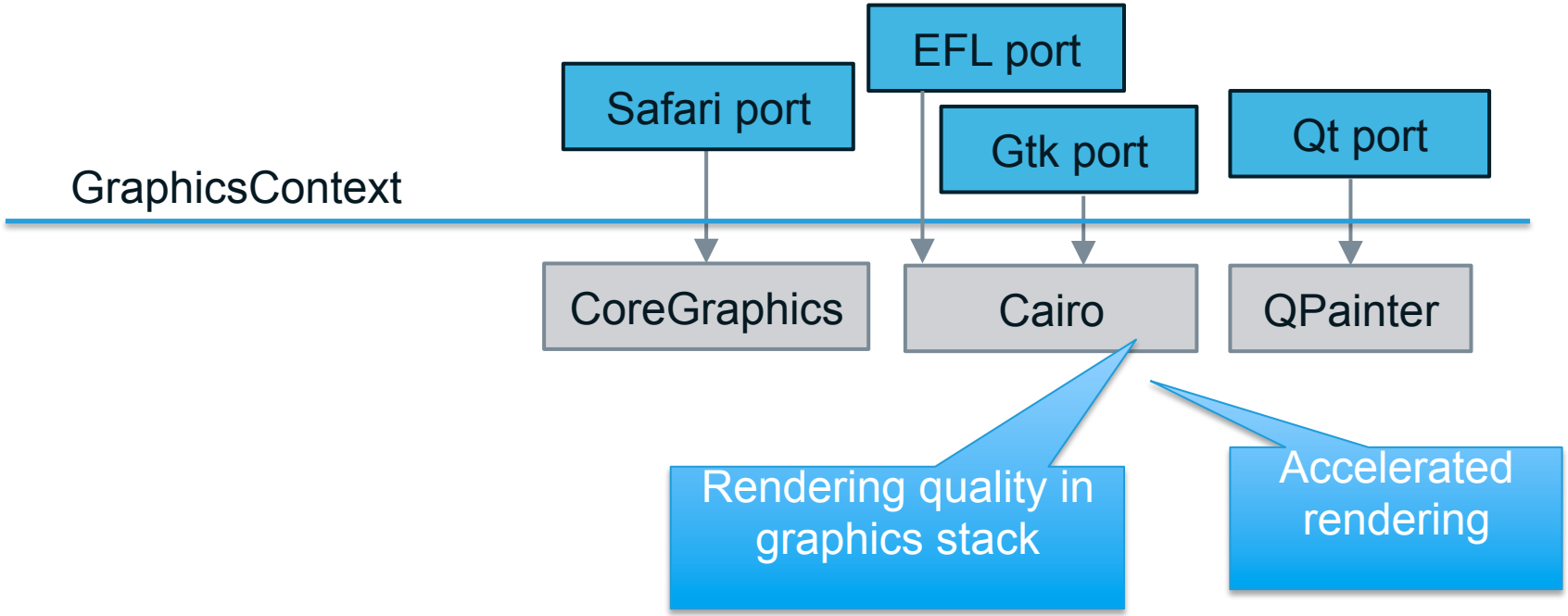
- **Do your homework**
  - Code history in revision control
  - W3C specification,
  - Other engines behavior
  - Add yourself to watchlists
- **You can help**
  - Fix bugs
  - Gardening http://trac.webkit.org/wiki/Keeping%20the%20Tree%20Green
  - Code maintenance, remove dead code, refactor code, find FIXME, http://trac.webkit.org/wiki/CommitterTips

WebKit Architecture

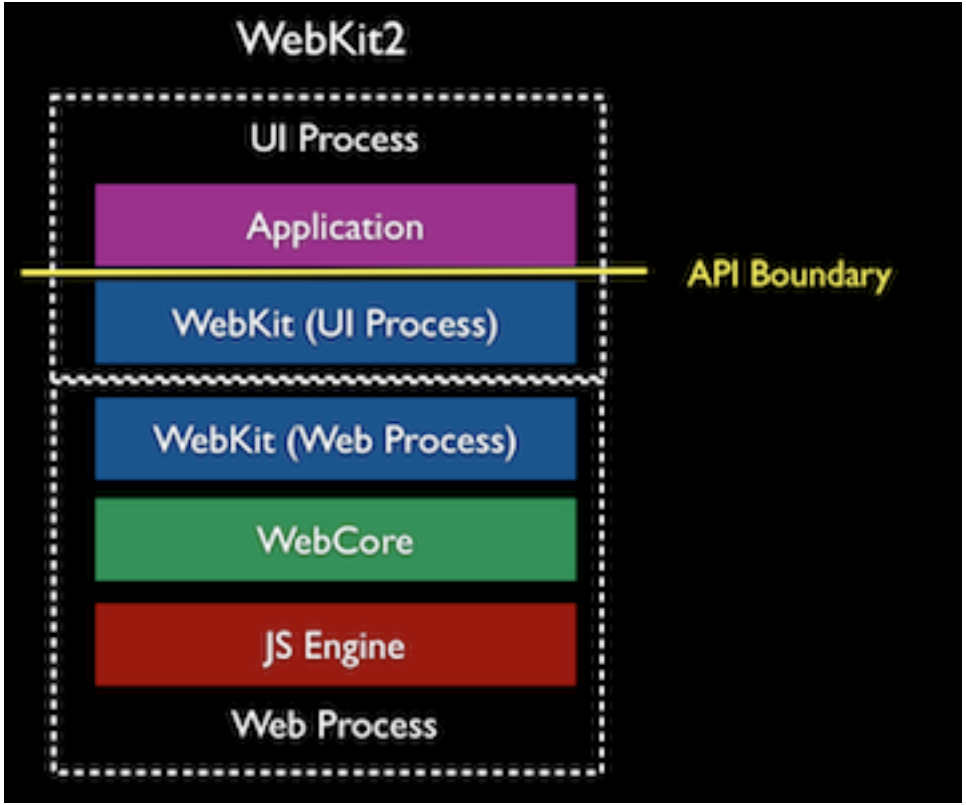
Major Components



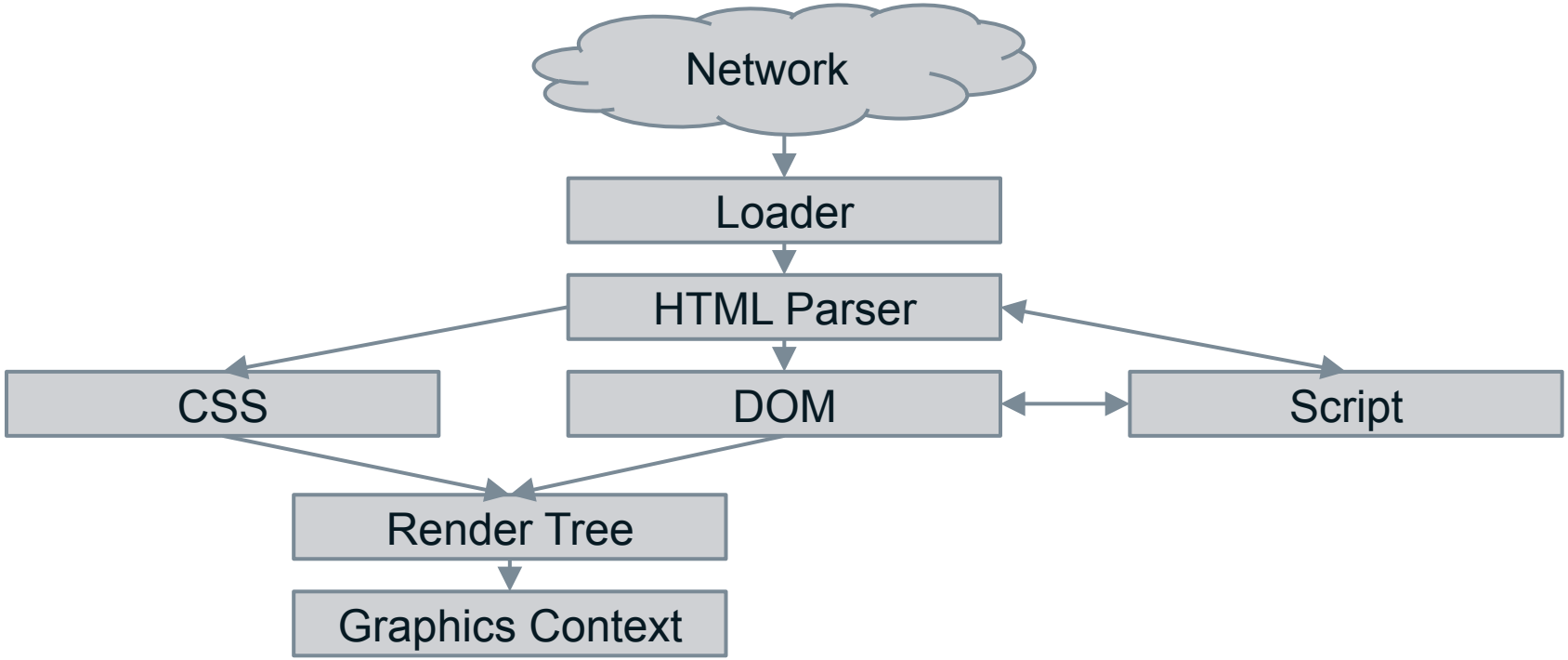
Graphics backends



WebKit2



Lifecycle of a page



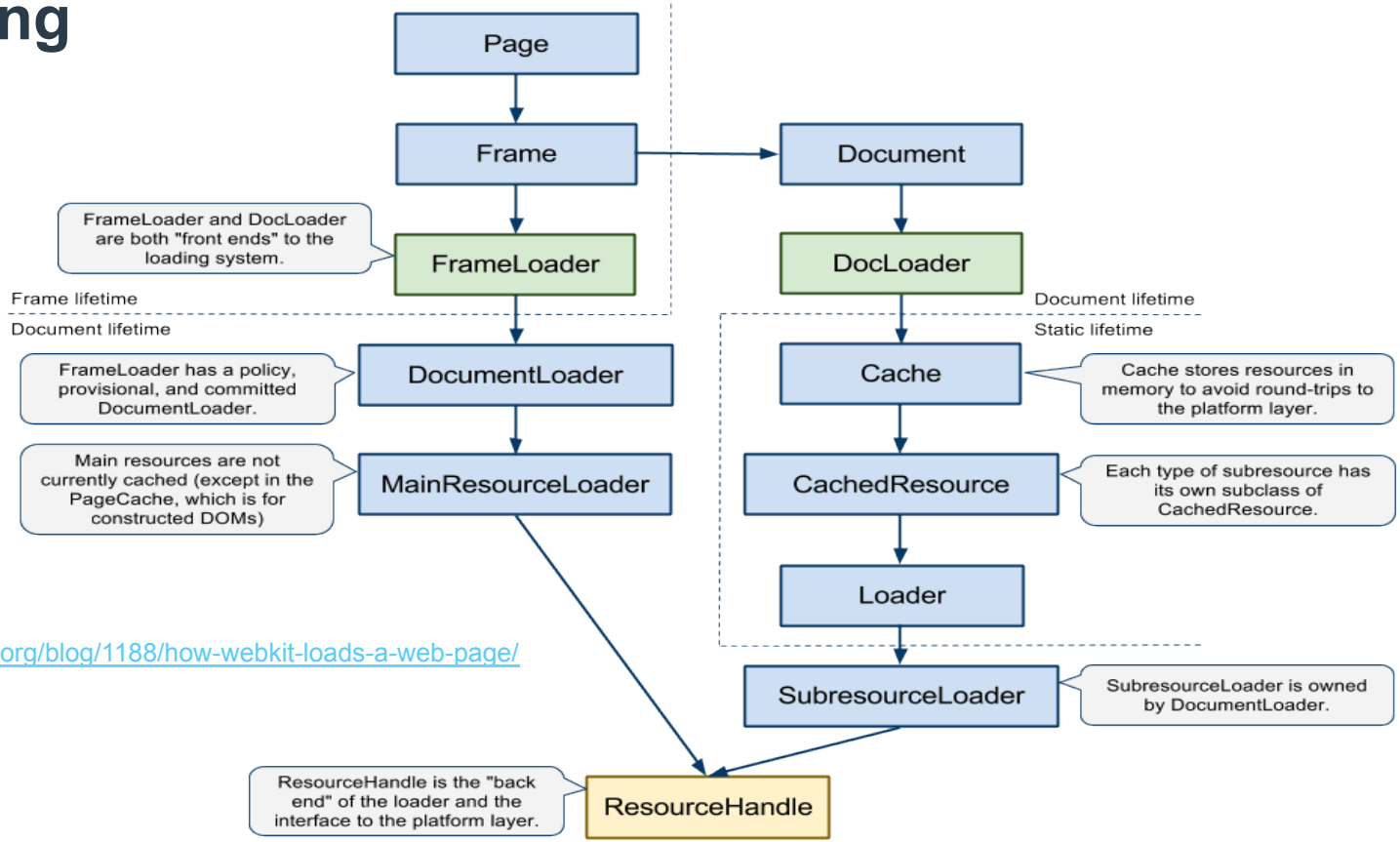
Loading

Split between WebKit & WebCore

- **WebCore/loader**
- **WebCore/platform/network**
- **FrameLoaderClient - does the network request**

2 code paths - Frames (FrameLoader) vs. Resources (DocLoader)

Loading



https://www.webkit.org/blog/1188/how-webkit-loads-a-web-page/

Loading states for a frame

Policy phase (allow vs. deny)

- block popups
- start process for cross process navigation

Provisional phase (download vs. commit)

- Pass download to download manager

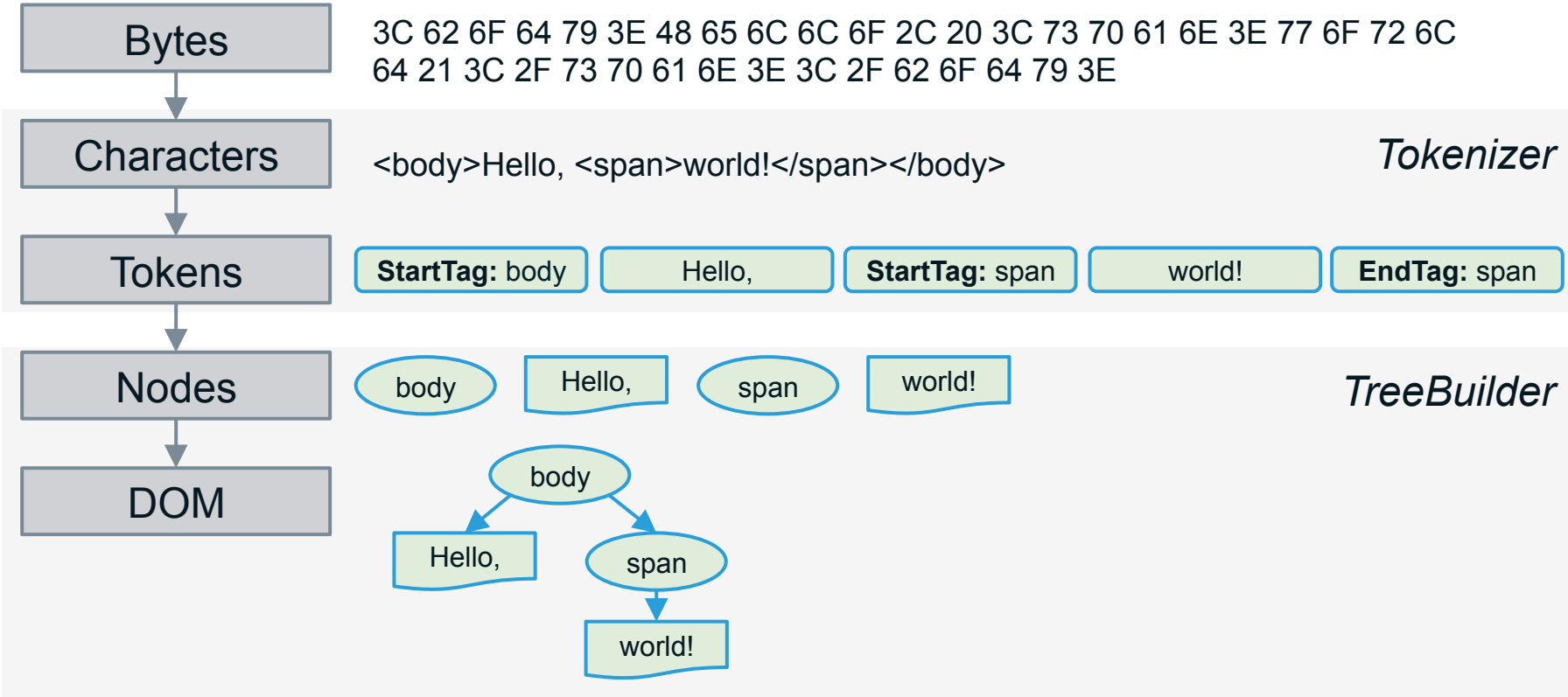
Committed phase (content rendered from server to render)

- start parsing

Caches

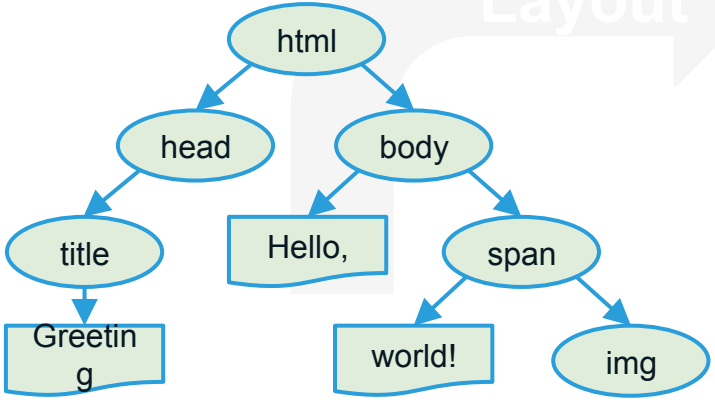
- HTTP disk cache (Port specific implementation)
- Memory cache (e.g. decoded images in WebCore)
- Page cache (back/forward navigation in WebCore)

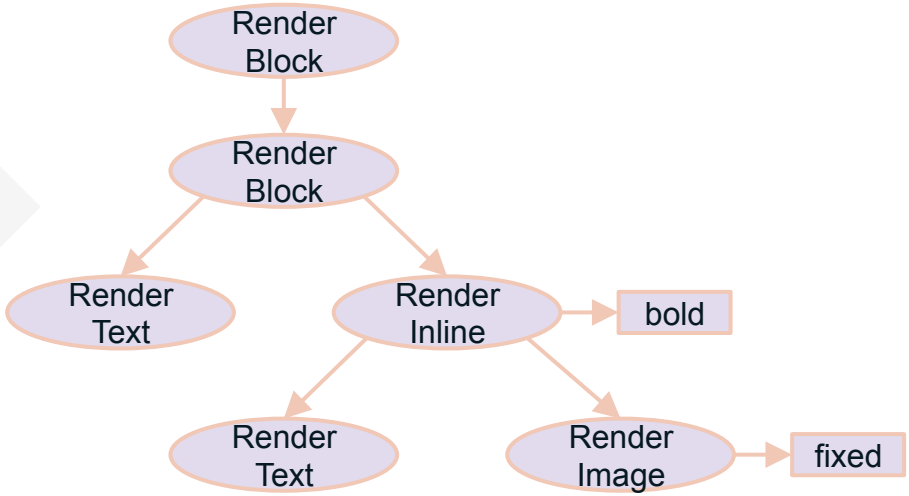
HTML parser



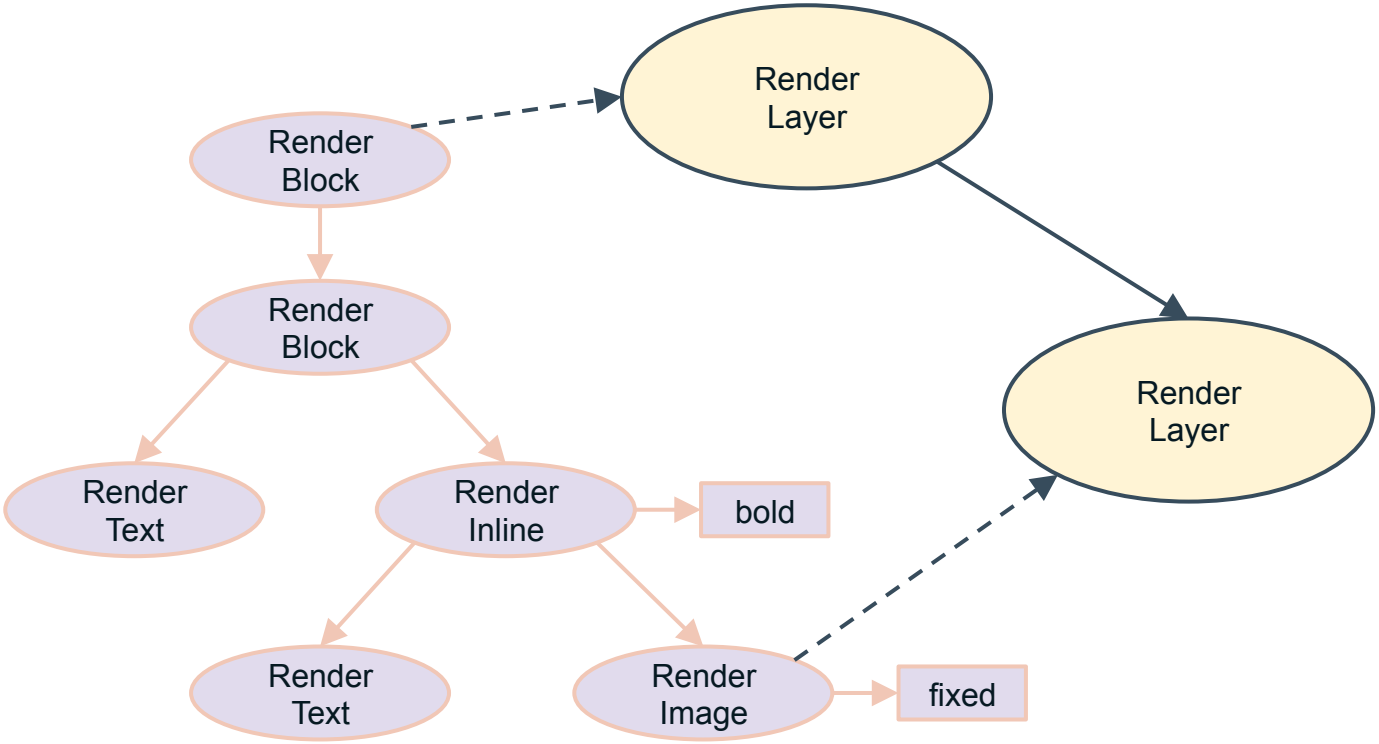
DOM + CSS → RenderTree

#footer { position: fixed; bottom: 0; left: 0 }
body > span { font-weight: bold; }





RenderLayer



Future challenges

What runs in a process ?

- One application process - initially one process for the whole browser application
- Renderer processes (per tab/origin/site instance) + plugin process + browser process
  http://www.chromium.org/developers/design-documents/process-models
- Network process
  https://docs.google.com/document/d/1ihpwbiG_EDirnLibkkglEtyFoEEcf7t9XNAn8JD4fQY/edit?pli=1
- GPU process
  http://www.chromium.org/developers/design-documents/gpu-accelerated-compositing-in-chrome
- iFrame process
  http://www.chromium.org/developers/design-documents/oop-iframes

Trade-offs for the process model

- HW capabilities (multicore CPU or GPU)
- Responsiveness (offload main UI thread)
- Security (process isolation)
- Robustness (software crash)
- Memory management (shared vs. cloned data)
- Process vs. thread
- Configurability (change model dynamically, reuse process)

Hardening WebKit2

API design for the Web

- **What is the right level of abstraction ?**
  - Expose the service capability (pick a profile pic)
  - Expose the HW capability (camera api, gallery/file api)
- **What level to expose to ?**
  - OS, browser chrome, renderer, web
- **Examples of challenging APIs**
  - Network characteristics, contact API, NFC

HTML5 features on Tizen

Tizen Web Device API

http://www.w3.org/Mobile/mobile-web-app-state/

API Security/Execution model

- **When to allow access to an API**
  - Only installed things (web apps, extensions, etc) ?
  - Separate trust levels
- **When and how to prompt the user**
  - Installation time vs. runtime when needed
  - All permissions at once or one by one
- **Separate versions of the API**
  - different security requirements (high level vs. low level)

Tizen WebRuntime Update

Conclusion

- Hacking on WebKit is exiting and there are ways to get involved at various commitment and technical levels.
- The best way to influence the web is directly contribute to upstream projects.

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