

Firefox Enhancement Proposal

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Overview

- ⌘ Problems in the Current Firefox Architecture
- ⌘ Enhancement Possibilities
- ⌘ Approach Chosen
- ⌘ Advantages and Disadvantages of Approach
- ⌘ Limitations
- ⌘ Lessons Learned

Problems in the Firefox Architecture

- ⌘ Single-processed environment.
 - ⌘ If any particular tab/website crashes, so does the browser
 - ⌘ Performance is directly correlated to CPU speed and load, does not scale with multi-processors
 - ⌘ Industry focus is currently on CPUs with more parallel processing capability than raw processing power – lots of performance to find here
 - ⌘ Not as secure (sandboxing)
- ⌘ Layers contain significant amounts of inter-dependencies
 - ⌘ Components are not easily swappable (one of the main advantages of OO style)
 - ⌘ Simple modifications to components might require multiple modifications in other components
 - ⌘ Unnecessary complexity between components

Enhancement Possibilities

⌘ Multi-Process

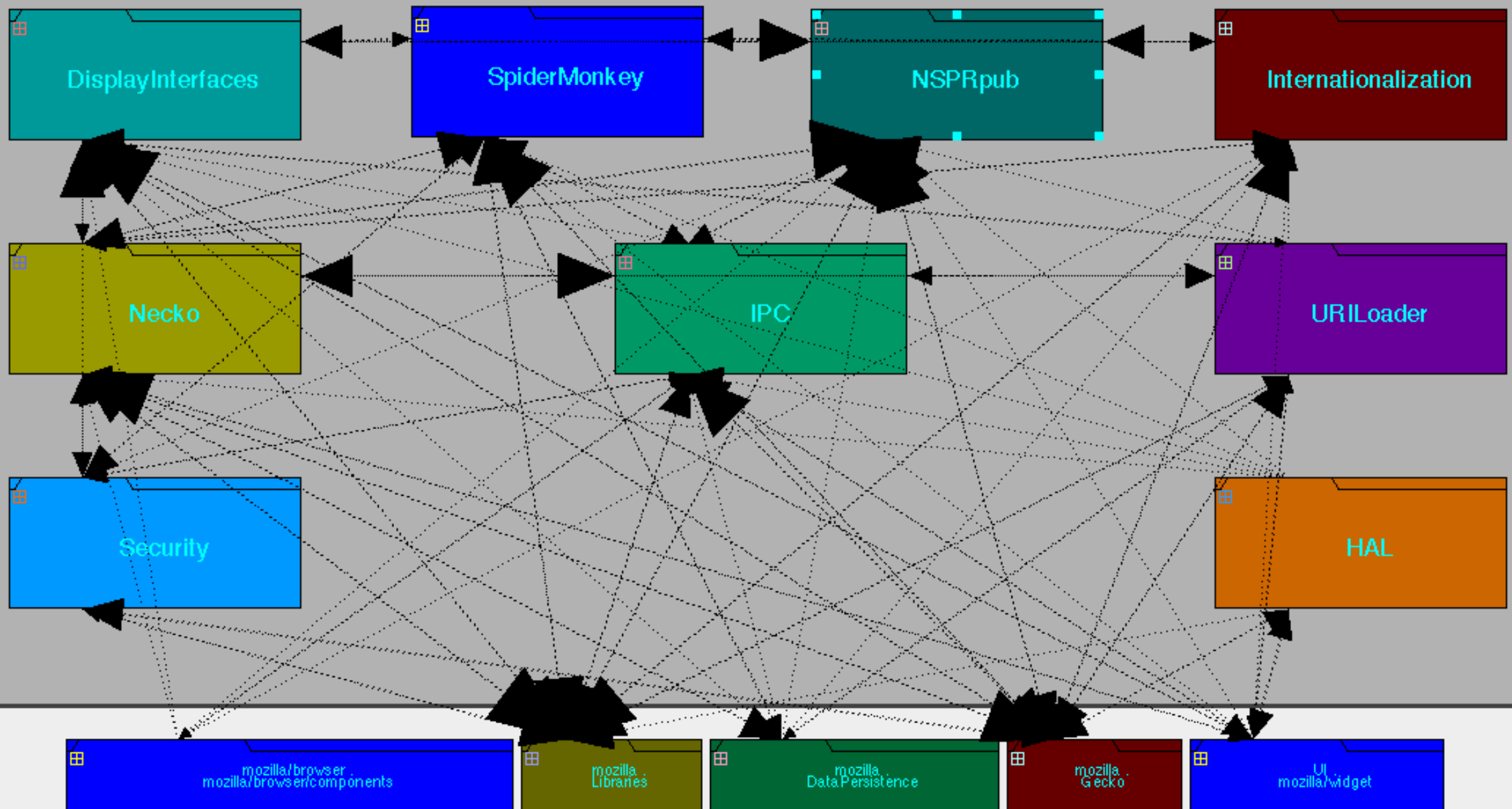
- ⌘ + Better performance scaling
- ⌘ + More efficient use of available resources
- ⌘ - More complexity

⌘ Create a Façade for the Core App Services Layer

- ⌘ + Greatly reduced complexity
- ⌘ + Roles of individual components become much more clear
- ⌘ - Introduces performance overhead
- ⌘ - Extending functionality means making changes in the class and in the façade

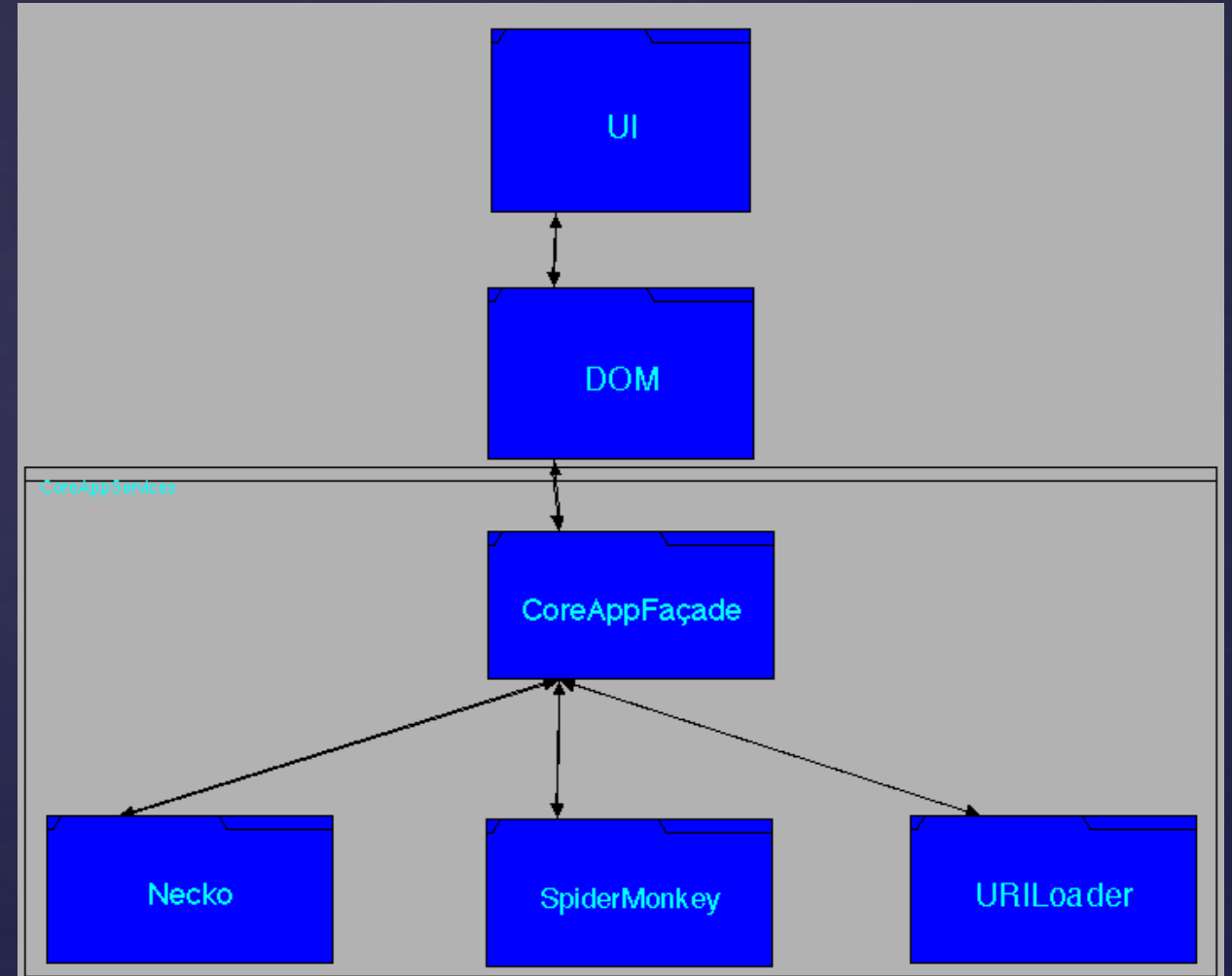
Existing Dependencies

- ⌘ Most dependencies within the Core App Services Layer are:
 - ⌘ For conversions such as
 - ⌘ Number conversions (calls made to IPC)
 - ⌘ Unicode conversions (calls made to intl)
 - ⌘ Time conversions (calls made to HAL)
 - ⌘ Calling methods that can be implemented by the calling class
 - ⌘ Due to nature of the module, convenience (e.g. Necko)



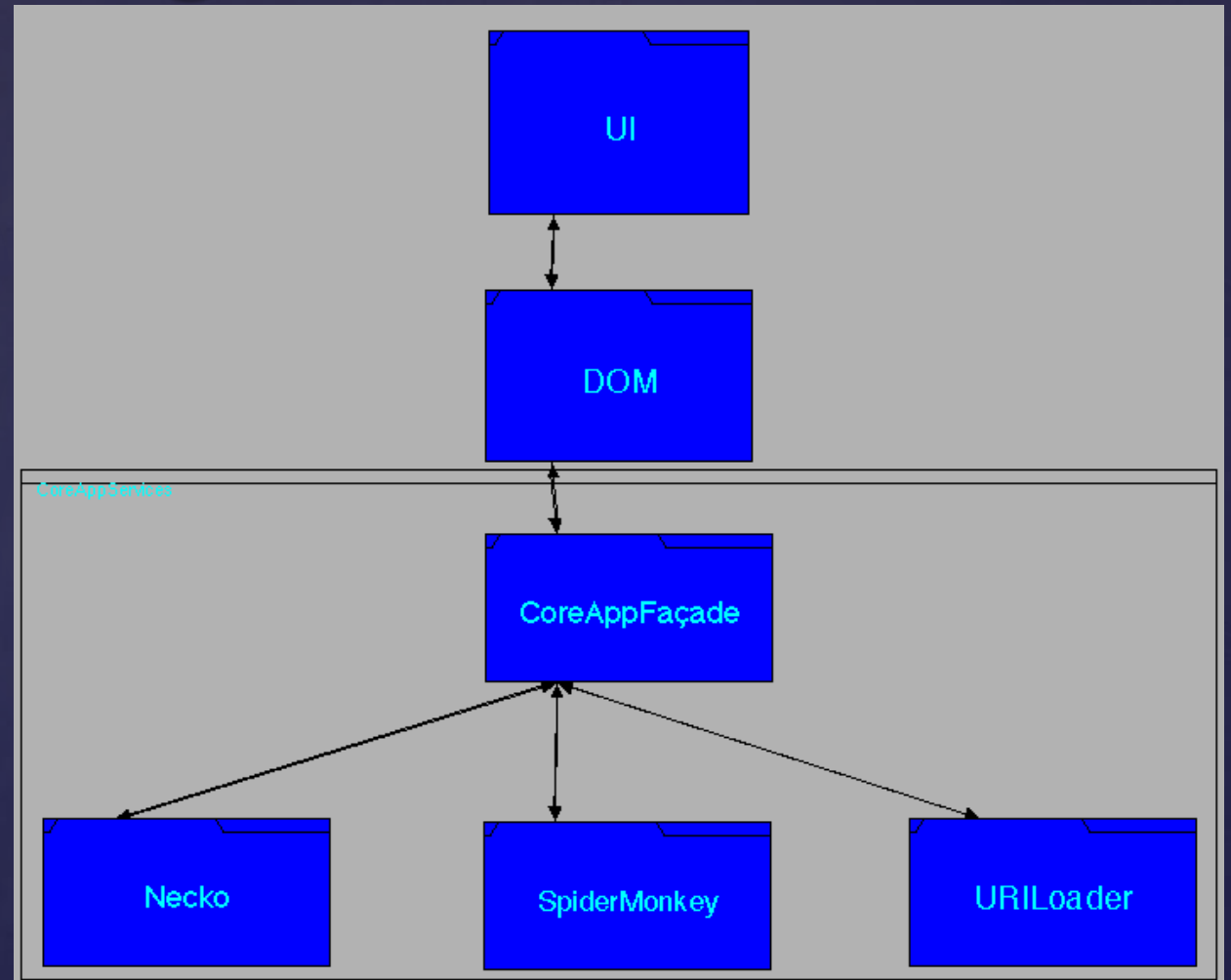
Core-App Services Façade

- ⌘ Create a component that acts as a go between DOM layer and CoreAppServices
- ⌘ Restrict communication between components
- ⌘ Control all the communication both in and out of CoreAppServices



Architectural Changes

- ⌘ Creation of structural façade code (function definitions etc.)
- ⌘ Much of Core App Services would need to be rewritten (especially components which communicate with the network)
- ⌘ Some of the DOM layer interfacing would need to be modified



Impact of chosen feature

- ⌘ Firefox is open source, many short-term developers
- ⌘ Firefox developers took a serious commitment to update documentation a few years ago in order to attract more volunteer developers
- ⌘ Architecture being confusing may be holding back even more aid

Impact of chosen feature

- ⌘ Developers with small ideas can quickly jump in and add their improvements without having to deal with dependency resolution across multitudes of files
- ⌘ Significantly decrease time for fixes and additional feature creation
- ⌘ Components would now be easily pluggable / replaceable
 - ⌘ Multi-processing could be done more easily by spawning a different process for each component, with a single interface managing them all
- ⌘ Possible: This would extend toward the other two layers as well

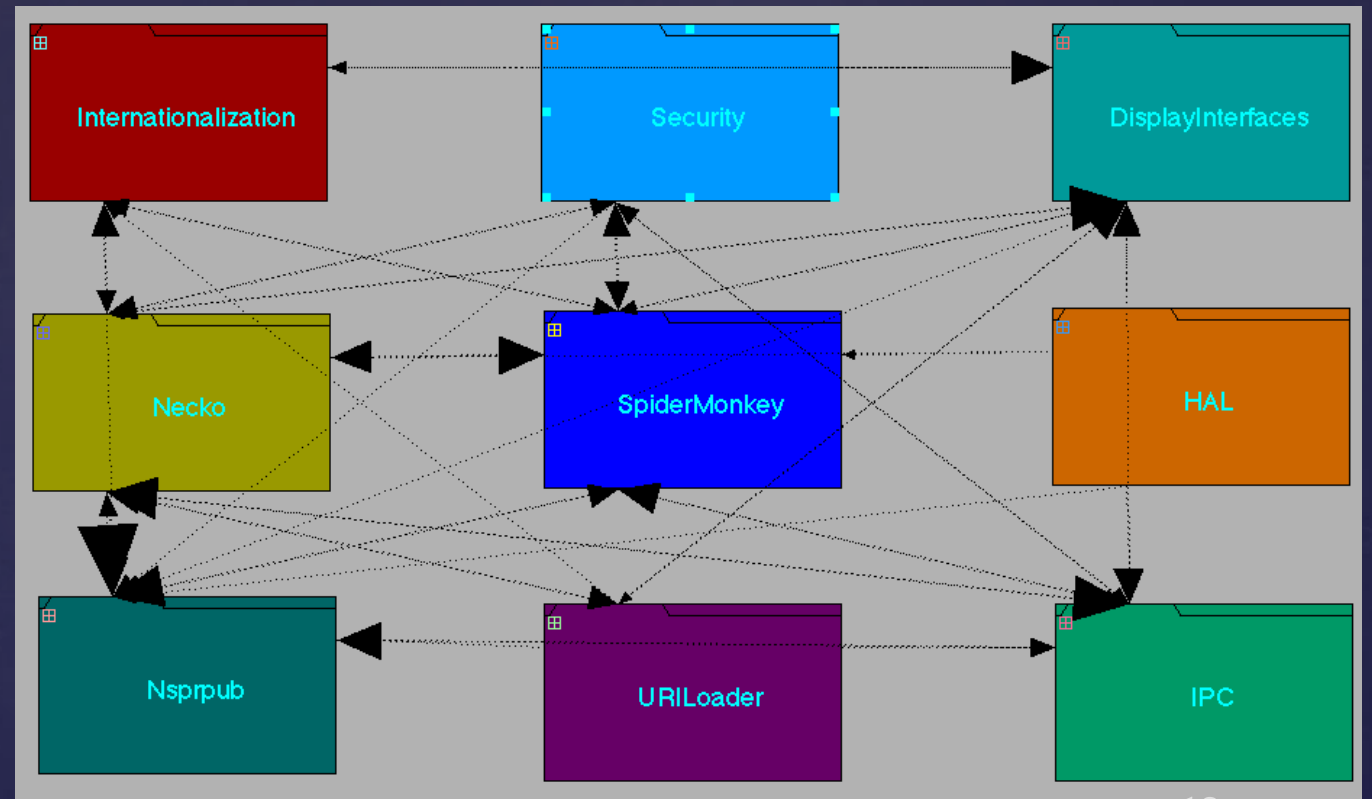
Impact of chosen feature

⌘ Potential stakeholders

- ⌘ Mozilla Developers (both seasoned and new)
- ⌘ Carriers which offer Firefox OS
- ⌘ Developers for various other Mozilla projects (Thunderbird)
- ⌘ Users of various Mozilla Framework technologies
- ⌘ Various product owners (e.g. Dave Camp for Firefox, Fabrice Desré for FirefoxOS)²

Pros of chosen feature

- ⌘ Elimination of cross-dependencies
- ⌘ Ease of creation for unit tests
- ⌘ Minimize potential surface area for bugs



Cons of chosen feature

- ⌘ Potential performance overhead (symbol table while compiling takes up more space, and execution takes longer because of late binding)
- ⌘ Developer energy investment into changes that only serve to simplify the structure, but will not actually contribute to the project in a meaningful way (e.g. Necko)
- ⌘ Certain types of testing may ultimately be more difficult¹

Limitation of Work Findings

- ⌘ Difficult simulate the system we are thinking of and implementing it would cost too much time
- ⌘ Only used source code and documentation to make assumptions, since this has not been investigated publicly among developers

Lessons Learned

- ⌘ Designing and implementing is a fight between convenience and clean code
- ⌘ Real-world costs of theoretical changes are hard to estimate
- ⌘ Without proper introspection, original design decisions get lost

References

1. <http://programmingarehard.com/2014/01/11/stop-using-facades.html/>
2. <https://wiki.mozilla.org/Modules/All>