Current Investigation
Toward a Security Reference Architecture of Web Browser

Paulina Silva Ghio

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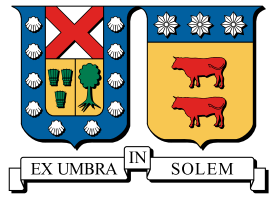

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Context

- Web Browser's war in the nineties.
- Built and fix.
- Web Browser: a tool used daily.
- Common user uses its services.
- Many type of implementations.
- Web 2.0 y 3.0: AJAX (Asynchronous Javascript and XML).

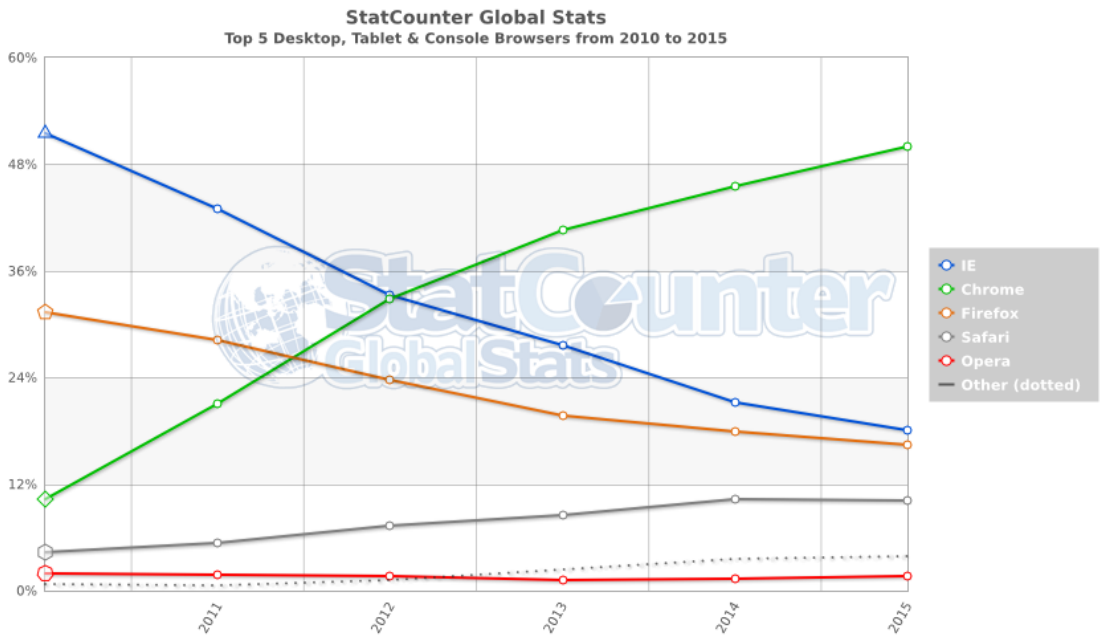

Figura: Market Percentaje of each Browser. Cite: [1]

Motivation

Browser is an indispensable tool, this lets:

- New ways of interacting.
- Lower building costs for a client program.
- Already implemented a lot of robust security features in the browser.
- Reuse.

Principal Concerns

- Systems which are called by users using a browser.
- Stakeholders involved: browser's user, host's user and the external service used.

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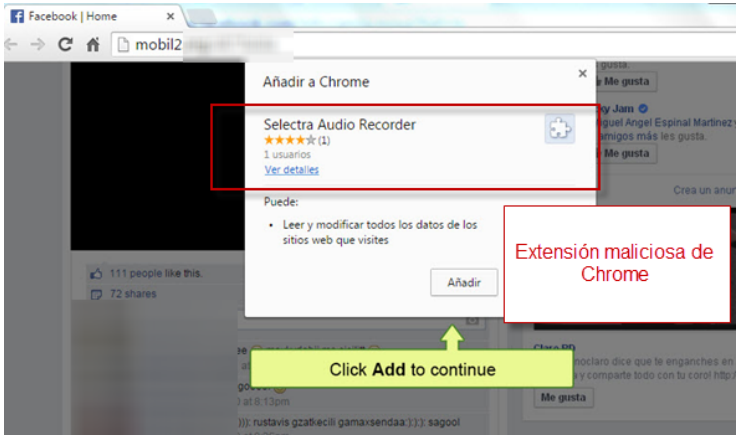
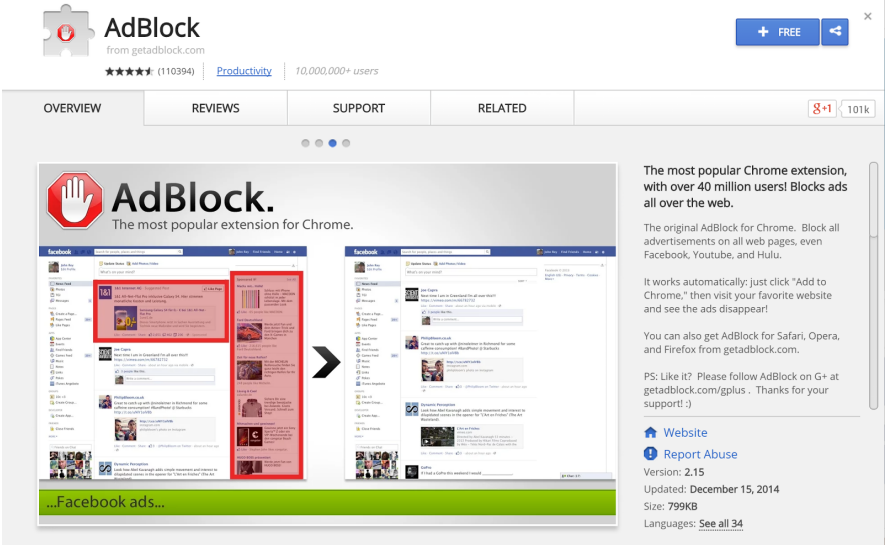
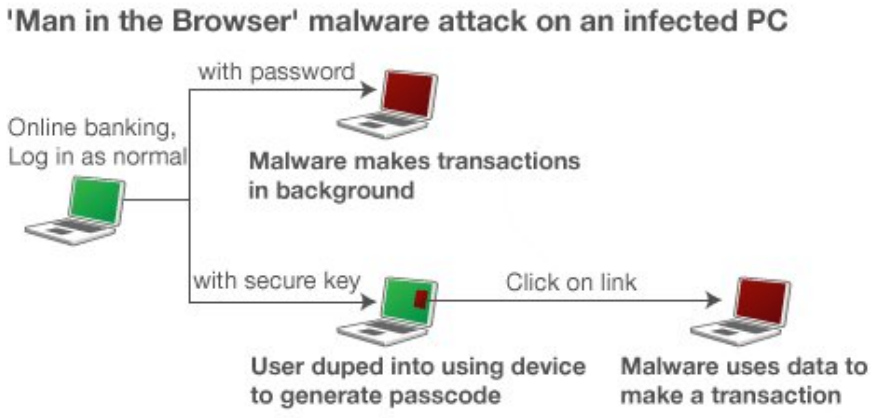
Threats and Vulnerabilities



1. Installation of Malware and malicious Extensions.
2. Benign-but-buggy Extensions.
3. Man in the Browser.
4. Code Injection.





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Reference Architecture (RA) for the browser

- Specifies the decomposition of the systems into subsystems, interactions between these parts and functionality distribution between them.
- Captures the essence of the architecture through a collection of similar systems, using architectonic reuse.
- Currently, there is no consensus in how to define an RA, what should have and how should be built. We use architectural patterns.
- Describes concerns and quality attributes needed.
- Helps: developers, in general stakeholders.
- Compares design decisions.
- Holistic view of the system.

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State of Art

- Have not found updated works about Reference Architectures of the Browser. The work of Grosskurth et al. [2] is close, but the technique is different.
- Works:
  - Larrondo et al. [3]: analyzes the browser and obtains a Domain Model, an Object Model, a Feature Tree which describes structure and functionality of the browser.
  - Grosskurth et al. [4, 2]: Reverse engineering tool to obtain a high-level architecture of open-source browsers: Mozilla y Konqueror.
  - Godfrey et al. [5]: similar to the above but only for Mozilla, and also obtained architectural views of the system.
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General and specific objectives/goals

General objective

- Build an organized body of information about the Web Browser and its security.
- Systematize, organize and classify adquiered knowledge in a document, with a semi-formal format.
- Better comprehension of browser's security.

Specific objectives

- A guide to comunicate relevant concepts.
- Improve our Reference Architecture and continue our misuse pattern catalog.
- Build a conceptual model of browser's security, a Security Reference Architecture.
- Get to know how social engineering can affect the browser.
- Use Experimental Software Engineering techniques.

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Hypotesis

Main Hypotesis

H1: The definition of a Security Reference Architecture for the Web Browser allows to abstract and capture main structural aspects, its behavior and security related requirements.

Validation

- Reference Architecture and Security Reference Architecture are not implemented. They are abstract models.
- Experts opinions.
- *PLoP conferences and “shepherding”process. Conferences: AsianPLoP y EuroPLoP.
- Experimental Software Engineering to validate or reject hypotesis.

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Work already done

- RA and misuse pattern.
- AsianPLoP and EuroPLoP.

Side work

- Fondecyt Project: Software Development Initiatives to Identify and Mitigate Security Threats – A Systematic Mapping.
  - A systematic mapping has been conducted to cover the existent technologies for identification and mitigation of security threats.
  - A total of 10 different techniques covering threats identification and 8 covering the mitigation of threats were found.
  - All the initiatives were integrated to at least one activity of the Software Development Lifecycle (SDLC), while 7 show signs of being adopted in the industry.
  - The mapping found only 15 studies that covered 11 different iniatiatives.
  - Only two techniques presented scientific evidence of its results through controlled experiments, while others selected studies presented informal case studies or examples.
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  - A Theoretical Framework for quality assessment of security metrics.
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Questions?

¡Muchas Gracias!, Thank you!, Arigatou Gozaimashita!, Grazie!


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