

# Ocaml in a Web Startup

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Ocaml Users Meeting 2010  
Paris, 16<sup>th</sup> of April 2010

Nleyten project

Ocaml and the web

Lambdoc

- Motivation

- Architecture

- Supported markups

- Taming pathological documents

- Features

# The Nleyten project

- ▶ Take user-contributed content to next level:
  - ▶ Go beyond the link-farm;
  - ▶ Allow for rich documents.
- ▶ Make web communities resilient and scalable:
  - ▶ Overcome growth problems;
  - ▶ Tackle the moderation problem.
- ▶ Build on a strong foundation:
  - ▶ Where Ocaml and Ocsigen come in!



lambda cubed

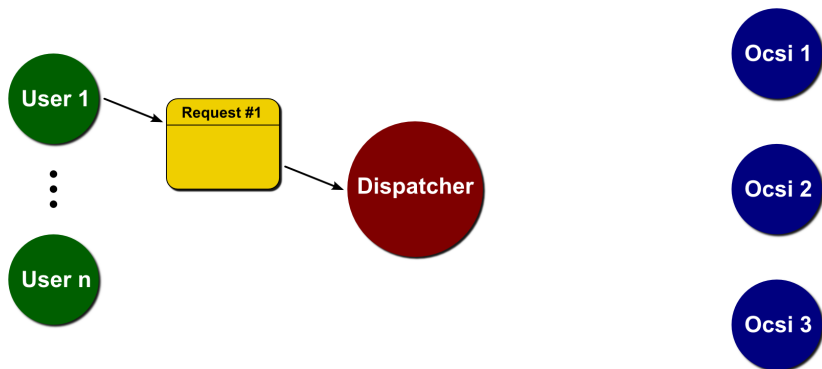
# Ocaml and the web: marriage made in heaven?

- ▶ Ocsigen brings the safety and rich type system of Ocaml into web applications;
- ▶ Type-safety can extend even into the interface with DB backend (cf. PG'OCaml);
- ▶ How does Ocaml's non-concurrent GC fit into highly concurrent web domain?
  - ▶ Ocsigen uses a cooperative green-thread model (LWT);
  - ▶ This model ensures maximum performance per core;
  - ▶ Web is highly concurrent but trivially so.

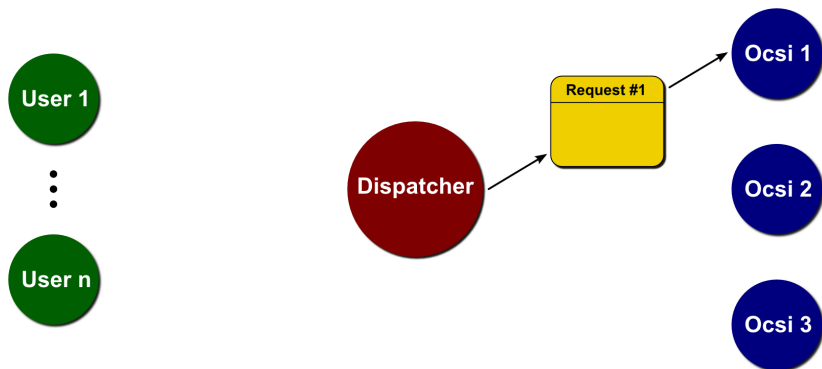
# The dispatcher in practice



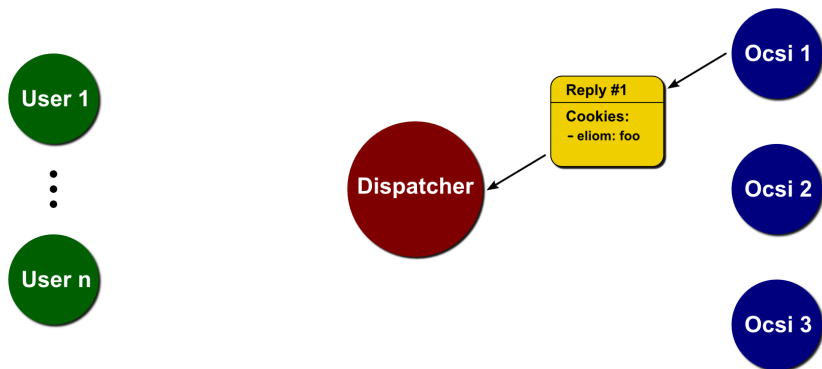
# The dispatcher in practice



# The dispatcher in practice

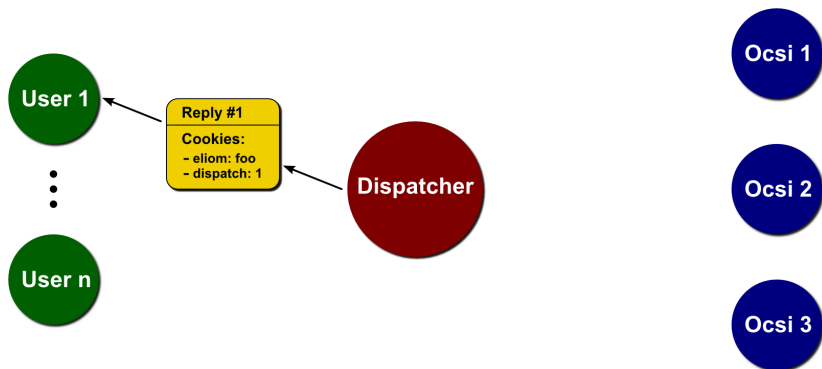


# The dispatcher in practice

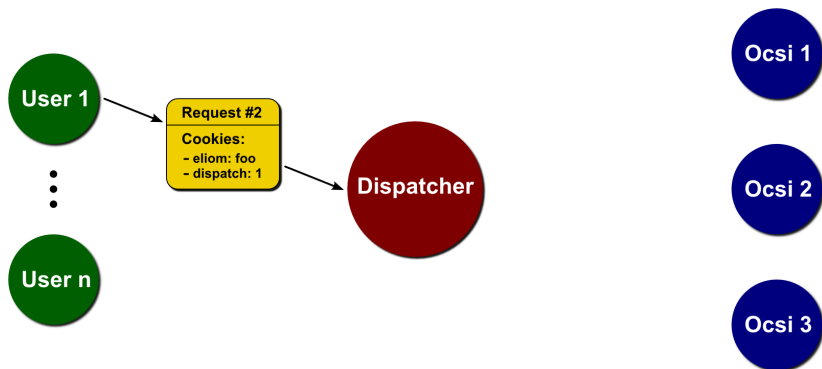




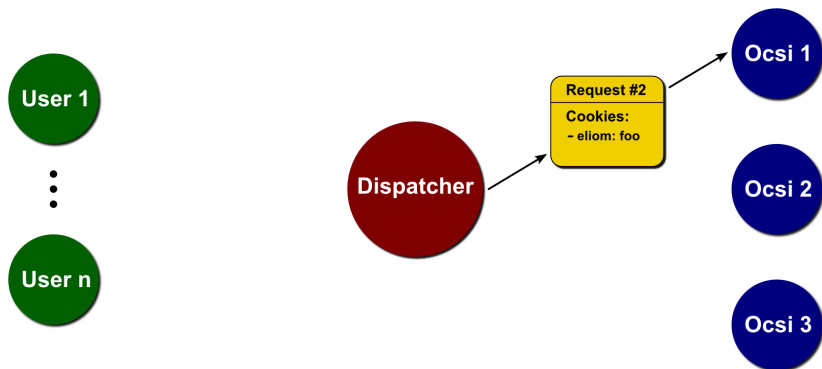
# The dispatcher in practice



# The dispatcher in practice



# The dispatcher in practice



# The Lambdoc library: motivation

# The Lambdoc library: motivation

## My awesome article



Under construction!!!

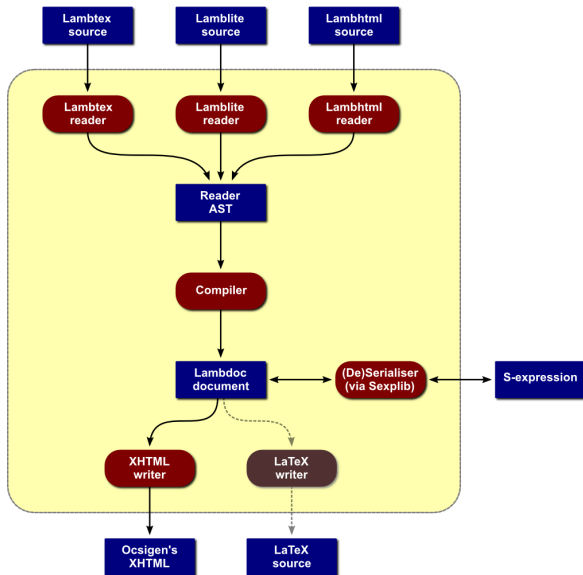
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# What is Lambdoc?

- ▶ Offers support for complex, semantically rich documents in web applications;
- ▶ Built with Ocsigen integration in mind;
- ▶ Distinguishes between two broad classes of documents:
  - ▶ Manuscripts: full-featured (ex: articles);
  - ▶ Compositions: limited (ex: article comments).
- ▶ Includes parsers for three distinct markups:
  - ▶ Lambtex;
  - ▶ Lambhtml;
  - ▶ Lamblite.
- ▶ Includes XHTML.M output.

# Architecture



# Elements (I)

## 1 Paragraphs

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# Elements (II)

## 2 Lists

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# Elements (III)

## 3 Quotation blocks

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# Elements (IV)

## 4 Source code (with syntax highlighting!)

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```
1  type t = One | Two | Three
2
3  let to_string = function
4      | One -> "one"
5      | Two -> "two"
6      | Three -> "three"
```

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# Elements (V)

## 5 Pull-quotes

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“ Weaseling out of things is important to learn: it's what separates us from the animals. Except the weasel.

— Homer Simpson

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# Elements (VI)

## 6 Boxouts

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### WARNING

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# Elements (VII)

## 7 Subpages

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### 1 Introduction

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#### TIP #1

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# Elements (VIII)

## 8 Figures

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**Fig. 1:** This is a square.

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# Elements (IX)

## 9 Tables

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Name	Phone	Address
John	123456	London
Mary	234567	Paris
Mark	345678	Moscow
Jane	456789	Sydney

**Tab. 1:** This is a table.

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# Lambtex

- ▶ Syntax inspired by  $\text{\LaTeX}$  (but without the hairy stuff);
- ▶ Designed with brevity and consistency in mind;
- ▶  $\text{\LaTeX}$  users should grok it immediately;
- ▶ Newbies will find it much simpler than  $\text{\LaTeX}$ ;
- ▶ Supports all the features of the Lambdoc library;
- ▶ <http://lambdoc.forge.ocamlcore.org/lambtex-manual/>

```
\section[sec:intro]{Introduction}
```

This is a paragraph with some `\emph{emphasised}` text and a link to the `\link{http://www.wikipedia.org/}{Wikipedia}`.

This is another paragraph. Note that paragraphs are separated by a blank line. Below is an unordered list:

```
\begin{itemize}  
\item Alpha;  
\item Beta;  
\item Gamma.  
\end{itemize}
```

# Lamblite

- ▶ Light-weight syntax in the guise of Markdown or Wiki markups;
- ▶ Largely compatible with WikiCreole;
- ▶ Does not cover full-range of Lambdoc features;
- ▶ Well-suited for writing comments;
- ▶ <http://lambdoc.forge.ocamlcore.org/lamblite-manual/>

```
= Introduction
```

```
This is a paragraph with some //emphasised// text and bold text  
and a link to [[http://www.wikipedia.org/|Wikipedia]].
```

```
> This is a quotation.
```

```
- Alpha;  
- Beta;  
- Gamma.
```

# Lambhtml

- ▶ XML-based markup, largely compatible with XHTML;
- ▶ May not be user-friendly, but many tools export it;  
(Some people actually enjoy XML – don't ask me why)
- ▶ Element names identical to Lambtex;
- ▶ Supports all the features of the Lambdoc library.

```
<h1>Introduction</h1>

<p>This is a paragraph with some <em>emphasised</em> text and a link
to the <a href="http://www.wikipedia.org/">Wikipedia</a>.</p>

<p>This is another paragraph. Below is an unordered list:</p>

<ul>
<li>Alpha;</li>
<li>Beta;</li>
<li>Gamma.</li>
</ul>
```

# Inline elements

```
type 'a inline_t =  
  [ 'Plain of Ustring.t  
  | 'Entity of Entity.t  
  | 'Linebreak  
  | 'Math of Math.t  
  | 'Bold of 'a nelist  
  | 'Emph of 'a nelist  
  | 'Code of 'a nelist  
  | 'Caps of 'a nelist  
  | 'Ins of 'a nelist  
  | 'Del of 'a nelist  
  | 'Sup of 'a nelist  
  | 'Sub of 'a nelist  
  | 'Mbox of 'a nelist  
  | 'Span of Classname.t option * 'a nelist  
  | 'Link of Uri.t * 'a nelist option  
  | 'See of Ref.t nelist  
  | 'Cite of Ref.t nelist  
  | 'Ref of Ref.t  
  | 'Sref of Ref.t  
  | 'Mref of Ref.t * 'a nelist  
  ] with sexp
```

```
type (+'a, +'b) t = private [< ('a, 'b) t inline_t ] with sexp
```

# The XHTML.M approach

```
type ('a, 'b, 'c) star = ?a:'a attrib list -> 'b elt list -> 'c elt
```

```
val a:
```

```
([< 'Accesskey | 'Charset | 'Class | 'Coords | 'Href | 'Hreflang  
  | 'Id | 'Name_01_00 | 'OnClick | 'OnDblClick | 'OnKeyDown  
  | 'OnKeyPress | 'OnKeyUp | 'OnMouseDown | 'OnMouseMove | 'OnMouseOut  
  | 'OnMouseOver | 'OnMouseUp | 'Rel | 'Rev | 'Shape | 'TabIndex  
  | 'Target | 'Title | 'Type | 'XML_lang ],
```

```
[< 'Abbr | 'Acronym | 'B | 'Bdo | 'Big | 'Br | 'Button | 'Cite  
  | 'Code | 'Del | 'Dfn | 'Em | 'I | 'Img | 'Input | 'Ins | 'Kbd  
  | 'Label | 'Map | 'Noscript | 'Object | 'PCDATA | 'Q | 'Samp  
  | 'Script | 'Select | 'Small | 'Span | 'Strong | 'Sub | 'Sup  
  | 'Textarea | 'Tt | 'Var ],
```

```
[> 'A ]) star
```

# The “grandchild problem”

```
# open XHTML.M;;

# let my_uri = uri_of_string "http://example.com/";;
val my_uri : XHTML.M.uri = <abstr>

# let foo = XHTML.M.a ~a:[a_href my_uri]
  [XHTML.M.a ~a:[a_href my_uri] [pcdata "click"]];;
Error: This expression has type [> 'A ] XHTML.M.elm
      but an expression was expected of type
      [< 'Abbr | 'Acronym | 'B | 'Bdo | 'Big | 'Br | 'Button | 'Cite
       | 'Code | 'Del | 'Dfn | 'Em | 'I | 'Img | 'Input | 'Ins | 'Kbd
       | 'Label | 'Map | 'Noscript | 'Object | 'PCDATA | 'Q | 'Samp
       | 'Script | 'Select | 'Small | 'Span | 'Strong | 'Sub | 'Sup
       | 'Textarea | 'Tt | 'Var ] XHTML.M.elm
The second variant type does not allow tag(s) 'A

# let foo = XHTML.M.a ~a:[a_href my_uri]
  [XHTML.M.span
    [XHTML.M.a ~a:[a_href my_uri] [pcdata "click"]]];;
val foo : [> 'A ] XHTML.M.elm = <abstr>
```

# Constraints on inline elements via phantom types

```
val plain: Ustring.t -> ([> 'Composition ], [> 'Nonlink ]) t
val entity: Entity.t -> ([> 'Composition ], [> 'Nonlink ]) t
val linebreak: unit -> ([> 'Composition ], [> 'Nonlink ]) t
val math: Math.t -> ([> 'Composition ], [> 'Nonlink ]) t
val bold: ('a, 'b) t nelist -> ('a, 'b) t
val emph: ('a, 'b) t nelist -> ('a, 'b) t
val code: ('a, 'b) t nelist -> ('a, 'b) t
val caps: ('a, 'b) t nelist -> ('a, 'b) t
val ins: ('a, 'b) t nelist -> ('a, 'b) t
val del: ('a, 'b) t nelist -> ('a, 'b) t
val sup: ('a, 'b) t nelist -> ('a, 'b) t
val sub: ('a, 'b) t nelist -> ('a, 'b) t
val mbox: ('a, 'b) t nelist -> ('a, 'b) t
val span: Classname.t option -> ('a, 'b) t nelist -> ('a, 'b) t
val link: Uri.t -> ('a, [< 'Nonlink ]) t nelist option -> ('a, [> 'Link ]) t
val see: Ref.t nelist -> ([> 'Manuscript ], [> 'Link ]) t
val cite: Ref.t nelist -> ([> 'Manuscript ], [> 'Link ]) t
val ref: Ref.t -> ([> 'Manuscript ], [> 'Link ]) t
val sref: Ref.t -> ([> 'Manuscript ], [> 'Link ]) t
val mref: Ref.t -> (_, [< 'Nonlink ]) t nelist -> ([> 'Manuscript ], [> 'Link ])
```

# Block elements

```
type 'a block_t =  
  [ 'Paragraph of bool * bool option * Inline.seq_t  
  | 'Itemize of Bullet.t * 'a nelist nelist  
  | 'Enumerate of Numbering.t * 'a nelist nelist  
  | 'Description of (Inline.seq_t * 'a nelist) nelist  
  | ...  
  | 'Verbatim of int * string  
  | 'Image of Image.t  
  | 'Subpage of 'a nelist  
  | 'Decor of Floatation.t * 'a  
  | 'Pullquote of Floatation.t * Inline.seq_t option * 'a nelist  
  | 'Boxout of Floatation.t * Custom.Boxout.t * Inline.seq_t option * 'a nelist  
  | 'Theorem of Custom.Theorem.t * Inline.seq_t option * 'a nelist  
  | 'Equation of Floatation.t * Wrapper.t * Inline.seq_t option * 'a  
  | 'Printout of Floatation.t * Wrapper.t * Inline.seq_t option * 'a  
  | 'Table of Floatation.t * Wrapper.t * Inline.seq_t option * 'a  
  | 'Figure of Floatation.t * Wrapper.t * Inline.seq_t option * 'a  
  | 'Heading of Heading.heading_t  
  | 'Title of Level.title_t * Inline.seq_t  
  | 'Abstract of 'a nelist  
  | 'Rule  
  ] with sexp
```

```
type (+'a, +'b, +'c, +'d, +'e) t = private [< ('a, 'b, 'c, 'd, 'e) t block_t ]
```



# The grandchild problem in block elements

## 10 The grandchild problem

- Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nullam porttitor tincidunt lacus at aliquam. Sed consequat blandit ultrices. Etiam auctor libero at lectus lacinia blandit. Praesent pellentesque tellus vel massa convallis hendrerit. Suspendisse potenti. Morbi vel arcu nisl.

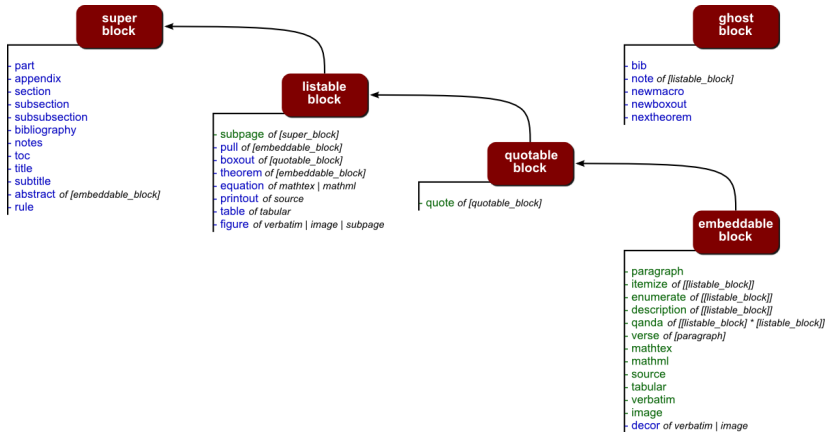
 **WARNING**

1. Alpha
2. Beta
3. Gamma

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- Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nullam porttitor tincidunt lacus at aliquam. Sed consequat blandit ultrices. Etiam auctor libero at lectus lacinia blandit. Praesent pellentesque tellus vel massa convallis hendrerit. Suspendisse

# Hierarchy



# Block elements

```
val itemize: Bullet.t -> ('a, [< 'Listable ], 'c, 'd, _) t nelist nelist ->
  ('a, [> 'Listable ], 'c, 'd, [> 'Itemize_blk ]) t

val verse: ('a, _, _, _, [< 'Paragraph_block ]) t nelist ->
  ('a, [> 'Listable ], [> 'Quotable ], [> 'Embeddable ], [> 'Verse_blk ]) t

val quote: ('a, [< 'Listable ], [< 'Quotable ], _, _) t nelist ->
  ('a, [> 'Listable ], [> 'Quotable ], [> 'Non_embeddable ], [> 'Quote_blk ]) t

val math: Math.t ->
  ([> 'Composition ], [> 'Listable ], [> 'Quotable ], [> 'Embeddable ], [> 'Math_blk ]) t
```

# Features (I)

- Features are runtime configurable via accept/deny/default mechanism:

```
# let deny_list = [ 'Feature_image' ];;  
# let doc =  
  Lambdoc_read_lambtex.Main.ambivalent_manuscript_from_string  
    ~deny_list  
    ~default: 'Accept  
    str;;  
  
# let accept_list = [ 'Feature_plain'; 'Feature_paragraph' ];;  
# let doc =  
  Lambdoc_read_lambtex.Main.ambivalent_manuscript_from_string  
    ~accept_list  
    ~default: 'Deny  
    str;;
```

# Features (II)

## ► Detailed error messages:

Error in line 4:

003	This is a sample paragraph. \bold{This text is bold}.
004	Please check \sref{sec:dev} for more information.
005	Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet.

Reference to an undefined label '**sec:dev**' in command '**\sref**'.

Error in line 14:

013	
014	\begin<lang=foo>{source}
015	let foo = 10

In command '**source**', the key '**lang**' expects a language specifier, yet the assigned value '**foo**' cannot be interpreted as such.

## Features (III)

- ▶ Basic macro mechanism;
- ▶ Command line document processing via Lambcmd:

```
lambcmd --from lambtex --to xhtml --in source.ltex --out index.html
```

- ▶ Parserserver and Lambdoc\_proxy;
- ▶ Built-in serialisation via Sexplib;
- ▶ Native UTF-8 support.

# Lambdoc: the road to 1.0

- ▶ Currently at 0.8.2
- ▶ Before 1.0:
  - ▶ Incorporate user feedback;
  - ▶ Generate APIDOC (PR#4209);
  - ▶ Stress test.
- ▶ More information: <http://lambdoc.forge.ocamlcore.org/>  
(Code is licensed under the GNU GPL v2)

# Q&A