
Introducing LaTeX Base

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LaTeX Base (<https://latexbase.com>) is a web-based \LaTeX editor that provides many useful features such as

- live, compile-as-you-type document preview,
- one-click document publishing and sharing,
- offline mode,
- integrations with file storage services like Google Drive and Dropbox,
- syntax highlighting,
- and familiar keyboard shortcuts for Vim and Emacs users.

This article focuses on the technical side of the interactions between LaTeX Base and \LaTeX . However, we're eager to hear from users about their experiences using the service; please feel free to reach out to us at team@latexbase.com with suggestions or if you'd like to beta test new features. Many features do require a premium membership.

Figure 1 shows the first page presented after loading, with simple LaTeX source on the left and the preview output on the right.

1 Offline mode

One unique aspect of LaTeX Base amongst web applications is that it can be used with or without an Internet connection! This is possible thanks to “service workers”: a recent development in the web platform that allows applications to intercept and cache network requests. That means that you can write your papers on a plane, in a park, or anywhere in between. While LaTeX Base isn't the first web-based \LaTeX editor, it is the only one with this capability.

If you're a programmer as well as a \LaTeX enthusiast, you may suspect that there's a bit more to the story. Service workers allow us to cache the editor, but (\LaTeX) doesn't run in the browser (it's ordinarily compiled to machine code). How can LaTeX Base compile documents without an Internet connection if it's limited to executing JavaScript?

2 Enter Emscripten

The answer lies in a fascinating tool that came out of Mozilla's research group a few years ago called Emscripten (wikipedia.org/wiki/Emscripten), which compiles LLVM bytecode to JavaScript. Many codebases such as Unreal Engine, Bullet Physics, and the Lua programming language (which appears to be of some interest to the greater \LaTeX community) have been ported from C/C++ to JavaScript using Emscripten. In building LaTeX Base, `pdflatex` was

compiled to LLVM bytecode using `clang` and from LLVM to JavaScript using Emscripten.

Whereas similar services send users' documents to servers with installed \LaTeX compilers and packages, LaTeX Base sends the compiler and packages to the browser. In addition to making offline mode possible, compiling in the browser also allows LaTeX Base to compile documents quickly and often — so much so that we can offer a real-time preview instead of requiring the user to compile manually.

3 Packages

Our design goal when considering the issue of packages was to make a large number of packages (eventually anything hosted on the CTAN registry) available to users while only ever downloading the packages needed to compile their documents. What we came up with is lazy package loading. Every time you include a new package in a document with LaTeX Base, you'll download it from our servers. When you use that package in the future it'll be cached in your browser. For this reason, using packages that a user hasn't previously used while offline will not work. You can also expect compiling to take slightly longer the very first time you use a package.

For the time being, we only support a small number (around 25) of the most commonly used packages, but our roadmap includes extending support to arbitrary hosted packages.

4 Images

The only way that our implementation of \LaTeX differs from a standard compiler is in how we handle external files (like images). We don't currently give users direct access to the virtual Emscripten filesystem that \LaTeX sees when it's running on <https://latexbase.com>. Instead, we support calling `\includegraphics` with an image url that we'll fetch and preload in Emscripten's virtual filesystem. When you download your documents, we automatically convert these url identifiers to simple file names and bundle the downloaded images so that no changes are necessary to compile documents elsewhere.

Our roadmap also includes allowing users to upload images and other local resources rather than supplying urls.

5 Conclusion

Web applications are great. They allow users to use software without permanently installing it. The abilities and permissions they're granted by default are very limited compared to native applications, so

The screenshot shows the LaTeX Base web editor interface. The top navigation bar includes 'LaTeX Base' and options for 'IMPORT', 'EXPORT', 'LANGUAGE', 'OVERVIEW', 'PRICING', and 'SIGN UP'. The document name is 'Getting started.tex' and it contains 135 words. The interface is split into two panes: 'LATEX' on the left and 'PREVIEW' on the right.

LATEX Pane:

```

1 \documentclass[12pt]{article}
2 \usepackage{amsmath}
3 \usepackage{hyperref}
4 \usepackage{graphicx}
5 \title{Getting started}
6 \date{\today}
7
8 \begin{document}
9 \maketitle
10
11 Welcome to LaTeX Base, a web-based LaTeX editor with live document preview!
12 Here are some things to try --
13
14 \begin{itemize}
15 \item edit the document name above by typing in the input field
16 \item make changes to the body on the left and see the preview update
17 \item check the compiler output by clicking the log button
18 \item format a mathematical expression like
19 \item  $\int_{-\infty}^{\infty} e^{-\frac{x^2}{2}} dx$ 
20 \item download the document as a pdf by selecting Save To > Local Filesystem
21 \item (or by clicking the cloud download button)
22 \item include an image by url like this one
23 \item \hspace*{0.5in}
24 \item \includegraphics{https://latexbase.com/images/raptor.jpg}
25 \item export your work to Dropbox or Google Drive
26 \end{itemize}
27
28 Editing single page documents online is free. View premium plans and
29 pricing at https://latexbase.com/static/pricing
30 to enjoy unlimited document editing (online or offline) and a variety of other useful features. Thanks for
31 trying
32 out our service and don't hesitate to get in touch at support@latexbase.com!
33 \end{document}
34

```


PREVIEW Pane:

Getting started

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Welcome to LaTeX Base, a web-based LaTeX editor with live document preview! Here are some things to try –

- edit the document name above by typing in the input field
- make changes to the body on the left and see the preview update
- check the compiler output by clicking the log button
- format a mathematical expression like $\frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{-\frac{x^2}{2}} dx$
- download the document as a pdf by selecting Save To > Local Filesystem (or by clicking the cloud download button)



- include an image by url like this one
- export your work to Dropbox or Google Drive

Editing single page documents online is free. View premium plans and pricing at <https://latexbase.com/static/pricing> to enjoy unlimited document editing (online or offline) and a variety of other useful features. Thanks for trying out our service and don't hesitate to get in touch at support@latexbase.com!

1

Figure 1: Getting Started page of LaTeX Base.

they are preferable from a practical security perspective. They're built on open standards, so they run anywhere and don't need to be sanctioned by any organization or app store. Using cutting edge tools, LaTeX Base is able to offer many advanced capabilities right in the browser. In this author's (absolutely biased) opinion, it's on its way to becoming the best way to write L^AT_EX documents.

In closing, I want to recognize Mozilla, not only for their tremendous standards work that's made the web the wonderful thing it is today, but also for their work on components that made LaTeX Base possible including Ace, Emscripten, PDF.js, and localforage.

About the author

Gareth is a New York native living in Portland, OR, with his wife Alison and toddler Albee. He received a BA in Computer Science with a Math minor from Middlebury College and worked in software development, most recently as an engineering lead at Mozilla, before building LaTeX Base. In his free time, he enjoys playing jazz piano and chess.

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