MPlib

ConTEXT

MkIV
We started using MetaPost over ten years ago. Graphics were embedded as eps.

We also added some extensions (using specials) like shading, transparency and support for processcolors, spotcolors and multitones.

By now the mechanisms are pretty stable and frequently used by users. No real in-depth knowledge is needed.

Challenged by Sebastian Rahtz we wrote a MetaPost to pdf converter in TEX so that we could use them directly.

At some point a mechanism appeared to include MetaPost code in the document source. Processing could take place between runs or directly (write18).

Such graphics are rather well integrated in background mechanisms and can adapt themselves to situations.

Reusing graphics has always been part of the game, either or not based on the current state of the document (dimensions, colors, etc.).

Embedding text was taken care of as efficient as possible, later by using some trickery that avoided separate runs altogether.

Graphics know a bit about the current situation, i.e. layout, font and other dimensions are passed along.

Such graphics are rather well integrated in background mechanisms and can adapt themselves to situations.
In education documents we often need backgrounds, rules in margins, underlining and special makeup of section and chapter titles.

This easily mounts up to tens of graphics per page, even when graphic data is collected.

This may add several seconds or runtime per page and more when we deal with text in MetaPost (which can be avoided).

The expectation was that by staying inside \TeX we could gain a lot. Of course MetaPost still had to do some work.

Some experiments (with Fabrice) demonstrated that using pipes was too fragile in the current situation (timing problems).

Using a tight integration (i.e. a library) made more sense and therefore the mplib project was started.

In \Context MkIV we already had reimplemented the MetaPost to pdf converter which in Lua is a bit faster than in \TeX (the bottleneck is now in the literals).

For special purposes like flowcharts and gnuplot graphics runtime may even be more influenced by calling MetaPost.

That library would focus on the graphic part as it was expected that text could be dealt with at the \TeX end.
In order to test the library the MetaPost to pdf converter had to be rewritten (again).

Although we could have used the PostScript parser, it made more sense to operate on the raw output (represented in tables).

Experiments with the first version of the library showed that we could easily get a throughput of thousands of graphics per second (processing and conversion).

The most complex part was (as usual) dealing with paths drawn by special pens, a complication that eventually resulted in a proper helper function.

Multiple runs for a graphic (as used for special text processing and outlines) is handled by MkIV internally in such a way that processing time is hardly influenced.

In order to test the library the MetaPost to pdf converter had to be rewritten (again).

We had expected to be able to use the relative new pre/postscript features of MetaPost, but this mechanism needs to be extended in order to replace all special based tricks.

In everyday documents MetaPost runtime has become close to zero, and in complex documents neglectable compared to the overall runtime.

All that users now see of MetaPost is the reported runtime and of course error messages (these go to the \TeX\ log).
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<tbody>
<tr>
<td>1</td>
<td>All existing mechanisms are supported in ConTeXt MkIV. It really helps that users are eager to update and test.</td>
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<tr>
<td>2</td>
<td>MetaPost format generation is done automatically and are kept in a ConTeXt specific namespace (bound to the TeX format).</td>
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<td>3</td>
<td>Multiple formats are supported but not yet at the user interface level. Soon each graphic can get a format attached.</td>
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<tr>
<td>4</td>
<td>We will also support multiple instances of a format so that user graphics will not interfere with system graphics (this is handy for modules).</td>
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<td>5</td>
<td>Tight integration of MetaPost resulted in many users using these features. We expect even more usage due to the neglectable runtime.</td>
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<td>6</td>
<td>Eventually mplib might produce proper charstrings that then can be used to construct (and extend) real fonts on the fly.</td>
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<td>7</td>
<td>In our reference document of (currently) 240 pages the 66 graphics take .35 seconds. The speed gain is even more noticeable for the LuaTeX manual.</td>
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<td>8</td>
<td>Document styles that operate close to what is reasonable now behave rather normal. We currently test these mechanisms on real projects.</td>
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<td>9</td>
<td>We will use mplib for runtime font generation. Tests show that a generation speed of 500-1000 glyphs with pens per second uncached is feasible (Dell M90 with Vista).</td>
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