

The background of the entire image is a repeating pattern of small, light gray circular arrows. Each arrow is composed of a thin circle with a small arrowhead pointing in a clockwise direction. These arrows are arranged in a grid-like fashion, covering the entire background.

lua tools
mtxrun
context

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1 Remark

This manual is work in progress. Feel free to submit additions or corrections. Before you start reading, it is good to know that in order to get starting with CONTEXT, the easiest way to do that is to download the standalone distribution from contextgarden.net. After that you only need to make sure that `luatex` is in your path. The main command you use is then `context` and normally it does all the magic it needs itself.

2 Introduction

Right from the start CONTEXT came with programs that managed the process of T_EX-ing. Although you can perfectly well run T_EX directly, it is a fact that often multiple runs are needed as well as that registers need to be sorted. Therefore managing a job makes sense.

First we had T_EXEXEC and T_EXUTIL, and both were written in MODULA, and as this language was not supported on all platforms the programs were rewritten in PERL. Following that a few more tools were shipped with CONTEXT.

When we moved on to RUBY all the PERL scripts were rewritten and when CONTEXT MkIV showed up, LUA replaced RUBY. As we use L^AT_EX this means that currently the tools and the main program share the same language. For MkII scripts like T_EXEXEC will stay around but the idea is that there will be LUA alternatives for them as well.

Because we shipped many scripts, and because the de facto standard T_EX directory structure expects scripts to be in certain locations we not only ship tools but also some more generic scripts that locate and run these tools.

3 The location

Normally you don't need to know so many details about where the scripts are located but here they are:

```
<texroot>/scripts/context/perl
```

```
<texroot>/scripts/context/ruby
<texroot>/scripts/context/lua
<texroot>/scripts/context/stubs
```

This hierarchy was actually introduced because CONTEX was shipped with a bunch of tools. As mentioned, we nowadays focus on LUA but we keep a few of the older scripts around in the PERL and RUBY paths. Now, if you're only using CONTEX MkIV, and this is highly recommended, you can forget about all but the LUA scripts.

4 The traditional finder

When you run scripts multiple times, and in the case of CONTEX they are even run inside other scripts, you want to minimize the startup time. Unfortunately the traditional way to locate a script, using `kpsewhich`, is not that fast, especially in a setup with many large trees. Also, because not all tasks can be done with the traditional scripts (take format generation) we provided a runner that could deal with this: `texmfstart`. As this script was also used in more complex workflows, it had several tasks:

- locate scripts in the distribution and run them using the right interpreter
- do this selectively, for instance identify the need for a run using checksums for potentially changed files (handy for image conversion)
- pass information to child processes so that lookups are avoided
- choose a distribution among several installed versions (set the root of the TEX tree)
- change the working directory before running the script
- resolve paths and names on demand and launch programs with arguments where names are expanded controlled by prefixes (handy for TEX-unaware programs)
- locate and open documentation, mostly as part the help systems in editors, but also handy for seeing what configuration file is used
- act as a KPSEWHICH server cq. client (only used in special cases, and using its own database)

Of course there were the usual more obscure and undocumented features as well. The idea was to use this runner as follows:

```
texmfstart texexec <further arguments>
texmfstart --tree <rootoftree> texexec <further arguments>
```

These are just two ways of calling this program. As `texmfstart` can initialize the environment as well, it is basically the only script that has to be present in the binary path. This is quite comfortable as this avoids conflicts in names between the called scripts and other installed programs.

Of course calls like above can be wrapped in a shell script or batch file without penalty as long as `texmfstart` itself is not wrapped in a caller script that applies other inefficient lookups. If you use the CONTEX minimals you can be sure that the most efficient method is chosen, but we've seen quite inefficient call chains elsewhere.

In the CONTEX minimals this script has been replaced by the one we will discuss in the next section: `mtxrun` but a stub is still provided.

5 The current finder

In MkIV we went a step further and completely abandoned the traditional lookup methods and do everything in LUA. As we want a clear separation between functionality we have two main controlling scripts: `mtxrun` and `luatools`. The last name may look somewhat confusing but the name is just one on in a series.¹

In MkIV the `luatools` program is nowadays seldom used. It's just a drop in for `kpsewhich` plus a bit more. In that respect it's rather dumb in that it does not use the database, but clever at the same time because it can make one based on the little information available when it runs. It can also be used to generate format files either or not using LUA stubs but in practice this is not needed at all.

For CONTEX users, the main invocation of this tool is when the TEX tree is updated. For instance, after adding a font to the tree or after updating CONTEX, you need to run:

```
mtxrun --generate
```

After that all tools will know where to find stuff and how to behave well within the tree. This is because they share the same code, mostly because they are started using `mtxrun`. For instance, you process a file with:

```
mtxrun --script context <somefile>
```

Because this happens often, there's also a shortcut:

```
context <somefile>
```

But this does use `mtxrun` as well. The help information of `mtxrun` is rather minimalistic and if you have no clue what an option does, you probably never needed it anyway. Here we discuss a few options. We already saw that we can explicitly ask for a script:

```
mtxrun --script context <somefile>
```

but

```
mtxrun context <somefile>
```

also works. However, by using `--script` you limit the lookup to the valid CONTEX MkIV scripts. In the TEX tree these have names prefixed by `mtx-` and a lookup look for a plural as well. So, the next two lookups are equivalent:

```
mtxrun --script font
mtxrun --script fonts
```

Both will run `mtx-fonts.lua`. Actually, this is one of the scripts that you might need when your font database is somehow outdated and not updated automatically:

¹ We have `ctxttools`, `exatools`, `mpstools`, `mtxtools`, `pdftools`, `rlxtools`, `runtools`, `texttools`, `tmftools` and `xmltools`. Most of their functionality is already reimplemented.

`mtxrun --script fonts --reload --force`

Normally `mtxrun` is all you need in order to run a script. However, there are a few more options:

```
mtxrun      | ConTeXt TDS Runner Tool 1.31
mtxrun      |
mtxrun      | --script          run an mtx script (lua preferred method) (--noquotes), no script gives list
mtxrun      | --evaluate        run code passed on the commandline (between quotes)
mtxrun      | --execute         run a script or program (texmfstart method) (--noquotes)
mtxrun      | --resolve         resolve prefixed arguments
mtxrun      | --ctxlua          run internally (using preloaded libs)
mtxrun      | --internal        run script using built in libraries (same as --ctxlua)
mtxrun      | --locate          locate given filename in database (default) or system (--first --all --detail)
mtxrun      |
mtxrun      | --autotree        use texmf tree cf. env texmfstart_tree or texmfstarttree
mtxrun      | --tree=pathtotree use given texmf tree (default file: setup.tex.tmf)
mtxrun      | --environment=name use given (tmf) environment file
mtxrun      | --path=runpath    go to given path before execution
mtxrun      | --ifchanged=filename only execute when given file has changed (md checksum)
mtxrun      | --iftouched=old,new only execute when given file has changed (time stamp)
mtxrun      |
mtxrun      | --makestubs       create stubs for (context related) scripts
mtxrun      | --removestubs     remove stubs (context related) scripts
mtxrun      | --stubpath=binpath paths where stubs will be written
mtxrun      | --windows         create windows (mswin) stubs
mtxrun      | --unix            create unix (linux) stubs
mtxrun      |
mtxrun      | --verbose         give a bit more info
mtxrun      | --trackers=list   enable given trackers
mtxrun      | --progrname=str   format or backend
mtxrun      | --systeminfo=str  show current operating system, processor, etc
mtxrun      |
mtxrun      | --edit            launch editor with found file
mtxrun      | --launch          launch files like manuals, assumes os support (--all)
mtxrun      |
mtxrun      | --timedrun        run a script and time its run
mtxrun      | --autogenerate    regenerate databases if needed (handy when used to run context in an editor)
mtxrun      |
mtxrun      | --usekpse         use kpse as fallback (when no mkiv and cache installed, often slower)
mtxrun      | --forcekpse       force using kpse (handy when no mkiv and cache installed but less functionality)
mtxrun      |
mtxrun      | --prefixes        show supported prefixes
mtxrun      |
mtxrun      | --generate        generate file database
mtxrun      |
mtxrun      | --variables       show configuration variables
mtxrun      | --configurations  show configuration order
mtxrun      |
mtxrun      | --directives      show (known) directives
```

```

mtxrun      | --trackers          show (known) trackers
mtxrun      | --experiments       show (known) experiments
mtxrun      |
mtxrun      | --expand-braces     expand complex variable
mtxrun      | --expand-path       expand variable (resolve paths)
mtxrun      | --expand-var        expand variable (resolve references)
mtxrun      | --show-path         show path expansion of ...
mtxrun      | --var-value         report value of variable
mtxrun      | --find-file         report file location
mtxrun      | --find-path         report path of file
mtxrun      |
mtxrun      | --pattern=string    filter variables
mtxrun      |
mtxrun      |
mtxrun      | More information about ConTeXt and the tools that come with it can be found at:
mtxrun      |
mtxrun      | maillist : ntg-context@ntg.nl / http://www.ntg.nl/mailman/listinfo/ntg-context
mtxrun      | webpage  : http://www.pragma-ade.nl / http://tex.aanhet.net
mtxrun      | wiki     : http://contextgarden.net

```

Don't worry, you only need those obscure features when you integrate CONTEXt in for instance a web service or when you run large projects where runs and paths take special care.

6 Updating

There are two ways to update CONTEXt MkIV. When you manage your trees yourself or when you use for instance T_EX_LI_VE, you act as follows:

- download the file `cont-tmf.zip` from www.pragma-ade.com or elsewhere
- unzip this file in a subtree, for instance `tex/texmf-local`
- run `mtxrun --generate`
- run `mtxrun --script font --reload`
- run `mtxrun --script context --make`

Or shorter:

- run `mtxrun --generate`
- run `mtxrun font --reload`
- run `context --make`

Normally these commands are not even needed, but they are a nice test if your tree is still okay. To some extent `context` is clever enough to decide if the databases need to be regenerated and/or a format needs to be remade and/or if a new font database is needed.

Now, if you also want to run MkII, you need to add:

- run `mktextlsr`
- run `texexec --make`

The question is, how to act when `luatools` and `mtxrun` have been updated themselves? In that case, after unzipping the archive, you need to do the following:

- run `luatools --selfupdate`
- run `mtxrun --selfupdate`

For quite a while we shipped so called ConTeXt minimals. These zip files contained only the resources and programs that made sense for running ConTeXt. Nowadays the minimals are installed and synchronized via internet.² You can just run the installer again and no additional commands are needed. In the console you will see several calls to `mtxrun` and `luatools` fly by.

7 The tools

We only mention the tools here. The most important ones are `context` and `fonts`. You can ask for a list of installed scripts with:

```
mtxrun --script
```

On my machine this gives:

```
mtxrun      | ConTeXt TDS Runner Tool 1.31
mtxrun      |
mtxrun      | no script name given, known scripts:
mtxrun      |
mtxrun      | babel      1.20  Babel Input To UTF Conversion
mtxrun      | base       1.35  ConTeXt TDS Management Tool (aka luatools)
mtxrun      | bibtex     bibtex helpers
mtxrun      | cache      0.10  ConTeXt & MetaTeX Cache Management
mtxrun      | chars      0.10  MkII Character Table Generators
mtxrun      | check      0.10  Basic ConTeXt Syntax Checking
mtxrun      | colors     0.10  ConTeXt Color Management
mtxrun      | convert    0.10  ConTeXt Graphic Conversion Helpers
mtxrun      | distribution 0.10  ConTeXt Distribution Helpers
mtxrun      | epub       1.10  ConTeXt EPUB Helpers
mtxrun      | example    0.10  ConTeXt Example Helpers
mtxrun      | fcd        1.00  Fast Directory Change
mtxrun      | flac       0.10  ConTeXt Flac Helpers
mtxrun      | fonts      0.21  ConTeXt Font Database Management
mtxrun      | grep       0.10  Simple Grepper
mtxrun      | idris      0.10  Special Hacks For Idris
mtxrun      | interface  0.13  ConTeXt Interface Related Goodies
mtxrun      | listen     1.00  ConTeXt Request Watchdog
mtxrun      | metapost   0.10  MetaPost to PDF processor
mtxrun      | metatex    0.10  MetaTeX Process Management
mtxrun      | modules    1.00  ConTeXt Module Documentation Generators
```

² This project was triggered by Mojca Miklavc who is also charge of this bit of the ConTeXt infrastructure. More information can be found at contextgarden.net.

mtxrun	package	0.10	Distribution Related Goodies
mtxrun	patterns	0.20	ConTeXt Pattern File Management
mtxrun	pdf	0.10	ConTeXt PDF Helpers
mtxrun	plain	1.00	Plain TeX Runner
mtxrun	profile	1.00	ConTeXt MkIV LuaTeX Profiler
mtxrun	queue	1.00	Sequential runner
mtxrun	rsync	0.10	Rsync Helpers
mtxrun	scite	1.00	Scite Helper Script
mtxrun	server	0.10	Simple Webserver For Helpers
mtxrun	stubs	0.10	ConTeXt Stub Management
mtxrun	swiglib	1.00	ConTeXt Swiglib Updater
mtxrun	tds	0.10	TeX Directory Structure Tools
mtxrun	testsuite	1.00	Experiments with the testsuite
mtxrun	texworks	1.00	TeXworks Startup Script
mtxrun	timing	0.10	ConTeXt Timing Tools
mtxrun	tools	1.01	Some File Related Goodies
mtxrun	tracing	1.00	MkIV LuaTeX Profiler
mtxrun	unicode	1.02	Checker for char-def.lua
mtxrun	unzip	0.10	Simple Unzipper
mtxrun	update	1.02	ConTeXt Minimals Updater
mtxrun	update	1.02	ConTeXt Minimals Updater
mtxrun	watch	1.00	ConTeXt Request Watchdog
mtxrun	web	0.10	Some (Private) Webservice Goodies
mtxrun	youless	1.00	YouLess Fetcher

The most important scripts are **mtx-fonts** and **mtx-context**. By default fonts are looked up by filename (the **file:** prefix before font names in CONTEX is default). But you can also lookup fonts by name (**name:**) or by specification (**spec:**). If you want to use these two methods, you need to generate a font database as mentioned in the previous section. You can also use the font tool to get information about the fonts installed on your system.

8 Running CONTEX

The **context** tool is what you will use most as it manages your run.

mtx-context		ConTeXt Process Management 0.62
mtx-context		
mtx-context		basic options:
mtx-context		
mtx-context	--run	process (one or more) files (default action)
mtx-context	--make	create context formats
mtx-context		
mtx-context	--ctx=name	use ctx file (process management specification)
mtx-context	--noctx	ignore ctx directives and flags
mtx-context	--interface	use specified user interface (default: en)
mtx-context		
mtx-context	--autopdf	close pdf file in viewer and start pdf viewer afterwards
mtx-context	--purge	purge files either or not after a run (--pattern=...)

```

mtx-context | --purgeall      purge all files either or not after a run (--pattern=...)
mtx-context |
mtx-context | --usemodule=list load the given module or style, normally part of the distribution
mtx-context | --environment=list load the given environment file first (document styles)
mtx-context | --mode=list      enable given the modes (conditional processing in styles)
mtx-context | --path=list      also consult the given paths when files are looked for
mtx-context | --arguments=list set variables that can be consulted during a run (key/value pairs)
mtx-context | --randomseed=number set the randomseed
mtx-context | --result=name    rename the resulting output to the given name
mtx-context | --trackers=list  set tracker variables (show list with --showtrackers)
mtx-context | --directives=list set directive variables (show list with --showdirectives)
mtx-context | --silent=list    disable logcategories (show list with --showlogcategories)
mtx-context | --noconsole      disable logging to the console (logfile only)
mtx-context | --purgeresult    purge result file before run
mtx-context |
mtx-context | --forcexml       force xml stub
mtx-context | --forcecld       force cld (context lua document) stub
mtx-context | --forcelua       force lua stub (like texlua)
mtx-context | --forcemp        force mp stub
mtx-context |
mtx-context | --arrange        run extra imposition pass, given that the style sets up imposition
mtx-context | --noarrange      ignore imposition specifications in the style
mtx-context |
mtx-context | --jit            use luajitex with jit turned off (only use the faster virtual machine)
mtx-context | --jiton         use luajitex with jit turned on (in most cases not faster, even slower)
mtx-context |
mtx-context | --once          only run once (no multipass data file is produced)
mtx-context | --runs          process at most this many times
mtx-context | --forcedruns    process this many times (permits for optimization trial runs)
mtx-context |
mtx-context | --batchmode      run without stopping and do not show messages on the console
mtx-context | --nonstopmode    run without stopping
mtx-context | --synctex       run with synctex enabled (optional value: zipped, unzipped, 1, -1)
mtx-context |
mtx-context | --generate       generate file database etc. (as luatools does)
mtx-context | --paranoid      do not descend to .. and ../..
mtx-context | --version       report installed context version
mtx-context |
mtx-context | --global        assume given file present elsewhere
mtx-context | --nofile        use dummy file as jobname
mtx-context |
mtx-context |
mtx-context | More information about ConTeXt and the tools that come with it can be found at:
mtx-context |
mtx-context | maillist : ntg-context@ntg.nl / http://www.ntg.nl/mailman/listinfo/ntg-context
mtx-context | webpage  : http://www.pragma-ade.nl / http://tex.aanhet.net
mtx-context | wiki     : http://contextgarden.net

```

There are few expert options too:

```
mtx-context | ConTeXt Process Management 0.62
mtx-context |
mtx-context | expert options:
mtx-context |
mtx-context | --touch           update context version number (also provide --expert, optionally provide --basepath)
mtx-context | --nostatistics    omit runtime statistics at the end of the run
mtx-context | --update          update context from website (not to be confused with contextgarden)
mtx-context | --profile         profile job (use: mtxrun --script profile --analyze)
mtx-context | --timing           generate timing and statistics overview
mtx-context | --keep Tuc        keep previous Tuc files (jobname-tuc-[run].tmp)
mtx-context | --keeplog         keep previous log files (jobname-log-[run].tmp)
mtx-context |
mtx-context | --extra=name      process extra (mtx-context-... in distribution)
mtx-context | --extras          show extras
mtx-context |
mtx-context | special options:
mtx-context |
mtx-context | --pdftex          process file with texexec using pdftex
mtx-context | --xetex           process file with texexec using xetex
mtx-context | --mkii            process file with texexec
mtx-context |
mtx-context | --pipe            do not check for file and enter scroll mode (--dummyfile=whatever.tmp)
mtx-context |
mtx-context | --sandbox         process file in a limited environment
mtx-context |
mtx-context |
mtx-context | More information about ConTeXt and the tools that come with it can be found at:
mtx-context |
mtx-context | maillist : ntg-context@ntg.nl / http://www.ntg.nl/mailman/listinfo/ntg-context
mtx-context | webpage  : http://www.pragma-ade.nl / http://tex.aanhet.net
mtx-context | wiki     : http://contextgarden.net
```

You might as well forget about these unless you are one of the `ConTeXt` developers.

9 Prefixes

A handy feature of `mtxrun` (and as most features an inheritance of `texmfstart`) is that it will resolve prefixed arguments. This can be of help when you run programs that are unaware of the `TEX` tree but nevertheless need to locate files in it.

```
mtxrun      | ConTeXt TDS Runner Tool 1.31
mtxrun      |
mtxrun      |
mtxrun      | auto: env: environment: file: filename: full: home: jobfile: jobpath: kpse: loc: locate: machine: nodename:
path: pathname: rel: relative: release: selfautodir: selfautoloc: selfautoparent: sysname: toppath: version:
```

An example is:

```
mtxrun --execute xsltproc file:whatever.xsl file:whatever.xml
```

The call to `xsltproc` will get two arguments, being the complete path to the files (given that it can be resolved). This permits you to organize the files in a similar way as \TeX files.

10 Stubs

As the tools are written in the LUA language we need a LUA interpreter and of course we use \LaTeX itself. On UNIX we can copy `luatools` and `mtxrun` to files in the binary path with the same name but without suffix. Starting them in another way is a waste of time, especially when `kpsewhich` is used to find them, something which is useless in MkIV anyway. Just use these scripts directly as they are self contained.

For `context` and other scripts that we want convenient access to, stubs are needed, like:

```
#!/bin/sh
mtxrun --script context "$@"
```

This is also quite efficient as the `context` script `mtx-context` is loaded in `mtxrun` and uses the same database.

On Windows you can copy the scripts as-is and associate the suffix with \LaTeX (or more precisely: `texlua`) but then all LUA script will be run that way which is not what you might want.

In \TeX LIVE stubs for starting scripts were introduced by Fabrice Popineau. Such a stub would start for instance `texmfstart`, that is: it located the script (PERL or RUBY) in the \TeX tree and launched it with the right interpreter. Later we shipped pseudo binaries of `texmfstart`: a RUBY interpreter plus scripts wrapped into a self contained binary.

For MkIV we don't need such methods and started with simple batch files, similar to the UNIX startup scripts. However, these have the disadvantage that they cannot be used in other batch files without using the `start` command. In \TeX LIVE this is taken care of by a small binary written by T.M. Trzeciak so on \TeX LIVE 2009 we saw a call chain from `exe` to `cmd` to `lua` which is somewhat messy.

This is why we now use an adapted and stripped down version of that program that is tuned for `mtxrun`, `luatools` and `context`. So, we moved from the original `cmd` based approach to an `exe` one.

```
mtxrun.dll
mtxrun.exe
```

You can copy `mtxrun.exe` to for instance `context.exe` and it will still use `mtxrun` for locating the right script. It also takes care of mapping `texmfstart` to `mtxrun`. So we've removed the intermediate `cmd` step, can not run the script as any program, and most of all, we're as efficient as can be.

Of course this program is only meaningful for the \ConTeXt approach to tools.

It may all sound more complex than it is but once it works users will not notice those details. Als, in practice not that much has changed in running the tools between MkII and MkIV as we've seen no reason to change the methods.

Colofon

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