



luatools 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 TEX-ing. Although you can perfectly well run TEX 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 TEXexec and TEXutil, 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 LuaTEX this means that currently the tools and the main program share the same language. For MkII scripts like TEXexec 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 TEX 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 ConT_EXt 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 ConT_EXt 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 ConT_EXt 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 T_EX 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 T_EX-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 ConT_EXt minimals you can be sure that the most efficient method is chosen, but we've seen quite inefficient call chains elsewhere.

In the ConT_EXt 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 ConT_EXt users, the main invocation of this tool is when the T_EX tree is updated. For instance, after adding a font to the tree or after updating ConT_EXt, 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>
```

¹ We have `ctxtools`, `exatools`, `mpstools`, `mtxtools`, `pdftools`, `rlxtools`, `runtools`, `textools`, `tmftools` and `xmltools`. Most if their functionality is already reimplemented.

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 ConT_EXt MkIV scripts. In the T_EX 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:

```
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 1.32
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) (=loop) (exit|quit
aborts)
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      | --tree=pathtotree use given texmf tree (default file: setuptex.tmf)
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 | --addbinarypath     prepend the (found) binarypath to runners
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,--list)
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 | --resolve-path      expand variable (completely resolve paths)
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 ConT_EXt 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 ConT_EXt MkIV. When you manage your trees yourself or when you use for instance T_EXLive, 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 `mktexlsr`
- 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 ConT_EXt minimalists. These zip files contained only the resources and programs that made sense for running ConT_EXt. Nowadays

the minimalists 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 1.32
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      | dvi        0.10 ConTeXt DVI Helpers
mtxrun      | epub       1.10 ConTeXt EPUB Helpers
mtxrun      | evohome    1.00 Evohome Fetcher
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      | install    2.00 ConTeXt Installer
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
mtxrun      | package    0.10 Distribution Related Goodies
mtxrun      | patterns   0.20 ConTeXt Pattern File Management
```

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

| | | | |
|--------|-----------|------|-----------------------------------|
| 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 | synctex | 1.00 | ConTeXt SyncTeX Checker |
| 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 | 1.03 | ConTeXt Minimals Updater |
| mtxrun | update | 1.02 | ConTeXt Minimals Updater |
| mtxrun | vscode | | vscode extension generator |
| mtxrun | watch | 1.00 | ConTeXt Request Watchdog |
| mtxrun | web | 0.10 | Some (Private) Webservice Goodies |
| mtxrun | youless | 1.10 | 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 ConTeXt 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 CONTEXt

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

| | | |
|-------------|-------------|---|
| mtx-context | | ConTeXt Process Management 1.03 |
| 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 | --strip | strip Lua code (only meant for production where no errors are expected) |
| mtx-context | --errors=list | show errors at the end of a run, quit when in list (also when --silent) |
| mtx-context | --htmlerrorpage | generate html error page instead (optional: =scite) |
| 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 luajit with jit turned off (only use the faster virtual machine) |
| mtx-context | --jiton | use luajit 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 | | |
| mtx-context | --nosynctex | never initializes synctex (for production runs) |
| mtx-context | --synctex | run with synctex enabled (better use \setupsynctex[state=start]) |
| mtx-context | | |
| mtx-context | --nodates | omit runtime dates in pdf file (optional value: a number (this 1970 offset time) or string "YYYY-MM-DD HH:MM") |
| mtx-context | --nocompression | forcefully turns off compression in the backend |
| mtx-context | --trailerid | alternative trailer id (or constant one) |
| 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 1.03
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 | --profile        profile job (use: mtxrun --script profile --analyze)
mtx-context | --timing          generate timing and statistics overview
mtx-context | --keepuc         keep previous tuc files (jobname-tuc-[run].tmp)
mtx-context | --keeplog        keep previous log files (jobname-log-[run].tmp)
mtx-context | --lmtx           force lmtx mode (when available)
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 | --addbinarypath prepend the (found) binarypath to runners
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 ConT_EXt 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 T_EX tree but nevertheless need to locate files in it.

```
mtxrun      | ConTeXt TDS Runner Tool 1.32
mtxrun      |
mtxrun      |
mtxrun      | auto: env: environment: file: filename: full: home: 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 T_EX files.

10 Stubs

As the tools are written in the Lua language we need a Lua interpreter and of course we use LuaT_EX 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 LuaT_EX (or more precisely: `texlua`) but then all Lua script will be run that way which is not what you might want.

In T_EXLive 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 T_EX 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 T_EXLive this is taken care of by a small binary written by T.M. Trzeciak so on T_EXLive 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 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 ConT_EXt approach to tools.

It may all sound more complex than it is but once it works users will not notice those details. Also, 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.

11 A detailed look at `mtxrun`

This section is derived from Taco Hoekwaters presentation and article for the 2018 ConT_EXt meeting. You might want to read this if you want to benefit from even the most obscure features. There is a bit of repetition with the previous sections but so be it.

11.1 Common flags

Much of the code inside MkIV can alter its behaviour based on either 'trackers' (which add debugging information to the terminal and log output) or 'directives' or 'experiments' (for getting code to perform some alternate behaviour). Since this also affects the Lua code within `mtxrun` itself, it makes sense to list these options first.

Trackers enable more extensive status messages on the console or in ConT_EXt additional visual clues. Directives change behaviour that is not part of the official interface and have no corresponding commands. Experiments are like directives but not official (yet).

```
--trackers
  show (known) trackers

--directives
  show (known) directives

--experiments
  show (known) experiments
```

Enabling directives, trackers and experiments:

```
--trackers=list
  enable given trackers

--directives=list
  enable given directives

--experiments=list
  enable given experiments
```

The next tree (hidden) options are converted into ‘directives’ entries, that are then enabled. These are just syntactic sugar for the relevant directive.

```
--silent[=...]
  sets logs.blocked={\%s}

--errors[=...]
  sets logs.errors={\%s}

--noconsole
  sets logs.target=file
```

As you can see here, various directives (and even some trackers) have optional arguments, which can make specifying such directives on the command line a bit of a challenge. Explaining the details of all the directives is outside of the scope of this article, but you can look them up in the ConT_EXt source by searching for `directives.register` and `trackers.register`.

In verbose mode, `mtxrun` itself gives more messages, and it also enables `resolvers.locating`, which is a tracker itself:

`--verbose`
give a bit more info

The `--timedlog` (hidden) option starts the `mtxrun` output with a timestamp line:

`--timedlog`
prepend output with a timestamp

11.2 Setup for finding files and configurations

The next block of options deals with the setup of `mtxrun` itself. You do not need to deal with these options unless you are messing with the ConTeXt distribution yourself instead of relying on a prepackaged solution, or you need to use `kpathsea` for some reason (typically in a MkII environment). In particular, `--progrname` and `--tree` are often needed as well when using the `kpse` options.

`--configurations`
show configuration order, alias `--show-configurations`

`--resolve`
resolve prefixed arguments, see `--prefixes`, below

and:

`--usekpse`
use `kpse` as fallback (when no MkIV and cache installed, often slower)

`--forcekpse`
force using `kpse` (handy when no MkIV and cache installed but less functionality)

`--progrname=str`
format or backend

`--tree=pathtotree`
use given texmf tree (default file: `setuptex.tmf`)

We don't provide such a `.tmf` file in the distribution.

11.3 Options for finding files and reporting configurations

Once the configuration setup is done, it makes sense to have a bunch of options to use and/or query the configuration.

--locate

locate given filename in database (default) or system (uses the sub--options **--first**, **--all** and **--detail**)

--autogenerate

regenerate databases if needed (handy when used to run context in an editor)

--generate

generate file database

--prefixes

show supported prefixes for file searches

--variables

show configuration variables (uses the sub--option **--pattern**, and an alias is **--show-variables**)

--expansions

show configuration variable expansion (uses the sub--options **--pattern**, alias **--show-expansions**)

--expand-braces

expand complex variable

--resolve-path

expand variable (completely resolve paths)

--expand-path

expand variable (resolve paths)

--expand-var

expand variable (resolves references inside variables, alias **--expand-variable**)

--show-path

show path expansion of ... (alias **--path-value**)

--var-value

report value of variable (alias **--show-value**)

`--find-file`report file location; it uses the sub-options `--all`, `--pattern`, and `--format``--find-path`

report path of file

Hidden option:

`--format-path`

report format path

11.4 Running code

Here we come to the core functionality of `mtxrun`: running scripts. First there are few options that trigger how the running takes place:

`--path=runpath`

go to given path before execution

`--ifchanged=filename`only execute when given file has changed (this loads and saves an md5 checksum from `filename.md5`)`--iftouched=old,new`

only execute when given file has changed (time stamp)

`--timedrun`

run a script or program and time its run (external)

Specifying both `--iftouched` and `--ifchanged` means both are tested, and when either one is false, nothing will happen. These options have to come before one of the next options:

`--script`run an `mtx` script (where Lua is the preferred method); it has the sub-options `--nofiledatabase`, `--autogenerate`, `--load`, and `--save`. The latter two are currently no-ops

--execute

run a script or program externally (`texmfstart` method); it has sub-option `--noquotes`

--internal

run a script using built-in libraries (alias is `--ctxlua`)

--direct

run an external program; it has the sub-option `--noquotes`

Since scripts potentially have their own options, any options intended for `mtxrun` itself have to come *before* the option that specifies the script to run, and options for the script itself have to come *after* the option that gives the script name. This is especially true when using `--script`, so it is important to check the order of your options.

Of the four above options, `--script` is the most important one, since that is the one that finds and executes the Lua `mtxrun` scripts provided by the distribution. With `--nofiledatabase`, it will not attempt to resolve any file names (which means you need either a local script or a full path name). On the opposite side, when you also provide `--autogenerate`, it will not only attempt to resolve the file name, it will also regenerate the database if it cannot find the script on the first try. In a future version of ConTeXt, the `--load` and `--save` will allow you to save/restore the current command line in a file for reuse.

The shell return value of `mtxrun` indicates whether the script was found. When you specify something like `--script base`, `mtxrun` actually searches for `mtx-base.lua`, `mtx-bases.lua`, `mtx-t-base.lua`, `mtx-t-bases.lua`, and `base.lua`, in that order. The distribution-supplied scripts normally use `mtx-<name>.lua` as template. The template names with `mtx-t-` prefix is reserved for third-party scripts, and `<name>.lua` is just a last-ditch effort if nothing else works. Scripts are looked for in the local path, and in whatever directories the configuration variable `LUAINPUTS` points to.

The `--execute` option exists mostly for the non-Lua MkII scripts that still exist in the distribution. It will try to find a matching interpreter for non-Lua scripts, and it is aware of a number of distribution-supplied scripts so that if you specify `--execute texexec`, it knows that what you really want to execute is `ruby texexec.rb`. Support is present for Ruby (`.rb`, Lua (`.lua`), python (`.py`) and Perl (`.pl`) scripts (tested in that order). File resolving uses `TEXMFSCRIPTS` from the configuration. The shell return value of `mtxrun` indicates whether the script was found and executed.

The `--internal` option uses the file search method of `--execute`, but then assumes this is a Lua script and executes it internally like `--script`. This is useful if you have a Lua script in an odd location.

The last of the four options, `--direct`, directly executes an external program. You need to give the full path for binaries not in the current shell `PATH`, because no searching is done at all. The shell return value of `mtxrun` in this case is a boolean based on the return value of `os.exec()`.

It is also possible to execute bare Lua code directly:

```
--evaluate
```

run code passed on the command-line (between quotes)

11.5 Options for maintenance of `mtxrun` itself

None of these are advertised. Normally developers should be the only ones needing them, but if you made a change to one of the distributed libraries (maybe because of a beta bug), you may need to run `--selfmerge` and `--selfupdate`.

```
--selfclean
```

remove embedded libraries

```
--selfmerge
```

update embedded libraries in `mtxrun.lua`

```
--selfupdate
```

copy `mtxlua.lua` to the executable directory, renamed `mtxrun`

11.6 Creating stubs

Stubs are little shortcuts that live in some binaries directory. For example, the content of the Unix-style `context` shell command is:

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

Apart from the `context` command itself (which is provided by the distribution), use of stubs is discouraged. Still, the `mtxrun` options are there because sometimes existing workflows depend on executable tool names like `ctxtools`.

- `--makestubs`
create stubs for (context related) scripts
- `--removestubs`
remove stubs (context related) scripts
- `--stubpath=binpath`
paths where stubs will be written
- `--windows`
create windows (mswin) stubs (alias `--mswin`)
- `--unix`
create unix (linux) stubs (alias `--linux`)

11.7 Remaining options

The remaining options are hard to group into a subcategory. These are the advertised options:

- `--systeminfo`
show current operating system, processor, et cetera
- `--edit`
launch editor with found file; the editor is taken from the environment variable `MTXRUN_EDITOR`, or `TEXMFSTART_EDITOR`, or `EDITOR`, or as a last resort: `gvim`
- `--launch`
launch files like manuals, assumes os support (uses the sub-options `--all`, `--pattern` and `--list`)

While these are sort of hidden options:

- `--ansi`
colorize output to terminal using ansi escapes
- `--associate`
launch files like manuals, assumes os support. this function does not do any file searching, so you have to use either a local file or a full path name

`--exporthelp`output the `mtxrun` xml help blob (useful for creating man and html help pages)`--fmt`shortcut for `--script base --fmt``--gethelp`attempt to look up remote `context` command help (uses the sub-options `--command` and `--url`)`--help`print the `mtxrun` help screen`--locale`force setup of locale; unless you are certain you need this option, stay away from it, because it can interfere massively with ConT_EXt's Lua code`--make`(re)create format files (aliases are `--ini` and `--compile`)`--platform`(alias is `--show-platform`)`--run`shortcut for `--script base --run``--version`print `mtxrun` version

11.8 Known scripts

When you run `mtxrun --scripts`, it will output a list of ‘known’ scripts. The definition of ‘known’ is important here: the list comprises the scripts that are present in the same directory as `mtx-context.lua` that do not have an extra hyphen in the name (like `mtx-t-...scripts` would have). In a normal installation, this means it ‘knows’ almost all the scripts that are distributed with ConT_EXt. Note: it skips over any files from the distribution that do have an extra hyphen, like the `mtx-server` support scripts.

Since this section is about `mtxrun`, I’ll just present the list of the scripts that are ‘known’ in the current ConT_EXt beta as output by `mtxrun` itself, and not get into detail about all of the script functionality (they all have `--help` options if you want to find out more). Where we still felt the need to explain something, there is an extra bit of text in italics.

babel

Babel Input To UTF Conversion

base

ConTeXt TDS Management Tool (aka luatools)

bibtex

bibtex helpers (obsolete)

cache

ConTeXt & MetaTeX Cache Management

chars

MkII Character Table Generators

check

Basic ConTeXt Syntax Checking

Occasionally useful on big projects, but be warned that it does not actually run any T_EX engine, so it is not 100% reliable.

colors

ConTeXt Color Management

This displays icc color tables by name

convert

ConTeXt Graphic Conversion Helpers

A wrapper around ghostscript and imagemagick that offers some extra (batch processing) functionality.

dvi

ConTeXt DVI Helpers

epub

ConTeXt EPUB Helpers

The EPUB manual ([epub-mkiv.pdf](#)) explains how to use this script.

evohome

Evohome Fetcher

Evohome is a domotica system that controls your central heating

fcd

Fast Directory Change

flac

ConTeXt Flac Helpers

Extracts information from `.flac` audio files into an xml index.

fonts

ConTeXt Font Database Management

grep

Simple Grepper

interface

ConTeXt Interface Related Goodies

metapost

MetaPost to PDF processor

metatex

MetaTeX Process Management (obsolete)

modules

ConTeXt Module Documentation Generators

package

Distribution Related Goodies

This script is used to create the generic ConT_EXt code used in LuaL^AT_EX c.s.

patterns

ConTeXt Pattern File Management

Hyphenation patterns, that is . . .

pdf

ConTeXt PDF Helpers

plain

Plain TeX Runner

profile

ConTeXt MkIV LuaTeX Profiler

rsync

Rsync Helpers

scite

Scite Helper Script

server

Simple Webserver For Helpers

There are some subscripsts associated with this.

synctex

ConTeXt SyncTeX Checker

texworks

TeXworks Startup Script

timing

ConTeXt Timing Tools

tools

Some File Related Goodies

unicode

Checker for `char-def.lua`

unzip

Simple Unzipper

update

ConTeXt Minimals Updater

`watch`

ConTeXt Request Watchdog

`youless`

YouLess Fetcher

YouLess is a domotica system that tracks your home energy use.

11.9 Writing your own

A well-written script has some required internal structure. It should start with a module definition block. This gives some information about the module, but more importantly, it prevents double-loading.

Here is an example:

```
if not modules then modules = { } end
```

```
modules ['mtx-envttest'] = {
  version    = 0.100,
  comment    = "companion to mtxrun.lua",
  author     = "Taco Hoekwater",
  copyright  = "Taco Hoekwater",
  license    = "bsd"
}
```

Next up is a variable containing the help information. The help information is actually a bit of xml stored in Lua string. In the full example listing at the end of this article, you can see what the internal structure is supposed to be like.

```
local helpinfo = [[
<?xml version="1.0"?>
<application>
  ....
</application>
]]
```

And this help information is then used to create an instance of an `application` table.

```
local application = logs.application {
  name      = "envttest",
  banner    = "Mtxrun environment demo",
```

```

    helpinfo = helpinfo,
}

```

After this call, the `application` table contains (amongst some other things) three functions that are very useful:

`identify()`

Prints out a banner identifying the current script to the user.

`report(str)`

For printing information to the terminal with the script name as prefix.

`export()`

Prints the `helpinfo` to the terminal, so it can easily be used for documentation purposes.

Next up, it is good to define your scripts' functionality in functions in a private table. This prevents namespace pollution, and looks like this:

```

scripts          = scripts          or { }
scripts.envtest = scripts.envtest or { }

function scripts.envtest.runtest()
    application.report("script name is " .. environment.ownname)
end

```

And finally, identify the current script, followed by handling the provided options (usually with an `if-else` statement).

```

if environment.argument("exporthelp") then
    application.export()
elseif environment.argument('test') then
    scripts.envtest.runtest()
else
    application.help()
end

```

11.10 Script environment

`mtxrun` includes lots of the internal Lua helper libraries from ConTEXt. We actually maintain a version of the script without all those libraries included, and before every

(beta) ConT_EXt release, an amalgamated version of `mtxrun` is added to the distribution. In the merging process, all comments are stripped from the embedded libraries, so if you want to know details, it is better to look in the original Lua source file.

Inside `mtxrun`, the full list of embedded libraries can be queried via the array `own.libs`:

```
l-lua.lua l-macro.lua l-sandbox.lua l-package.lua l-lpeg.lua l-function.lua l-
string.lua l-table.lua l-io.lua l-number.lua l-set.lua l-os.lua l-file.lua l-gzip.lua l-
md5.lua l-url.lua l-dir.lua l-boolean.lua l-unicode.lua l-math.lua util-str.lua util-
tab.lua util-fil.lua util-sac.lua util-sto.lua util-prs.lua util-fmt.lua trac-set.lua trac-
log.lua trac-inf.lua trac-pro.lua util-lua.lua util-deb.lua util-tpl.lua util-sbx.lua util-
mrg.lua util-env.lua luat-env.lua lxml-tab.lua lxml-lpt.lua lxml-mis.lua lxml-aux.lua
lxml-xml.lua trac-xml.lua data-ini.lua data-exp.lua data-env.lua data-tmp.lua data-
met.lua data-res.lua data-pre.lua data-inp.lua data-out.lua data-fil.lua data-con.lua
data-use.lua data-zip.lua data-tre.lua data-sch.lua data-lua.lua data-aux.lua data-
tmf.lua data -lst.lua util-lib.lua luat-sta.lua luat-fmt.lua
```

In fact, the Lua table `own` contains some other useful stuff like the script's actual disk name and location (`own.name` and `own.path`) and some internal variables like a list of all the locations it searches for its embedded libraries (`own.list`), which is used by the `--selfmerge` option and also allows the non-amalgamated version to run (since otherwise `--selfmerge` could not be bootstrapped).

`mtxrun` offers a programming environment that makes it easy to write Lua script. The most important element of that environment is a Lua table that is conveniently called `environment` (`util-env` does the actual work of setting that up).

The bulk of `environment` consists of functions and variables that deal with the command-line given by the user as `mtxrun` does quite a bit of work on the given command-line. The goal is to safely tuck all the given options into the `arguments` and `files` tables. This work is done by two functions called `initializearguments()` and `splitarguments()`. These functions are part of the `environment` table, but you should not need them as they have been called already once control is passed on to your script.

arguments

These are the processed options to the current script. The keys are option names (without the leading dashes) and the value is either `true` or a string with one level of shell quotes removed.

files

This array holds all the non-option arguments to the current script. Typically, those are supposed to be files, but they could be any text, really.

getargument(name, partial)

Queries the `arguments` table using a function. Its main reason for existence is the `partial` argument, which allows scripts to accept shortened command-line options (alias: `argument()`).

setargument(name, value)

Sets a value in the `arguments` table. This can be useful in complicated scripts with default options.

In case you need access to the full command-line, there are some possibilities:

arguments_after

These are the unquoted but otherwise unprocessed arguments to your script as an array.

arguments_before

These are the unquoted but otherwise unprocessed arguments to `mtxrun` before your scripts' name (so the last entry is usually `--script`).

rawarguments

This is the whole unprocessed command-line as an array.

originalarguments

Like `rawarguments`, but with some top-level quotes removed.

reconstructcommandline(arg, noquote)

Tries to reconstruct a command-line from its arguments. It uses `originalarguments` if no `arg` is given. Take care: due to the vagaries of shell command-line processing, this may or may not work when quoting is involved.

`environment` also stores various bits of information you may find useful:

validengines

This table contains keys for `luatex` and `luajittex`. This is only relevant when `mtxrun` itself is called via LuaTeX's `luaonly` option.

basicengines

This table maps executable names to **validengines** entries.

default_texmfcnf

This is the **texmfcnf** value from **kpathsea**, processed for use with MkIV in the unlikely event this is needed.

homedir

The user's home directory.

ownbin

The name of the binary used to call **mtxrun**.

ownmain

The mapped version of **ownbin**.

ownname

Full name of this instance of **mtxrun**.

ownpath

The path this instance of **mtxrun** resides in.

texmfos

Operating system root directory path.

texos

Operating system root directory name.

texroot

ConT_EXt root directory path.

As well as some functions:

texfile(filename)

Locates a T_EX file.

luafile(filename)

Locates a Lua file.

loadluafile(filename, version)

Locates, compiles and loads a Lua file, possibly in compressed **.luc** format. In the compressed case, it uses the **version** to make sure the compressed form is up-to-date.

`luafilechunk(filename,silent,macros)`

Locates and compiles a Lua file, returning its contents as data.

`make_format(name,arguments)`

Creates a format file and stores it in the ConT_EXt cache, used by `mtxrun --make`.

`relativepath(path,root)`

Returns a modified version of `root` based on the relative path in `path`.

`run_format(name,data,more)`

Run a T_EX format file.

11.11 Shell return values

As explained earlier, the shell return value of `mtxrun` normally indicates whether the script was found. If you are running a ConT_EXt release newer than September 2018 and want to modify the shell return value from within your script, you can use `os.exitcode`. Whatever value you assign to that variable will be the shell return value of your script.

Colofon

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Taco Hoekwater, extra `mtxrun` section

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