

logging: structured logging for gretl

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1 Introduction

This addon provides structured logging for gretl; that is, a means of recording the history and progress of a computation as a log of events.

There are in principle two roles involved in logging—the *coder* (the writer of a hansl script or function package) and the *user* (the person running the script or package)—although one person may play both roles.

The *coder* gets to decide which events will be logged, and the importance or “level” to be assigned to each event. This is done by means of the logging functions `Debug`, `Info`, `Warn`, `Error` and `Critical` (in increasing order of importance). Each of these functions requires a single string argument and offers no return value. For example, the signature of `Info` is

```
void Info (const string msg)
```

The coder must include the following statement prior to calling these functions:

```
include logging.gfn
```

The *user* determines which log messages will be shown, by selecting a threshold: print only messages of a specified level or above. This is done via the command

```
set loglevel <level>
```

where `<level>` can be given by number or name, as shown below.

| number | name | associated function |
|--------|----------|---------------------|
| 0 | debug | Debug |
| 1 | info | Info |
| 2 | warn | Warn |
| 3 | error | Error |
| 4 | critical | Critical |

The default level is 2 or warn, so messages set via the `Debug` and `Info` functions will not be printed unless the user specifies a lower threshold. A user who does not care to see warning messages can raise the threshold to 3 or error.

2 Remarks

Using structured logging provides some advantages over using `print` or `printf` statements:

1. It gives control over the visibility and presentation of messages without editing the source code. For example, the code

```
Debug("This is a debugging message")
```

will produce no output by default; such messages are printed only if the user selects a verbose level of logging.

2. It's cheap to leave debugging statements like this in the source code: the program evaluates the message only if it is currently called for.
3. Log messages can have timestamps, and can be written to a separate file which can be analysed afterwards. More on these points below.

Note that the message passed to a logging function does not have to a fixed piece of text. You can incorporate current state information by means of the `sprintf` function, as in this example

```
Warn(sprintf("The matrix X looks funny:\n%12g\n", X))
```

which prints the elements of `X` following the message.

The table below may be helpful in determining which level of logging to use for which purpose.¹

| | |
|----------|--|
| Debug | Detailed information, typically of interest only when diagnosing problems. |
| Info | Confirmation that things are working as expected. |
| Warn | An indication that something unexpected happened, or indicative of some problem in the near future (e.g. "disk space low"). The software is still working as expected. |
| Error | Due to a more serious problem, the software has not been able to perform some function. |
| Critical | A serious error, indicating that the program itself may be unable to continue running. |

3 Timestamps

Optionally, the user can arrange for each logging message to show a timestamp. This is achieved via the command

```
set logstamp on
```

And timestamps can be turned off via "set logstamp off".

Suppose a function contains the following statement, triggered when an argument `x` is negative:

```
Warn("x is negative")
```

Without a timestamp the output will be

```
WARNING: x is negative
```

With a timestamp it will resemble the following, showing date, time and time-zone:

```
WARNING 2021-07-08 10:26:44 EDT: x is negative
```

¹It is borrowed from <https://docs.python.org/3/howto/logging.html>.

4 Logging to file

By default log messages are printed to the same place (window, file, or whatever) as regular program output. But the `set` variable `logfile` can be used to redirect logging output. For example, if you specify

```
set logfile "mylog.txt"
```

logging output will go `mylog.txt`. Note that when a simple filename is given, as above, the file will be written in the user's working directory. To take control over its location you can supply a full path. You can also specify the "file" as `stdout` or `stderr` (without quotes) to send logging to the standard output or standard error streams, respectively.

5 A simple example

Listing 1 illustrates usage on the part of both coder (in the function `testlog`) and user. You can try uncommenting the "set" lines in the main script to see their effect.

```
include logging.gfn

function void testlog (scalar x)
    Debug("Here in function testlog")
    Info(sprintf("testlog: x = %g", x))
    if missing(x)
        Error("x value is invalid")
    elif x < 0
        Warn("x is negative")
    endif
end function

/* main script */

# set loglevel info
# set logstamp on
# set loglevel debug
testlog(3)
testlog(-1)
testlog(NA)
```

Listing 1: Sample usage of logging functionality

6 Accessors

The settings of `loglevel`, `logstamp` and `logfile` can be accessed via `$loglevel`, `$logstamp` and `$logfile`, respectively. The first two accessors return a numerical value (0/1 for `logstamp`); `$logfile` returns an empty string if redirection is not set. However, these accessors are basically internals of the addon, unlikely to be of interest to its users.

7 Changelog

2021-07-08 Initial version.