LaTeX Dogwagger

[A different approach to documentation]

Version 2.0.0

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Contents

1 Introduction

LaTeX Dogwagger is a solution to a pernicious problem. All too often programmers write a magnificent program, and then *document* their creation as a sort of 'addendum'. Put another way, the documentation is separate and looks tacked on, something like the stumpy, customarily docked tail of a large rottweiler. Dogwagger tries to address this by integrating the documentation and the program. The program becomes something which is pulled out of the documentation, rather than the other way around.[1]

For example, in the wonderful programming language Perl, there's a variety of conventions that allow you to mark sections of the program with an equals sign, followed by a name. All of the subsequent code is ignored by Perl until a magic line beginning with the expression `=cut` is encountered. A separate program can then be used to pull out the *cut* sections and assemble them into some sort of documentation. This approach is called POD, or 'Plain Old Documentation'. Dogwagger, although it is written in Perl, is somewhat more sophisticated.[2]

Here's a short list of Dogwagger features:

- Complete code can be generated for a variety of languages, including C, C++, Perl, and so forth;
- Multiple files can be produced on demand, for example C++ .CPP files, and .H header files;
- Binary code can be turned into files, where required.
- The tail wags the dog.

The last feature simply means that the source code which magically generates these files is *also* the documentation. Documentation is always written in LaTeX, because we believe LaTeX is the best way of producing elegant documentation. We simply place all relevant *code* inside the LaTeX source code, within `verbatim` statements. When you submit this source code to LaTeX, it makes an appropriate document (we normally create PDF documents, for great Web portability). When you submit the same source code to DogWagger, it magically creates all of the relevant Perl, C++ or other files.

[1] Okay, we freely admit that we only thought up the idea 90% of the way through our current project, so all of my documentation, including DogWagger itself, is less than perfect by virtue of having been added. Here's to the future!

[2] In the sense of being smart and somewhat elegant, not in the original meaning of the word which is 'mixed up'. Well, come to think of it, we do mix things up slightly, but that's another story!

1.1 Advantages of Dogwagger

These are many:

- All program code and documentation is seamlessly integrated;
- Updates are concurrent. You can update program and documentation at one go, and generate program *or* documentation by simply submitting the same file to either LaTeX or Dogwagger;
- Binary code is integrated (as required) with other code, without needing fancy tools or many different types of file;
- As Dogwagger is available under the GNU public licence, it'll aways be freely available without charge.

The source code of this file (Dogwagger20.tex) is available under the GNU public licence for download from anaesthetist.com. As a tiny frill you only have to download the single file *Dogwagger20.tex*. If you now say:

```
perl Dogwagger20.tex
```

...then Perl will run the .TEX file as a Perl script (without amendment) and our DogWagger program can be used without further ado! You can even submit the file `Dogwagger20.tex` to *itself* to generate a functioning Perl program! And you can generate the documentation you're currently reading by submitting the *same file* to LaTeX![3] We use PdfLatex, but with small modifications you might use other tools to generate whatever LaTeX documentation you need.[4]

How did we do this? For this file only, we've used the pernicious old Perl POD approach of having `=cut` statements within the .TEX document. As we've already mentioned, Dogwagger is more subtle. We explore exactly how Dogwagger works below, but first, the disadvantages of Dogwagger.

1.2 Disadvantages of Dogwagger

There are a few:

- If you can't write LaTeX, you're stuffed. (Learn LaTeX)!

[3] Note however that a single minor error will result; it's better to insert a single percentage sign at the top of the .TEX file before submitting this file to LaTeX.

[4] Of course, you can simply download the file *Dogwagger20.pl* from the same site, but we liked the paradox of a file generating itself!

- You have to know how to submit a Perl program to Perl. But you've already learnt this above!
- Your expensive word processor may give you more trouble with editing the .TEX source than an inexpensive (WinEdt) or free (MSDos Edit, vim, Notepad) word processor.[5]
- If you wish to generate binary files and include them in your documentation/program, you'll have to find a program which can UUencode. Gosh. Here's one!
- The pressure is now on you to produce good documentation. Is this a disadvantage? Microsoft might think so!
- You have to include all of the code for the program. Is this a disadvantage?

Now let's explore how Dogwagger actually works. But first, an important note...

1.3 GNU Public Licence

This program is distributed under the Gnu Public Licence (GPL). A copy should accompany any distribution. For details of the GPL, see Appendix A, at the end of this document.

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[5] This is sure to bring out the inadequacies of people who *simply must* drive big cars, fast yachts, or fancy word processors!

2 How to use Dogwagger

If you read the LaTeX source for *this file*, then you'll see Dogwagger in action! But to get a bit more than a flavour read the following documentation thoroughly. The basic idea is something like this:

1. Create your LaTeX documentation;
2. Insert arbitrary chunks of program within the documentation as `\verbatim` comments — these chunks will eventually all be concatenated into one long program file!
3. Dress things up a little.

That's really it. The dressing up is very easy indeed. The only *really important* piece of dressing up is something which must be inserted in the first four lines of the file. We call it the *title line*, and it runs like this:

```
% LaTeX DogWagger version='2.0.0' fileTarget='foo.pl'
```

If such a line isn't present, and you submit a file for Dogwagger to parse, then she will complain bitterly. You'll also get warnings if the version number is wrong. See how, in LaTeX-like style, we submit parameters in between a 'backtick' and a conventional single quote! The `fileTarget` instruction is self-explanatory.

There are a two other parameters you will almost certainly use on this important title line. They are:

- `startComment='#'`
- `noWarn='yes'`

The `startComment` option specifies how lines will be commented out. This is important because DogWagger normally writes a few lines at the start of a generated file saying where the file came from and when it was created. In addition, separate sections in the generated program code are separated by comments.

Different programming languages use different character sequences to signal a comment line — for example, C++ uses a double slash `//`, and Perl uses a hash character #, otherwise known as a 'pound' or even a 'tictactoe'! As most grown up C compilers also now permit the `//` convention, we've not implemented the old-fashioned, ugly C `/*` comment style `*/`. The default comment character is the Perl one, which is worse than useless if you happen to be creating C++ files.

By default, Dogwagger kindly warns you before it overwrites files, but you can override this behaviour using `noWarn`.

2.1 Making multiple files

Part of the way through your code, you may wish to terminate the current program file you're creating (and documenting), and start a new file. For example, you may have discussed (and created) the main CPP program, and now wish to do the same for the .H header file. This is pretty easy. In the line *immediately preceding* the next `verbatim` section, insert a commented line like the following:

```
% DogWagger newTarget='foobar.h' newComment='//'
```

We will refer to such a line as *preamble*. Remember to comment the line out in LaTeX using a percentage character as the *first character* of the preamble line. See how we use `newComment` and `newTarget` to remind ourselves that this isn't the first file specified in the title line, but a subsequent one.

Files within directories

We deliberately don't encourage files generated by DogWagger to be written to obscure locations. They should generally be placed in the current directory, but if a subdirectory exists, then the files can be written to that subdirectory thus:

```
% DogWagger newTarget='foo/bar.c' newComment='//'
```

This statement creates the file *bar.c* in the subdirectory *foo*.

2.2 Suppressing unwanted *verbatim* sections

Within your normal LaTeX documentation, you may wish to include a `verbatim` section which *must not* appear within the final program you will generate. Here's how:

```
% DogWagger dogsAllowed='no'
```

Simply insert the above line immediately prior to the verbatim section you wish to suppress!

2.3 Minor frills and restrictions

Each `verbatim` section begins with `\begin{verbatim}` and ends with `\end{verbatim}`. In between there *must* be at least one whole line of data, otherwise DogWagger will choke. Another minor irritation is that even if verbatim statements have been commented out in LaTeX, they will still be seen by DogWagger (we might consider revising this)!

There are several little conveniences in DogWagger. You can label the comment at the start of each section using a line like the following *immediately preceding* a `verbatim` section:

```
% DogWagger sectionTitle='Fred'
```

Again, the line preceding the verbatim section is commented out in LaTeX. We then use `sectionTitle` to provide a label. We can do slightly more fancy things:

```
% DogWagger sectionTitle='Fred: Section $[SECTION]'
```

...which actually uses Dogwagger's internal section counter to replace `$[SECTION]` with the relevant section number.

Writing code as a single line

Occasionally it's convenient to write several lines of verbatim text as a single line of output. Dogwagger to the rescue with the `oneLine='yes'` command! Note that in this mode, trailing spaces count, but the leading spaces on the next line are removed. All other whitespace is preserved *as is*.

2.4 Deferred code

In version 2.0 of Dogwagger, we introduced the ability to move code sections down below other sections. In other words, we can now *defer* writing of a code section until other sections on which it *depends* have been written to the output file.

For example, when discussing SQL code, we might wish to talk about the main table first, but in the final code we will first want to define the minor tables on which the main table depends!

To make use of this facility, use the following commands:

```
% DogWagger dependsOn='alpha'
```

...or even, if something depends on several other sections:

```
% DogWagger dependsOn='alpha,beta,gamma'
```

The name of the section depended on is then given by:

```
% DogWagger myName='alpha'
```

When a dependsOn statement is encountered the assumption is made that *all*

of the names depended on have *not yet been defined*! If any of them had already, then the smart user would simply leave them out!

Note that an item can have both a myName and dependsOn values. In this case, the name is kept pending until all dependsOn values have been fulfilled, at which point the item is written to output, and then only is the name of the item itself resolved. (Self-dependence will necessarily result in an unresolved dependency, and thus an error).

2.5 Including binary files

Occasionally it may be necessary to include a binary file with your source code. Because such files are inscrutable (and potentially harmful) this is a practice to avoid, but unfortunately it's sometimes vital to include small binary files. Dogwagger meets this need by allowing UUencoded files to be included in `verbatim` sections thus:

```
% DogWagger newTarget='uudecode'
```

In other words, the only 'filename' which is reserved is `uudecode`. If this name is specified, then (as is usual for uunecoded files) the filename is picked out of the subsequent uuencoded information (located within the verbatim statement). You'll find a (uuencoded) uunecoding program in Appendix B!

Note that for reasons best know to us (if at all) that the first file specified (in the header line) *cannot* be a uuencoded file. Regard this as a feature rather than a bug!

2.6 Making a debug version!

Here's a command which you can *only* include in the title line:

- `include='everything'`

This wrinkle allows us to create two versions of code, a *debug* version, and a production version. By default, if you *omit* the above command from the title line, then the production version is created. If you include it, then we make a debug version. And what's the difference? Well, if Dogwagger encounters a line within a `verbatim` section which begins with the sequence:

```
+OPTIONAL
```

...then by default all of the code (including the OPTIONAL statement itself) is *omitted* until the terminating sequence:

```
-OPTIONAL
```

is encountered later on. ‘Including everything’ forces Dogwagger to include the optional code contained between these two keywords.

In many languages, there are ways of creating debug versions, for example the C++ `#define` followed by `#ifdef` and so on, but our way is more explicit and simpler.[6]

[6] We considered having an optional parameter after the OPTIONAL statement to allow multiple versions, but rejected this as extremely silly.

3 The source code of Dogwagger

Here's the Dogwagger version 2.0 code. Run the program from the command line using

```
perl Dogwagger20.pl
```

First we have the conventional shebang line, followed by the packages required. We use the Tk toolkit to give us a simple graphical user interface. Ignore the '=name' and '=cut' statements, as they are merely a convenience to permit the original TEX file to be executed as a Perl script![7]

```
=cut
#!/usr/local/bin/perl -w

use strict;
use Tk;
require Tk::Dialog;
require Tk::Toplevel;
# require Tk::Font;

  # This program is distributed under the Gnu Public Licence (GPL).
  # You should have received a copy of the GNU General Public License
  # along with this program; if not, write to the Free Software
  # Foundation, Inc., 59 Temple Place - Suite 330,
  # Boston, MA  02111-1307, USA.

my $ERR;               # ugly global error;
my $ERRCOUNT;          # similarly nasty;
my $LINECOUNT;         # this is also a nasty global;
my $SECTIONTITLE;      # me too.

my $MAJORVERSION = 2;
my $MINORVERSION = 0;
my $TINYVERSION  = 0;   # version 1.0.0
my $BUG = 0;            # are we debugging (0=no)

=part2
```

3.1 Initialisation

We keep a record of what happened in a file *WAGLOG.LOG*. After getting the time (and printing it), we create version 2.0 arrays for deferred writing of code (See section 2.4).

[7] As discussed above!

```
=cut

my $filelog;
$filelog="WAGLOG.LOG";
open FILELOG, ">$filelog" or
     die "*CRASH* Could not open LOG $filelog :$!\n";
print FILELOG "LaTeX DogWagger, Version \
  $MAJORVERSION.$MINORVERSION.$TINYVERSION\n";

my $TODAY = &GetLocalTime();
print ("\n TODAY: $TODAY\n");
my @CHILDREN;
my @DEPENDENCIES;
my @PENDINGNAME;
=part3
```

The deferred arrays are CHILDREN (an array of sections which depend on other named sections, and haven't yet been written to file), DEPENDENCIES which stores the corresponding names *depended on*, and PENDINGNAME, which stores the name of each child, if that child has a name.

Each child contains multiple lines which will only be written to file when all of the dependencies of the child have been satisfied. As each name is encountered, it is removed from each dependency list where it occurs. If a dependency list becomes EMPTY in this process, the corresponding item is written to output.

4 Creating the main window

Next, we use Tk to open up a user interface. The ugly global variable `fred` is used for filename input — how imaginative!

```
=cut
my $fred;  # file name
$fred = "";

my $MAINW = new MainWindow;
   $MAINW->geometry('300x200');  # dimensions
   $MAINW->geometry('+80+30');   # screen offset!
   $MAINW->title("DogWagger Version $MAJORVERSION.$MINORVERSION.$TINYVERSION");
   $MAINW->focusFollowsMouse;    # change focus mode

my $FIRSTARG;
$FIRSTARG = $ARGV[0]; # allow command line for simple stuff!
if ((defined $FIRSTARG) && ((length $FIRSTARG) > 0))
   {  # &Alert ($MAINW, "First argument is $FIRSTARG");
     $fred = $FIRSTARG;
```

```
   }

=part3a
```

We put the control buttons in a separate frame in the main Tk window.

```
=cut
my $bottomFrame = $MAINW->Frame();
   $MAINW->Label( -text => 'Enter source file name')->pack();
my $txt = $MAINW->Entry( -textvariable => \$fred)->pack(-padx => 50,
                                                        -pady => 15,
                                                        -ipadx => 5);
   $txt->configure (-validatecommand => [ \&CheckFred, $MAINW],
                                -validate => 'focusout');
my $goBut = $MAINW->Button( -text => 'Wag',
                                -command => [ \&WagTheDog, $MAINW ] );
   $goBut->configure(-background => 'green');
   $goBut->configure(-width => 20);
my $quitBut = $bottomFrame->Button(-text => 'Quit',
              -command => [ \&ByeForNow, $MAINW ] );
   $quitBut->configure(-background => 'red');
   $quitBut->configure(-width => 20);
$quitBut->pack();
$goBut->pack();
$bottomFrame->pack(-side => 'bottom', -fill => 'both',

                   -pady => 20);
MainLoop;

=part4
```

The controls are really simple — a text Entry box for the file name, an execution (‘Wag’) button, and a red quit button. And that’s really that for the main section. Next we have the main function which does the ‘wagging work’.

5 The principal function

As the name suggests, `WagTheDog` does the work. There are several ugly features apart from its length, including use of the nasty global `fred`. We submit the current window, `thisW`.

```
=cut
sub WagTheDog
{
  my($thisW);
    ($thisW)=@_;
  my ($MANDATORY, $OPTN);
  $OPTN = 0; # default is capture
  print FILELOG "\n ------------------------";
  &Debug($thisW, "\n\n You specified <$fred>\n");
  if (length $fred < 1)
     { &Alert($thisW, "First enter file name, e.g. PerlPgm.tex");
       return;
     };
  my($FRED, $hotline, $i);
  $FRED = $fred;
  $ERRCOUNT = 0;

=part5a
```

5.1 Preliminaries

After some debugging statements and a check for the presence of a filename string, we clear the various arrays, and set up `myNam`, which stores a pending name about to be resolved. We only 'resolve' myNam once the code associated with the name *has been* written, at which point all of the dependent code is written, if indicated.

```
=cut
  @CHILDREN = ();
  @DEPENDENCIES = ();
  @PENDINGNAME = ();
    $CHILDREN[0]='';
    $DEPENDENCIES[0]='';
    $PENDINGNAME[0]='';
  my($myNam);

=part5b
```

Let's open the source file, failing if this opening fails:

```
=cut
   $LINECOUNT = 0;
   $ERR = 0; #hideous
     open FRED, $FRED
          or &GlobalError("Could not open source $FRED :$!");
     if ($ERR)
        { $ERRCOUNT ++; # bump error count
          &Alert($thisW, $ERR);
          return;
        };
=part5c
```

5.2 Finding the header line

Next, scan through the first four lines for the header line, failing if the header line isn't found.

```
=cut
     $i = 4;
     while ($i > 0)
       { $_ = <FRED>;
         $LINECOUNT ++;
         &Debug($thisW, "$_");
         if ( /\%.*LaTeX DogWagger/ )
            { $i = 0;  # force end
            };
         $i --;
       };
  if (! $i)  # if DogWagger found, $i should be -1.
     { &Caution($thisW, "DogWagger data not found in <$fred>");
       close FRED;
       return;
     };
  $hotline = $_;  # redundant
=part5d
```

Okay, we might even look for sequences such as \%, but we won't get too anal.

5.3 Checking the version

We check for version compatibility, and also extract the name of the target file, comment character sequence, and warning/mandatory flags. The MANDATORY variable tells us whether to insert debug code (bracketed by +/- OPTIONAL statement lines).

```
=cut
  my ($version, $DOGFILE, $startComment, $nowarn);
  my($majorVersion, $minorVersion);
  ($version, $DOGFILE, $startComment, $nowarn, $MANDATORY) =
     &ReadHeader($hotline);
  if (! $MANDATORY)
     { &Debug($thisW, "\n Optional text NOT included");
     };
  $_ = $version;
  /(.+)\.(.+)\.(.+)/;  # pull out major and minor version numbers:
  $majorVersion = $1;
  $minorVersion = $2;  # ignore trivial version number = $3

  if ($majorVersion > $MAJORVERSION)
     { &Caution($thisW,
     "Warning: DogWag(V$MAJORVERSION.$MINORVERSION \
     won't support all features of V$majorVersion.$minorVersion");
     } else
     { if (  ($majorVersion == $MAJORVERSION)
           &&($minorVersion > $MINORVERSION)
          )
          { &Caution($thisW, "Caution: minor version switch.\
            Problems may abound!");
          };
     };
=part5e
```

We give appropriate warnings if the major or minor version numbers of Dogwagger and the file being translated aren't compatible. Trivial version numbers (the third part of the dotted version number) are ignored.

5.4 Opening the target file

We open the target file, using the name provided, and fail if this fails.

```
=cut
  my ($c, $ok, $wagline);
  $c = $startComment; # shorter. hmm. clumsy.
  if (! OpenTargetFile($thisW, $DOGFILE, $c, $FRED, $nowarn))
       { return;  #fail
       };

=part5f
```

5.5 Read source and process

Now we're ready to read in the source file, and process it. There is a small 'bug' in that a verbatim statement which has been commented out will still trigger action. Hmm. A biig `while` statement surrounds everything, within which we read each line in turn and process it. Several startup flags control interpretation, the most important being `ishot`, which determines whether we are actively writing lines, or just throwing away LaTeX text.

```
=cut
     my($ishot, $hotdata, $chomper, $chomped);
     my($nodogs);
     my($SECTION);
     $SECTION = 1;

     $ishot = 0;
     $chomper = 0;  # default is OFF
     $chomped = 0;
     $SECTIONTITLE = ''; # default is empty
     $ok=1;
     $nodogs=0; # default

while($ok)
  { $_ = <FRED>;
    $LINECOUNT ++;

    if (! defined)
       { $ok = 0;
       } else
       { if (! $ishot) # if not writing
            { if ( /\\begin\{verbatim\}(.*)/ )
                 { if (! $nodogs)
                      { $ishot = 1; # turn on
                        $hotdata = $1;
                        $SECTION = &PrintSectionHeader($c, $SECTION);
                        print DOGFILE $hotdata; # clumsy but explicit
                      };
                 } else
# see comment [1] below
{   my($depOn);
    $myNam = '';
    $depOn = '';
    $nodogs = 0;
    if (/^\%.*DogWagger/)
       { if ( /dogsAllowed=\'no\'/)
            { $nodogs = 1;
            } else
            { $wagline = $_;
```

```
            if (/dependsOn=\‘(.+?)\’/)
               { $depOn = $1;
                 print FILELOG "\n Section dependencies <$depOn>";
               };
            if (/myName=\‘(.+?)\’/)
               { $myNam = $1;
                 print FILELOG "\n Section name: >$myNam";
               };
            if (/noWarn=\‘(.+)\’/)
                { if ($1 eq ’yes’)
                     { $nowarn = 1;
                     } else
                     { $nowarn = 0; # default (safer)
                     };
                };
            if (/oneLine=\‘yes\’/)
               { $chomper = 1; # turn on!
                 print FILELOG " (chomp)";
               };
            if (/sectionTitle=\‘(.+?)\’/) # self-explanatory
               { $SECTIONTITLE = $1;
               };
            if (/newComment=\‘(.+?)\’/) # new comment string!
               { $startComment = $1; # note usage!
               };
            if (/newTarget=\‘(.+?)\’/)
               { $_ = $1;
if (/uudecode/) # if uudecoding ?!...
   { my ($ufile, $umode, $uout) = Uudecode($MAINW);
     if (length $ufile > 0)
        {
          print FILELOG ("\n Uudecoding <$ufile> mode $umode");
          open UFILE, ">$ufile" or &GlobalError("UU");
          binmode UFILE; # NB otherwise DOS stuffup!
          print UFILE $uout;
          # hmm what about the unix mode (opening?)
          close UFILE;
        };
     # ??? also print to FILELOG?
   } else # close current, open new!
   { $DOGFILE = $_; # retain new name
     &CloseDogFile($thisW, $c); # close previous file
     $c = $startComment; # only now alter comment!
     print FILELOG ("\n Comment intro is <$c>");
     if (! OpenTargetFile($thisW, $DOGFILE, $c, $FRED, $nowarn))
        { return;  #fail
        };
   };
```

```
                };
              # ----------------------------------------
              # here if more tests, use $wagline, not $_ !
              # ----------------------------------------
            };
       };
    if (length $depOn > 0)  # if dependency
       { if (! &StoreChild ($myNam, $depOn)) # keep whole
            { &Caution($thisW, "WARNING: \
            Input file <$FRED> terminated unexpectedly!");
              close FRED;
              close DOGFILE;
              return; #fail!
            };
         $myNam = ''; # cannot YET resolve (stored not printed)!
       };
# END AMENDMENT V2.0 9/9/2005.
                    };
=part5g
```

Comment 1 In the above, if we're not 'hot' (writing) we look for the 'begin' verbatim statement. If this verbatim statement is present, we turn on the heat. Otherwise, we check to see whether we're dealing with a DogWagger line *immediately preceding* a begin verbatim statement, in other words, we check for a preamble line. See how, for a preamble line to be detected, the first character on the line must be a percentage character.

The above code performs a variety of checks, including for `dogsAllowed`, `dependsOn`, `myName`, `noWarn`, `newComment`, `newTarget`, and the obscure `oneLine`. See how within this section we have the ability to UUdecode a whole section of many lines, writing the file and then just bashing on with the current file!

If we *are* busy writing lines to output (are hot) we check for the end of a verbatim statement. If this is the case but an OPTION statement is still active we fail but otherwise we go cold after resolving the name and writing code (FixName), if appropriate.

```
=cut
 } else # are hot!
 { if ( /(.*)\\end\{verbatim\}/ ) # end verbatim?
      { if ($OPTN) # OPTION still on?
           { &Alert ($MAINW,
              "Optional text not closed. See log!");
             &GlobalError(
              "\n ERROR: NO option closure, line $LINECOUNT");
             $OPTN = 0;
```

```
          };
        $hotdata = $1;
        print DOGFILE $hotdata; #last chunk
        if (length $myNam > 0) # if name defined
                  { $SECTION = FixName($myNam, $c, $SECTION);
                  };
        $ishot = 0;   # turn off.
        $chomper = 0; # back to default
        $chomped = 0; # redundant.
        $SECTIONTITLE = '';
      } else
      # see Comment[2] below
      { if ($chomped)
           { / *(.*)/;  # even allow null line ??
             $_ = $1;   # remove leading spaces!
           };
        if ($chomper)  # v2.0 (23/8/2005): chomp line feed if indicated!
           { chomp;
             $chomped = 1; # signal we've just chomped
           };
        if ( /^\s*\+OPTIONAL/)
           { $OPTN = 1;
             $_ = "";
           };
        if ( /^\s*-OPTIONAL/)
           { $OPTN = 0;
             $_ = "";
           };
        if ($MANDATORY || ! $OPTN)
           { print DOGFILE $_; # write to output
           };
      };
 };
           };
       }; # end of biig while stmt.
  close FRED;
  &CloseDogFile($thisW, $c);
  &Caution($thisW, "Done!");
  return;
}
=part6
```

Comment 2 In the case where we are hot but it's not the end, we need to check some conditions. If the last line was chomped as part of a oneLine, we remove leading spaces. If we are busy chomping terminal carriage returns, we chomp. And we process OPTIONAL statements as appropriate.

We write the line to output (as appropriate), and then bash on. (If MANDATORY is on, we print regardless; if it's off then we only print non-optional lines.

6 Reading the header

As discussed in the introductory section, we must accommodate the various header line options. We obtain the version, fileTarget and startComment values in the following routine:

```
=cut

sub ReadHeader
{
  my ($hotline);
     ($hotline) = @_;
  my ($ver, $target, $comment, $nowarn, $mandatory);

  $ver = 0;
  $target = '';
  $comment = '#';
  $nowarn = 0;
  $mandatory = 0;

  $hotline =~ /version=\'(\d+\.\d+\.\d+)\'/;  # version
  $ver = $1;

  $hotline =~ /fileTarget=\'(.+?)\'/;         # file name
  $target = $1;

  $hotline =~ /startComment=\'(.+?)\'/;       # comment
  $comment = $1;

  if ($hotline =~ /include=\'everything\'/)
     { $mandatory = 1;
     };

  if ($hotline =~ /noWarn=\'yes\'/)
     { $nowarn = 1;
     };

  return ($ver, $target, $comment, $nowarn, $mandatory);
}
=part7
```

Straightforward, really.

7 Miscellaneous routines

The following are rather trivial routines:

7.1 Confirm an action

Given a window and a message, obtain confirmation.

```
=cut
sub Confirm
{ my ($thisW, $msg);
     ($thisW, $msg) = @_;

    my $D = $thisW->Dialog(
                -title => "Confirm your choice",
                -text  => "$msg",
                -default_button => 'No',
                -buttons        => ['No','Yes'],
                      );
    $_ = $D->Show();  # use Show for Tk-b9.01
    if ($_ eq 'Yes')
       { return 1;
       };
    return (0);
}
=part8
```

7.2 Alert

Alert the user with a warning.

```
=cut
sub Alert
{ my ($thisW, $msg);
     ($thisW, $msg) = @_;

    my $D = $thisW->Dialog(
                -title => $msg,
                -text  => "$msg",
                -default_button => 'OK',
                -buttons        => ['OK'],
                      );
    $D->title('Note..');
    $D->Show;
}
=part9
```

A standard Tk Dialog.[8]

7.3 Caution — Alert with print

'Caution' is similar to `Debug`, but always generates an alert, regardless of the debugging status.

```
=cut
sub Caution
{ my ($thisW, $msg);
     ($thisW, $msg) = @_;
  print FILELOG "\n$msg";
  &Alert($thisW, $msg);
}
=part10
```

7.4 Read the time

```
=cut
sub GetLocalTime
{  my ($sec, $min, $hour, $mday, $mon,
       $year, $wday, $yday, $isdst);
($sec, $min, $hour, $mday, $mon,
       $year, $wday, $yday, $isdst) = localtime(time);

  $year += 1900;      #fix y2k.
  $mon ++;            #january is zero!
  return ("$year-$mon-$mday $hour:$min:$sec");
}
=part11
```

7.5 Farewell

We simply close the file log and exit.

```
=cut

sub ByeForNow
{ my ($thisW);
     ($thisW) = @_; # unused at present.

close FILELOG;
exit;
}
=part12
```

[8] For the pedant, part 7 has been removed!

7.6 A clumsy error-related hack

The following clumsy hack should be fixed. See (foul) usage!

```
=cut

sub GlobalError
{ my ($msg);
     ($msg) = @_;
  print FILELOG "$msg";
  $ERR = $msg; #ugly global ?!
}
=part13
```

7.7 Debugging

Debug simply logs a statement. If the `BUG` variable is set, then an alert message is displayed, but this is only used for detailed debugging.

```
=cut

sub Debug
{ my ($thisW, $msg);
     ($thisW, $msg) = @_;

  print FILELOG "$msg";

     if (! $BUG)
        { return;
        };
  &Alert($thisW, $msg);
}

=part14
```

7.8 More debugging

The following is only used for a clumsy debug where we displaying the value of the filename `fred` as an Alert, if you manually edit out the # from the relevant Perl line.

```
=cut
sub CheckFred
{
  my ($thisW);
     ($thisW) = @_;
```

```
#  &Alert($thisW, "Value is <$fred>");
}
=part15
```

7.9 Ask — datum input

Given a window, title and default text value, `Ask` gets user input. We might use this to acquire a file name, but at present this is an unused routine.[9]

```
=cut
sub Ask
{ my ($win, $title, $default);
     ($win, $title, $default) = @_;

  my ($db, $fred);
  my ($e);
  $fred = $default;

  $db = $win->DialogBox( -title => $title,
                         -buttons => ["OK", "Cancel"]
                         );
  $e = $db->add('Entry',
                -textvariable => \$fred)->pack(-padx => 50,
                                               -pady => 15,
                                               -ipadx => 5);

  my $choice = $db->Show;
  if ($choice eq "Cancel")
     { return ("");
     };
  return ($fred);
}
=part16
```

7.10 Store array of lines

Here we keep 'child' (dependent) lines in an array element, to be resolved later when all dependencies are met. The index of the topmost child is given by `$#CHILDREN`. The list of dependencies contains elements separated by commas, and there are starting and terminal commas (!) too.

```
=cut

sub StoreChild
```

[9] Remove me!

```
{  my ($pendingName, $dependencies);
      ($pendingName, $dependencies) = @_;
   my ($idx, $child);
   $idx = 1+$#CHILDREN;
   print FILELOG "\n Line $LINECOUNT: Storing child[$idx]";

   $_ = <FRED>; # first line *must* be begin verbatim
   if ( /\\begin\{verbatim\}(.*)/ )
      { $child = $1;  # keep rest of line
      } else
      { print FILELOG
     "\n ERROR at line $LINECOUNT: \
       no verbatim stmt on 1st child line!";
        $ERRCOUNT ++; # bump error
        print FILELOG "<$ERRCOUNT!>";
        print FILELOG "<$_>";
        return 1; # not fatal, per se.
      };

   $DEPENDENCIES[$idx] = ",$dependencies,";
   $PENDINGNAME[$idx] = $pendingName;
   $CHILDREN[$idx] = ''; # default nothing

     my($ishot, $hotdata);
     my($nodogs, $ok);
     my($SECTION);
     $SECTION = 1;

     $ishot = 0;
     $ok=1;
     $nodogs=0; # default

     while($ok)
       { $_ = <FRED>;
         $LINECOUNT ++;

         if (! defined)
            { return 0; # fail
            } else
            { if ( /(.*)\\end\{verbatim\}/ )
                 { $ok = 0;
                 } else
                 { $child = "$child$_";  # concatenate, unchomped
                 };
            };
      };
  $CHILDREN[$idx] = $child; # store away lines to be printed
  return 1; # success!
```

```
}
=part17
```

As things stand, there is a bug in the above, as optional (debug) code cannot be included in a child section!

7.11 Section labelling

FixName walks through all dependencies, resolves them (where relevant), and on resolution, writes the relevant child code to output.

```
=cut

sub FixName
{ my ($fname, $morenames, $c, $SECTION);
  ($fname, $c, $SECTION) = @_; # get name argument
  $morenames = ",$fname,";

  my ($idx);
  while ( $morenames =~ /^(.*,)(.+),$/ ) # split off last name
    { $fname = $2;
      $morenames = $1;
      $idx = $#CHILDREN;
      while ($idx > -1)
        { if ($DEPENDENCIES[$idx] =~ /(.*,)$fname,(.*)/ )
             { $_ = "$1$2";;  # if name in list, clip out
               $DEPENDENCIES[$idx] = $_;
               if ( /,/ ) # if all resolved
                  {  print FILELOG "\n Writing child[$idx] ";
                     $SECTION = &PrintSectionHeader($c, $SECTION);
                     print DOGFILE $CHILDREN[$idx];
                     $CHILDREN[$idx] = ''; # (might even remove)
                     # ....WAIT! HERE MUST RESOLVE THIS ONE:
                     if (length $PENDINGNAME[$idx] > 0)
                        { $morenames = "$morenames$PENDINGNAME[$idx],";
                          $PENDINGNAME[$idx] = '';  # clear me!
                        };
                  };
             };
          $idx --; # move down to next
        };
    };
  return $SECTION;
}
=part18
```

7.12 Check for unresolved dependencies

At the end, we have to make sure that all dependencies have been resolved, or signal an error. Errors are also written to the log.

```
=cut

sub CheckUnresolved
{ my($idx);
  $idx = $#CHILDREN;
  my ($errcnt);
  $errcnt = 0;

  while ($idx > -1)
    {
      if (length $CHILDREN[$idx] > 0)
         { print FILELOG "\n\n *** ERROR *** \n\n Unresolved code: \n ";
           print FILELOG "Dependencies: <$DEPENDENCIES[$idx]> \n";
           print FILELOG "Name: <$PENDINGNAME[$idx]> \n <Code: <---\n ";
           print FILELOG $CHILDREN[$idx];
           print FILELOG "$\n ---> Code ends> \n\n";
           $errcnt++;
         };
      $idx --;
    };
  return $errcnt;  # number of errors, 0=ok.
}
=part19
```

8 Handling of Multiple files

This section is is a consequence of the version 2 ability to generate multiple files from a single .TEX source. We chose the simple option of closing the first file and then opening and writing the next one, rather than having multiple dangling file handles. The sole exception to this rule is that if we are writing a UUdecoded binary file, we don't fiddle with the current open file.

8.1 Open the target

We open a target file. If opening fails, the very clumsy GlobalError invocation will be entered and the nasty global $ERR will then be altered, allowing us to detect the existence of a file. This ugly hack should be rewritten at some stage.

```
=cut

sub OpenTargetFile
{
  my ($thisW, $DOGFILE, $c, $FRED, $nowarn);
     ($thisW, $DOGFILE, $c, $FRED, $nowarn) = @_;
     my($ok);

  $TODAY = &GetLocalTime();
  $ERR = 0; # clumsy test for existence of file
     open DOGFILE, $DOGFILE or &GlobalError("OK");
     if (! $ERR)  # if file exists...
        { close DOGFILE;
          if ($nowarn)
             { $ok = 1;
             } else
             { $ok = &Confirm ($thisW, "Overwrite <$DOGFILE>? Are you sure?");
             };
          if (! $ok)
             { &Caution($thisW, "Aborted!");
               return 0; # fail.
             };
        };

     $ERR = 0;
     open DOGFILE, ">$DOGFILE" or
        &GlobalError("Could not open target $DOGFILE :$!");
     if ($ERR)
        { $ERRCOUNT ++; # bump error count
          &Alert($thisW, $ERR);
          return 0; #fail
        };
```

```
  print FILELOG "\n\n Opened target file: <$DOGFILE>";
  print DOGFILE "$c Generated by LaTeX DogWagger Version $MAJORVERSION.$MINORVERSI
  print DOGFILE "\n$c Date: $TODAY";
  print DOGFILE "\n$c Do NOT edit this file. Edit the LaTeX source!!\n\n";

  return 1; # success
}
=part20
```

On opening the target file, we write several lines to this file (DOGFILE) using the comment character(s) to rem out the lines.[10]

8.2 Close file

Simply close the output file handle DOGFILE.

```
=cut

sub CloseDogFile
{ my ($thisW, $c);
     ($thisW, $c) = @_;

  $ERRCOUNT += &CheckUnresolved();
  if ($ERRCOUNT > 0)
     { print FILELOG "<$ERRCOUNT!>";
       &Caution($thisW,
         "WARNING: Error count $ERRCOUNT. See WAGLOG.LOG!");
       print DOGFILE
         "\n\n$c -- WARNING: $ERRCOUNT ERROR(S). See log!\n\n";
       $ERRCOUNT = 0; # clear me.
     };

     print DOGFILE "\n$c ---END OF FILE---\n";
     print FILELOG "\n <END OF FILE>";
     close DOGFILE;
}
=part21
```

[10] As things stand, we don't allow suppression of this header except in binary files, but it's conceivable that at some stage we will need to modify DogWagger to permit this option.

9 Trivial amendments

9.1 Print a section header

We now have the ability to label sections with pre-defined text (commented out). Remember that LINECOUNT is an ugly global. We submit the section count SECTION, and return this value incremented by one. We also permit insertion of this section count.

```
=cut

sub PrintSectionHeader
{ my($c, $SECTION);
    ($c, $SECTION) = @_;

  if (length $SECTIONTITLE > 0)
     { $_ = $SECTIONTITLE;
       if (/\$\[SECTION\]/) # if contains section count
          { s/\$\[SECTION\]/$SECTION/;
          };
          print DOGFILE "\n$c$_\n";
     } else
     { print DOGFILE "\n$c --- <Section $SECTION> --- \n";
     };
  if (($SECTION % 10) == 1)
     { print FILELOG "\n";
     };
  print FILELOG " $LINECOUNT=[$SECTION]";
  $SECTION ++;
  return $SECTION;
}
=part22
```

10 Binary encoding and decoding

Responding to the need to write binary code from our TEX source:

10.1 UUdecode

We read the global file handle FRED, mandating that the initial line is the 'begin verbatim' line. The line immediately after this must contain the UUencoded header line. The subsidiary routine UUdecodeLine returns not only decoded text, but also an error code. If the error code is less than zero, an error has occurred; if the error code is zero, then the subsequent line *must* be an `end` statement signalling the end of the UUencoded section!

```
=cut

sub Uudecode
{ my ($MAINW) = @_;

  my ($filename, $mode, @rslt);
  my ($line, $decoded, $err);
  $filename = "";
  $line = <FRED>; # this should be \begin{verbatim} line:
  if ($line !~ /\\begin\{verbatim\}/ )
     { &Alert ($MAINW, "Uudecode: no verbatim <$line>");
       return ("", "", "");
     };

  $line = <FRED>; # MUST be header!
  chomp($line);
  $line =~ /begin\s+(\d{3})\s+(.+)/;
  if (! defined $1)
     { # here write error!
       &Alert ($MAINW, "Uudecode: bad first UU line <$line>");
       return ("", "", "");
     };
  $mode = $1;
  $filename=$2;
  $err = 1; # -ve will signal failure

  while ( $line = <FRED> )
    { # hmm what if extra 0xD ?
      last if (! defined $line); # ??
      chomp($line);
      last if ($line =~ /^end/);
      if (! $err) # bad if err zero
         { &Alert ($MAINW, "Uudecode: end stmt not seen!<$line>");
```

```
            last;
          };
       ($decoded, $err) = UudecodeLine($line);
       # nb if $err is zero, next line must be /^end/!
       if ($err < 0)
          { # here could write error!
            if ($err == -1)
               { $err = "Bad line";
               }
            elsif ($err == -2)
               { $err = "silly length($decoded)";
               }
            elsif ($err == -3)
               { $err = "lengths don't match($decoded)";
               };

            &Alert ($MAINW, "Uudecode: error $err in <$line>");
            last; # terminate
          };
       push @rslt, $decoded;
     };
  return ($filename, $mode, join("",@rslt));
}
=part23
```

10.2 UUdecoding

Here's the routine that actually does the business of UUdecoding. We've kept this very simple, based on publicly available code.[11] On most UNIX/Linux systems, UUencoding and decoding should be readily available, but for DOS uuencoding, try e.g. this program.

```
=cut

sub UudecodeLine
{
  my ($line) = @_;
  my ($charlen);
  my ($decoded, $ld);

  $line =~ /(.).*\`*$/; # remove terminal backticks too!
  if (! defined $1)
     { return ("", -1); # dud line!
     };
   $charlen = (ord($1) - 32) & 077;
```

[11] Source: http://search.cpan.org/src/ANDK/Convert-UU-0.52/lib/Convert/UU.pm

```
  if ($charlen == 0)
     { # ie terminal line with single backtick:
       # no error, but END!
       return ("", 0);
     };
  if (($charlen > 45) || ($charlen <0))
     { return ("$charlen($1)", -2); # bad length
     };
  # convert to number, then count of characters encoded;
  $decoded = unpack("u", $line); #uudecode!
    # MUST CHECK ON HOW ROBUST unpack IS???
  $ld = length $decoded;
  if ($ld != $charlen)
     { return ("$ld:$charlen:$decoded", -3); # length doesn't match!
     };
  return ($decoded, 1); # success!
}
=thelastpage
```

See the archaic use of octal. But it works.

A brief note on uuencoding/decoding

This description assumes you understand hexadecimal and ASCII
A uuencoded file consists of:

1. A header line;
2. A body;
3. A trailer line.

All other lines must be ignored Lines may end with 0x0D, 0x0A, or any combination of the two (ie carriage return and/or line feed). From now on we'll call the end of line character(s) the 'endline'. Conventionally this should be *encoded* as simply 0x0A. Here are the details:

1. The header line. This contains three items *separated* by spaces (0x20):
   (a) The five character string 'begin' (no quotes around it)
   (b) Three digits, each in the range 0..7 i.e. an octal number
   (c) The file name in ASCII (potential for trouble here!)

   The header line terminates with an endline.

2. The body. This contains one or more lines, each ending with an endline. For all but the last data line, there should be 62 characters in a line:

   (a) A single character, usually the ASCII character M

   (b) 60 characters representing an encoded string

   (c) The endline

   For the last line, some variation is permitted: The first character can be in the range 0x20 to 0x5F. There's a FURTHER CHECK: the very last line of the body does NOT contain data and is simply made up of a single backtick character.

   In all cases:

   (a) The first character represents the number of encoded characters, with 0x20 added! This is why all lines but the last should start with M: they contain 45 encoded characters (hex 0x3D). The ASCII representation of M is 5D, ie 0x3D + 0x20.

   (b) Encoding of characters is done three-at-a-time. If there are less than three characters, we pad with hex zero (0x0). Encoding is as follows:

      i. Divide the 3 bytes (3*8 = 24 bits) into four groups of 6 bits, working from left to right;

      ii. This gives us four numbers between 0x0 and 0x3F;

      iii. To each number, add 0x20, giving numbers in the range of 0x20–0x5F;

      iv. Write the numbers as four ASCII characters to the output file.

      In other words, we output characters in the set of:
      `!"#$%&'()*,-./:;<=>?@[\]^_` as well as plus, space, 0–9 and A–Z.

3. The trailer line. This starts with the three character string 'end' (No quotes).

There are some frills:

- Also permissible are ASCII characters $>$ 95 (5Fh) but only the rightmost 6 bits are relevant.

- The three digit number on the first line is the file mode (read/write/execute) The first number is the octal representation of the read permission of the file, the next the write permission, and finally the execute permission.

- Because some mailers used to strip off terminal blanks, it is usual (and perhaps wise) to pad such lines (with at least one terminal blank) with supplementary junk characters. The usual character is the backtick, 0x60, which has the added advantage that it translates to the otherwise illegal value 0x0 when the high bits are masked off.

11 Change log

11.1 Changes in version 2.0

The major changes in version 2.0 were related to the ability to shift sections down below other sections (defer writing of certain sections), waiting for all dependencies to be fulfilled before writing the code. Names are only resolved when all of the dependencies of that section have been met.

It would be possible to keep a record of 'names already resolved' but this is a little silly. We are only interested in deferring the writing of code, so there's little point in bookkeeping to this extent. Just leave out the dependency if it's already resolved!

If a child has no name, then the corresponding PENDINGNAME element is `''`. We could decrease memory requirements for CHILDREN by deleting array elements once written; we might benefit from even removing all corresponding elements entirely (as we will resolve the name immediately and the element in DEPENDENCIES is of course empty as well).

We also introduced the concepts of line concatenation, chomping off line feeds and subsequent leading spaces.[12]

Another amendment was allowing alteration of the initial comment string (newComment), the noWarn option to suppress irritating warnings (especially with multiple file writes), and OPTIONAL statements for a debugging version. (Note the bug with this described above).

We also introduced insertion of binary (uuencoded) files, by allowing the user to say `newTarget='uudecode'`. Usage of the Uudecode function is:

```
($filename, $mode, $outstring) = Uudecode($MAINW);
```

Several comments on the uudecoding option are (a) Should we check for and warn about executables? (b) At present permissions are disabled, so this isn't really an issue. (c) At some stage we should check on how robust the Perl unpack "u" option is!, and (d) the uuencoded line *cannot* start on the verbatim line but *MUST* start on the next line — there can be NO unused lines at the start.

[12] When using the WinEdt text editor, the default is to trim trailing spaces, which can be rather irritating. You have to uncheck Options—Preferences—defaults—Trim spaces, or in already created documents uncheck Document—document settings—trim spaces.

Appendix A: GNU GENERAL PUBLIC LICENSE Version 2, June 1991

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(END OF TERMS AND CONDITIONS)

Appendix B: A UUencoding program

Aww heck. Here's a UUencoding program we found on the 'Net at digitalriver.com:

```
begin 644 uuencode.com
MZV,-"DEN<'5T('!A=&@O9FEL93H@($EN<'5T(&9I;&4@97)R;W(N3W5T<'5T
M(&9I;&4@97)R;W(N8'T*96YD#0I.;R!A8W1I;VX@97AI<W1S(2'@06)O<G1I
M;F<A'''!'#@$''"T,,TA/')S#+JY!.E''>C$'>D]'>CB'7,QNOP#N;H'Z+,!
MN@(!N10'NP('M$#-(;]_',8%4(O7M'K-(>B['7,*M'&Z00&Y"0#KQ+KH'XOR
MN'']S2%S'^EP':-='8O/*\Y/L%S]\J[\='B+_H!]'3IU'D='B_>+UK^T'ZP*
MP'0#JNOXN'T*JU>+\K\X!(O7K'K'=0*P+JH\+G7TN'5UJ[AE'(D%,\F'/F0!
M_W0EM$[-(3P"=!T\$G0968O/*\J['@'#R[1'S2&Z2@&Y$P"P!>D]_[0\S2%9
M<P/IO'"C7P&ZJ@,KRNBA'.BV''1(L0:LBN#0Z-#HJJR*T-'HT>C1Z-'HJHKB
MK(K0T^BJBL*J@\4#.S9A'7('@#YC'0!U%X/]+74%Z#D'L08[-F$!<L&'/F,!
M'76S"^UT"2LV80$K[N@='+HY';D('.@^''(L>7P&T/LTAM$S-(5"T"<TA6.OT
MNJH#B\\KRE&+^HO%B'6T(+M@/XH%(L<"Q#K$=0**PZKB\5FX#0J)!4%!BQY?
M';1'S2%R!HOZ1S/MP[HG';D2'.LPNC@$N<BOBQY=';0_S2%R&HORB]H#V#O!
M='G'!P''Q@9C'0&)'F$!"\##NA8!N1$'Z','Z7S_4%)1NN($N0('Z!''65KH
M"P"ZX@2Y'@#H'@!8P[L"'+1'S2'#OH''O^@#_*P*P'0OM""L.L1V^SPO='0\
M+74<B]"+!#P_=!\D7SU/((O"=0OV%F0!1D:L.L1V!JJLZ_CYP\8%'/C#6+K\
M['!Z1'_D&)E9VEN(#8T-"!5545.0T]$12!V,BXP'$1A=FED(%'@2VER<V-H
M8F%U;2P@5&]A9"!(86QL+"!':79E;B!T;R!T:&4@<'5B;&EC(&1O;6%I;@!5
M545.0T]$12!;+6]=(%MD.EU;7'!A=&A<76)I;F%R>2YF:6P@/%)%5%523CX-
M"G!R;V1U8V5S(&)I;F%R>2Y5544@;VX@8W5R<F5N="!D<FEV95QP871H#0HH
M<')O=FED:6YG(&)I;F%R>2Y5544@9&]E<VXG="!A;')E861Y(&5X:7-T*2X-
M"BUO('-W:71C:"!F;W)C97,@;W9E<G=R:71E(&]F(&5X:7-T:6YG(&)I;F%R
M>2Y5544-"B14:&ES('!R;V=R86T@<F5Q=6ER97,@1$]3(%8R+C'@;W(@:&EG
':&5R+@T*)'''
'
end
```

Dogwagger will pull it out of the .TEX source, of course!