Report no. 47/98 KLIBAS

DNMI klima KLIBAS

Towards an ISO-9000 standard for system development by DRIFT

September 7th, 1998

Petter Øgland

DNMI/klima **KLIBAS**

NORWEGIAN METEOROLOGICAL INSTITUTE
BOX 41 BLINDERN N-0313 OSLO

PHONE: +47 22 96 30 00

ISBN

REPORT NO.
47/98 KLIBAS

DATE
Sep 07 1998

TITLE

Towards an ISO-9000 standard for system development by DRIFT

AUTHOR

Petter Øgland

CONTRACTOR

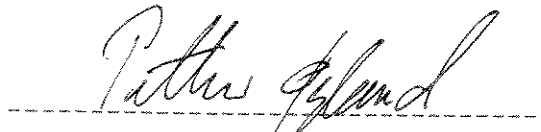
DNMI - Climatology Division

SUMMARY

The purpose of the computer program DRIFT is to give computer assistance to the development and maintenance cycle of the KLIBAS database system. The program contains algorithms for finding problems or latent problems with respect to program scheduling conflicting with Oracle availability, critical use of disk space on Dbserver, loading statistics and priority lists for programming and further development. The program generates output for the KLIBAS statistics report.

This is the first documented version of DRIFT although the program has been in use since April 1995. In order to reach an ISO-9000 level for the program development, the five level Software Engineering Institute (SEI) method is being used. The final level should be fairly close to ISO-9000.

SIGNATURE



Petter Øgland

Research Scientist

Bjørn Aune

Head of Division

1. PROBLEM FORMULATION AND SPECIFICATION

The purpose of the computer program DRIFT is to give computer assistance to the development and maintenance cycle of the KLIBAS database system. The program contains algorithms for finding problems or latent problems with respect to program scheduling conflicting with Oracle availability, critical use of disk space on Dbserver, loading statistics and priority lists for programming and further development. The program generates output for the KLIBAS statistics report.

1.1 Problem formulation

The problem formulation is given by first a description of input, output and operation required by the program and then a list of the most frequently occuring problems caused by runs and test runs of the program so far.

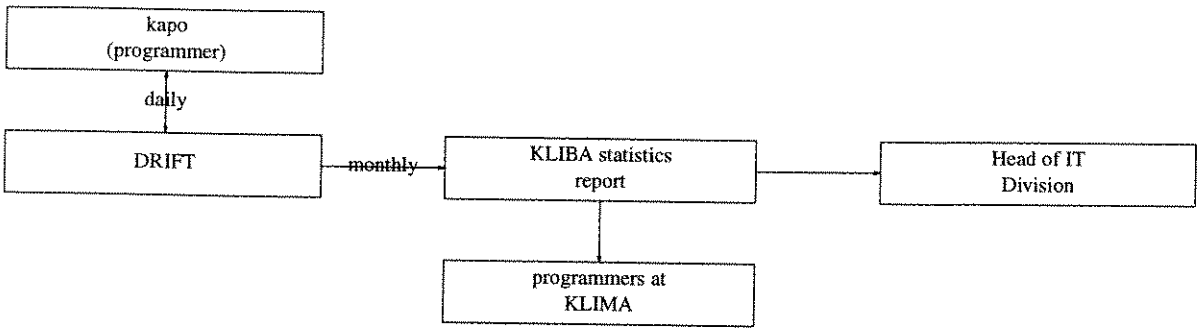
INPUT: Year and month to be examined.

OUTPUT: Statistics for daily check and information for the monthly KLIBAS statistics report.

ALGORITHM: Reading program logs and other relevant information for the DRIFT system, making analysis and summarising the results.

1.2 Problem specification

In order to make sure that a solution can be achieved, the problem is analysed in order to find out whether it (1) does in fact have a solution, (2) the solution is unique and (3) whether the solution is stable, in other words if the solution is continuosly dependable on the problem.



1.2.1 Existence of solution

The DRIFT program is run on a daily basis by KAPO in order to make the daily work of program mentainance and development systematic. The program consists of four major parts. The first part gives statistics for the KLIBAS project development, the second part contains information on Dbserver and Oracle statistics, the third part contain statistics for the programs while the fourth and last part show plans for the next month.

The statistics generated by the program are read in consequtive order, beginning with project statistics, showing productivity, quality in terms of solving problems relevant to the project and statistics showing how much time is spent on each particular task.

After verifying that project progress is under control, the system is analysed by lists showing the size of the KLIBAS system, defects in the system and how hard the system is working. The lists should be sufficient to decide which problems should be solved immediately. After the general lists, statistics and information concerning the different programs should checked to see if they appear to be working normally.

Finally a plan for the next month is presented.

1.2.2 Uniqueness of solution

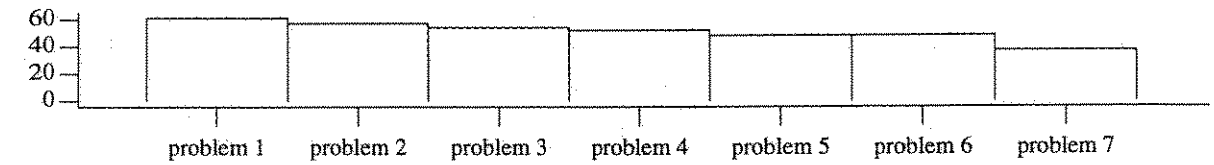
Algorithms are made in order to make priority lists and quality statistics in such a manner that there should be no confusion about which problems are the most serious. Only problems that are absolutely necessary to solve are considered.

1.2.3 Stability of solution

The stability of the DRIFT program consists in how well the program reflects the best mental way to handle the development and maintenance tasks. Minor adjustments in the DRIFT program should only result in minor alterations with the KLIBAS statistics.

1.3 Runtime warnings

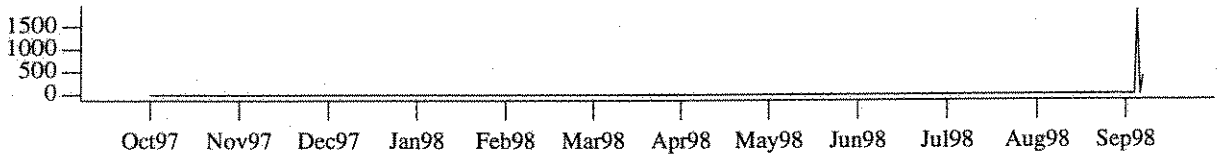
Below is a histogram presenting the distribution of problems. Only non-solved or non-ignored problems are accounted for.



Frequency plot - 7 most critical problems

```
Problem 1   The DRIFT program should be remodelled after by SEI or ISO-9000                    Count=61
Problem 2   DATAUT-RA:Stasjonsramme should be eliminated from WBS.                             Count=57
Problem 3   The AWS section should be adjusted by perhaps printing auto_backup.sys instead of listi  Count=54
Problem 4   Plot wait must be implemented.                                                     Count=52
Problem 5   The goal should be to produce a fully automated project report with PERT, GANTT, etc. a  Count=48
Problem 6   The maintenance report should be systematically proof read.                        Count=48
Problem 7   Program is running in test mode                                                   Count=37
```

The total count of non-solved or non-ignored problems adds up to 2254. The list show problems occuring the highest frequency. The plot below shows the day-by-day number of driftmatically reported errors and warning during the last twelve months.



Time plot - problems day by day

A total of 2252 warnings have been recorded for the program DRIFT.

2. SYSTEM ANALYSIS AND DESIGN

Do we know any related problems which could simplify the design of the program?

The first documented attempts at making standard for system developments in the KLIBAS project are described in report no. 44/92 KLIMA. The report no. 45/92 KLIMA contained the groups plans for quality management of the project.

Some of the first methods in order to make work more systematic was by establishing a Quality Assurance Officer (KLIBAS-report nos. 33/94, 34/94 and 03/95) and a User Group (KLIBAS-report no. 27/95 and 07/97).

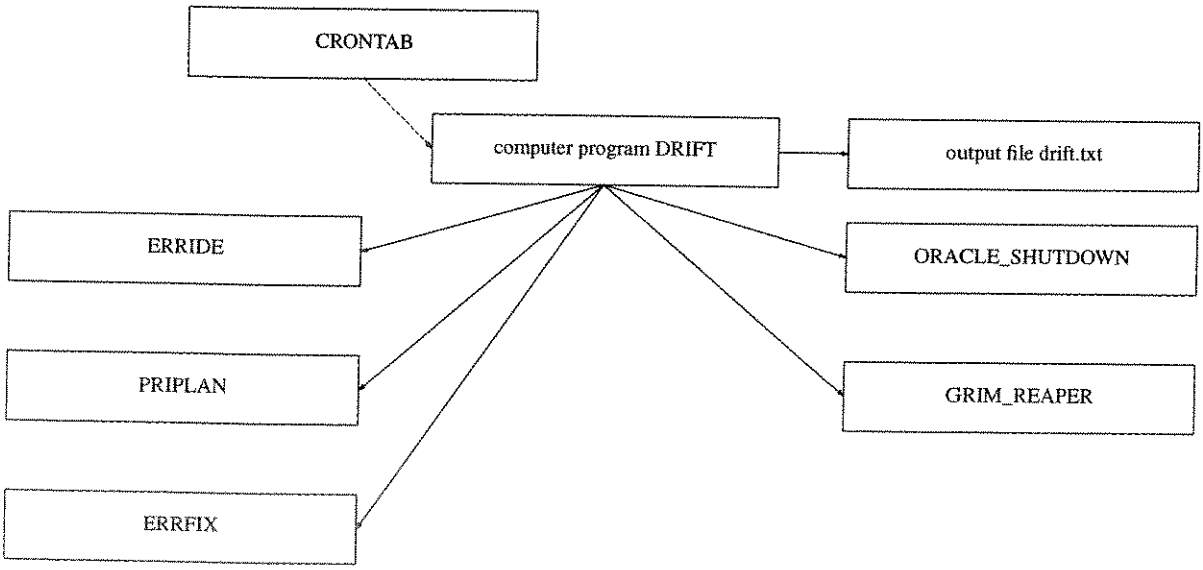
While there had been written status report for the KLIBAS project annually and sometimes biannually since 1991, a new series of monthly system statistics was introduced April 10th 1995 (KLIBAS-note no. 02/95) and have been published every month since.

The layout for these reports have been continuously revised. In May 1997, however, the first program that was generate with the sole purpose of updating the KLIBAS statistics report was published (KLIBAS-report no. 45/97). Other programs were shortly developed and documented (KLIBAS-report no. 46/97, 49/97, 50/97 and 53/97).

All the time, a program DRIFT had been responsible for producing and assembling statistics. In December 1997 the present version of this program was established.

2.1 System design at high level

The DRIFT program is executed on a daily basis. The program does some analysis but part of the analysis tasks are distributed among other programs such as ORACLE_SHUTDOWN (report no. xx/97 KLIBAS) and GRIM_REAPER (report no. xx/97 KLIBAS). The program ERRIDE, PRIPLAN and ERRFIX are used for updating and maintaining the priority list based on program errors and warnings.



In addition to the programs represented in the figure above DRIFT also makes system calls to the programs METARTID, SKRIVPLAN and PLOTLOG none of which are documented in the KLIBAS report series. The DRIFT program also assembles statistics from a number of programs, including SYNO_INN, AUTO_INN, SYNO_KONTR, PIO_INN, KLIMA_KONTR and many others central to the KLIBAS sys-

tem.

New ideas are constantly being added to the DRIFT working agenda and makes the DRIFT program often ranging in the upper half of the priority list.

What is the current system doing?
(1) Project statistics are collced and presented. Project effort is plotted b use of a system call to PLOT-LOG.
(2) KLIBAS system statistics are collected and presented. Time diagram and frequency plot of errors from the err-files are made by system call to ERRIDE. The priority plan is made up by a system call to PRIPLAN. Daily log of programming is made by a system call to ERRFIX.
(3) In order to collect and present the amount of space left on Dbserver, a system call to GRIM_REAPER is made.
(4) Oracle statistics are based on a system call to ORACLE_SHUTDOWN.
(5) For each section containing statistics for each category of weather stations, log files are being read for major programs related to these categories.

What extra features should be included in the new system?
(1) There should be a display of the daily development of system size and system effort in addition to system quality.
(2) The DRIFT program should be iteratively redesigned in order to make a SEI approach towards ISO-9000
(3) The DRIFT program should produce a fully automated project report with PERT, GANTT, etc. automatically estimated and updated.
(4) There should be a better control of the VNN routine. The routine apparently broke down August 29th 1998 as indicated in letter from Per-Tore Soervoll.
(5) The principle of system/data monitoring by DRIFT, SYNOP and SYNOP_KONTR should be explained in the report.
(6) The principle of system/data monitoring by DRIFT, AUTO and MKK/ADK should be explained in the report.

What constraints (such as response time) must the new system satisfy?
Presently there are no constraints to the system.

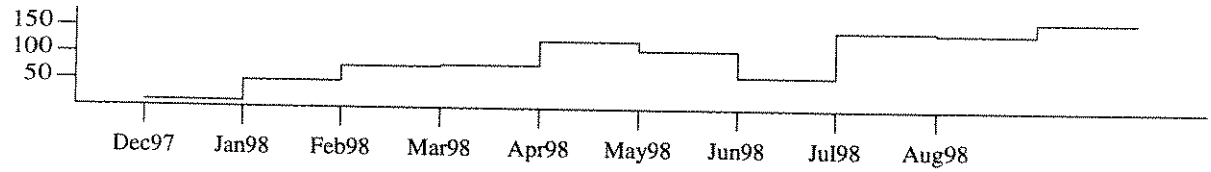
2.1.1 Main function structure

The program consists a call to a function collecting system statistics and another call a functiong analysing and printing the results in a suitable format.

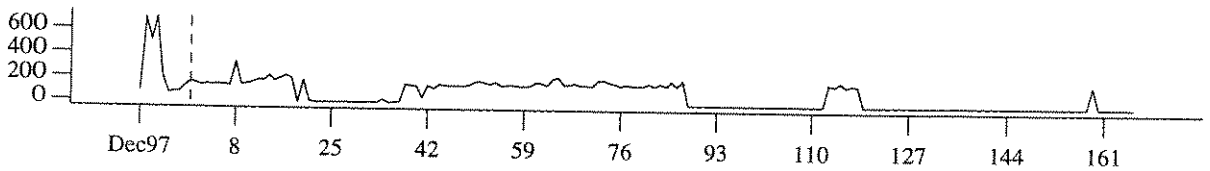
```
int system_test(){
  FILE *fp;
  int count=0;
  char title[BUFSIZ];
  sprintf(title,"KLIBAS Statistics %s %d",month[mnd0],aar0);
  sprintf(buf,"%s/drift.txt",path);
  fp=fopen(buf,"w");
  if(NULL==fp){
    fprintf(stderr,"ERROR: cannot open %s to write0,buf );
    goto error;
  }
  if(title_pageNote(fp,title))goto error;
  if(adm(fp,1))goto error;
```

```
    if(!test_mode){
      if(klibas(fp,2))goto error;
      if(systemStat(fp,3))goto error;
      if(archiveSynop(fp,4))goto error;
      if(archiveMetar(fp,5))goto error;
      if(archiveKlima(fp,6))goto error;
      if(archiveSAWS(fp,7))goto error;
      if(archiveAuto(fp,8))goto error;
      if(newPlans(fp,9))goto error;
    }else{
      fprintf(stderr,"WARNING: program is running in test mode0);
    }
    if(appendix1(fp))goto error;
    if(appendix2(fp))goto error;
    if(KLIBASdistributionNote(fp,title))goto error;
    fclose(fp);
    return 0;
error:
    fprintf(stderr,"ERROR in system_test0);
    return 1;
}
```

The graphs below shows the number of executions pr month and execution time for the program as recorded so far.



Plotting the number of runs pr month for DRIFT



Plotting average time and actual time (seconds) for executing DRIFT

2.2 Analysis and design at file level

The system drift is stored on directory /usr2/klima/people/kapo/drift and consists for the moment of the following files:

```
total 10584
drwxr-xr-x    5 kapo     klima          45 Apr 14 11:55 AANDERAA
drwxr-xr-x    3 kapo     klima          21 Apr 14 11:55 ADM
drwxr-xr-x    4 kapo     klima          33 Apr 14 11:55 APPEND
drwxr-xr-x    7 kapo     klima          69 Apr 14 11:55 AUTO
drwxr-xr-x    3 kapo     klima          21 Apr 14 11:55 DATAUT
drwxr-xr-x    6 kapo     klima          57 Apr 14 11:56 DRIFT
drwxr-xr-x    6 kapo     klima          57 Apr 14 11:56 FREM
drwxr-xr-x    5 kapo     klima          45 Apr 14 11:56 INFO
drwxr-xr-x    4 kapo     klima          33 Apr 14 11:56 INNLEDN
drwxr-xr-x    5 kapo     klima          70 Apr 14 11:56 KLIMA
drwxr-xr-x    3 kapo     klima          21 Apr 14 11:56 LINKE
drwxr-xr-x    7 kapo     klima          69 Apr 14 11:56 MDS
```

```
drwxr-xr-x    6 kapo     klima         57 Apr 14 11:56 METAR
drwxr-xr-x    7 kapo     klima         69 Apr 14 11:56 PLUMATIC
drwxr-xr-x    7 kapo     klima         69 Apr 14 11:56 PRECIP
drwxr-xr-x    7 kapo     klima         69 Apr 14 11:57 SYNOP
-rw-r--r--    1 kapo     klima        354 Sep  2 10:36 auto.log
drwxr-xr-x    2 kapo     klima       4096 May  7 09:17 bin
-rw-r--r--    1 kapo     klima      84184 Jul 21 19:12 cont1.txt
-rw-r--r--    1 kapo     klima      47890 Jul 21 18:08 cont2.txt
-rw-r--r--    1 kapo     klima     192425 Jul 21 19:10 cont3.txt
drwxr-xr-x    2 kapo     klima      12288 Sep  7 14:14 dat
-rwxr-xr-x    1 kapo     klima    2524116 Sep  7 14:14 drift
-rw-r--r--    1 kapo     klima     136943 Sep  2 10:21 drift.C.old
-rw-r--r--    1 kapo     klima     164605 Sep  7 14:14 drift.c
-rwxr-xr-x    1 kapo     klima       3069 Sep  7 13:48 drift.csh
-rw-r--r--    1 kapo     klima       5960 Sep  7 13:49 drift.err-inp
-rw-r--r--    1 kapo     klima      24337 Sep  7 14:16 drift.err.01
-rw-r--r--    1 kapo     klima          0 Sep  7 14:16 drift.err.02
-rw-r--r--    1 kapo     klima      16800 Sep  7 14:16 drift.err.03
-rw-r--r--    1 kapo     klima     104108 Sep  7 14:16 drift.err.04
-rw-r--r--    1 kapo     klima      64664 Sep  7 14:16 drift.err.05
-rw-r--r--    1 kapo     klima      43940 Sep  7 14:16 drift.err.06
-rw-r--r--    1 kapo     klima      82854 Sep  7 14:16 drift.err.07
-rw-r--r--    1 kapo     klima      56799 Sep  7 14:16 drift.err.08
-rw-r--r--    1 kapo     klima     223182 Sep  7 14:16 drift.err.09
-rw-r--r--    1 kapo     klima          0 Sep  7 14:16 drift.err.10
-rw-r--r--    1 kapo     klima          0 Sep  7 14:16 drift.err.11
-rw-r--r--    1 kapo     klima         67 Sep  7 14:16 drift.err.12
-rw-r--r--    1 kapo     klima        110 Apr 21 14:23 drift.fix.01
-rw-r--r--    1 kapo     klima          0 Apr 21 14:23 drift.fix.02
-rw-r--r--    1 kapo     klima        181 Apr 21 14:23 drift.fix.03
-rw-r--r--    1 kapo     klima         71 Sep  7 14:04 drift.fix.04
-rw-r--r--    1 kapo     klima        442 Apr 30 09:02 drift.fix.04~
-rw-r--r--    1 kapo     klima          0 Sep  7 14:04 drift.fix.05
-rw-r--r--    1 kapo     klima        582 May 29 11:10 drift.fix.05~
-rw-r--r--    1 kapo     klima         85 Sep  7 14:04 drift.fix.06
-rw-r--r--    1 kapo     klima        413 Jun 25 13:43 drift.fix.06~
-rw-r--r--    1 kapo     klima        321 Sep  7 14:04 drift.fix.07
-rw-r--r--    1 kapo     klima        683 Jul 30 18:13 drift.fix.07~
-rw-r--r--    1 kapo     klima         71 Sep  7 14:04 drift.fix.08
-rw-r--r--    1 kapo     klima        443 Sep  7 14:04 drift.fix.09
-rw-r--r--    1 kapo     klima        132 Apr 21 14:23 drift.fix.12
-rw-r--r--    1 kapo     klima      20987 Sep  7 14:16 drift.log
-rw-r--r--    1 kapo     klima          0 Sep  2 10:43 drift.log.01
-rw-r--r--    1 kapo     klima          0 Sep  2 10:43 drift.log.02
-rw-r--r--    1 kapo     klima          0 Sep  2 10:43 drift.log.03
-rw-r--r--    1 kapo     klima          0 Sep  2 10:43 drift.log.04
-rw-r--r--    1 kapo     klima          0 Sep  2 10:43 drift.log.05
-rw-r--r--    1 kapo     klima          0 Sep  2 10:43 drift.log.06
-rw-r--r--    1 kapo     klima          0 Sep  2 10:43 drift.log.07
-rw-r--r--    1 kapo     klima          0 Sep  2 10:43 drift.log.08
-rw-r--r--    1 kapo     klima          7 Sep  7 14:16 drift.log.09
-rw-r--r--    1 kapo     klima          7 Sep  7 14:16 drift.log.10
-rw-r--r--    1 kapo     klima          0 Sep  2 10:43 drift.log.11
-rw-r--r--    1 kapo     klima          0 Sep  2 10:43 drift.log.12
-rw-r--r--    1 kapo     klima     253424 Sep  7 14:14 drift.o
-rw-r--r--    1 kapo     klima      72864 Sep  7 14:16 drift.out
-rw-r--r--    1 kapo     klima     149269 Sep  7 14:10 drift.pc
-rw-r--r--    1 kapo     klima     149269 Sep  7 14:14 drift.pc.old
-rw-r--r--    1 kapo     klima        474 Sep  7 09:46 drift.pln
-rw-r--r--    1 kapo     klima       4867 Sep  7 11:26 drift.sql
```

```
-rw-r--r--    1 kapo     klima       8075 Sep  7 14:16 drift.tmp
-rw-r--r--    1 kapo     klima      53941 Sep  7 14:16 drift.txt
-rw-r--r--    1 kapo     klima      49115 Jul 21 19:26 konthum.txt
-rw-r--r--    1 kapo     klima     243435 Jul 21 18:56 lister1.txt
-rw-r--r--    1 kapo     klima      29290 Jul 21 19:08 lister2.txt
-rw-r--r--    1 kapo     klima      66931 Jul 21 19:21 lister3.txt
drwxrwxrwx    3 kapo     klima      12288 Sep  7 08:43 log
-rw-r--r--    1 kapo     klima       1749 Sep  2 10:23 proc.mk
drwxr-xr-x    2 kapo     klima       4096 Apr 14 11:57 project
-rw-r--r--    1 kapo     klima      16708 Jul 21 19:24 relfukt.txt
-rw-r--r--    1 kapo     klima     203231 Sep  7 14:16 slask
-rw-r--r--    1 kapo     klima       7287 Jul 20 08:54 slask.lst
drwxr-xr-x    2 kapo     klima       4096 Apr 14 11:57 src
-rw-r--r--    1 kapo     klima          0 Sep  7 14:16 symptoms
-rw-r--r--    1 kapo     klima       6010 Jul 21 19:27 tgtn.txt
drwxrwxrwx    2 kapo     klima      12288 Sep  4 10:05 tmp
-rw-r--r--    1 kapo     klima        372 Sep  3 10:45 utl-stasj.txt
```

Whenever the program *drift.csh* is executed, it does a comparison between the files *drift.pc* and *drift.pc.old*. If the files differ, *drift.pc* is copied to *drift.pc.old* and compiled using the make facility and auxhiliary file *proc.mk* for getting the Oracle interface right.

While executing, the files *symptoms*, *drift.err.01*, *drift.err.02*, ..., *drift.err.12* are updated. General output from *drift* is written to *drift.out*. All information directed to *stderr* is redirected to the file *symptoms*. At the end of execution of *drift.csh*, the *symptoms* file is investigated, and if there seems to be a reason to do so, an e-mail message is sent to *kapo*.

The files *drift.log*, *drift.err.01*, *drift.err.02*, ..., *drift.err.12* are updated at the end of session. The file *drift.log* contains executional statistics, while the other files contain summary of errors and warnings recorded for the month of execution.

The source code drift.pc is made up of 4766 lines, distributed over 122 functions. Complete source code listing is given in the appendix.

2.3 System design at low level

Below is a description of the main functions used by the program.

2.3.1 Presenting project statistics

Using the work breakdown structure (WBS) as basis for generating project statistics, algorithms for measuring productivity, quality and effort are constructed and presented by curves.

```
int adm(FILE *fq,int chapter){
  FILE *fp;
  int prev_month,prev_year;
  prev_year=aar0;
  prev_month=mnd0-1;
  if(!prev_month){
    prev_month=12;
    prev_year--;
  }
  fprintf(fq,"\fB%d. KLIBAS PROJECT DEVELOPMENT\fR0,chapter);
  fprintf(fq,".sp 00);
  fprintf(fq,"The KLIBAS project consists of developing and maintaining the parts of
the KLIBAS database system that is defined and planned in the KLIBAS statistics notes.
The statistics below are based on the work breakdown structure (WBS) given in appendix
one.  The three metrics Productivity, Quality and Efficiency for software projects are
slightly adapted from Yourdon [1] with emphasise on the prosess as described by Mitra
[2].0);
  fprintf(fq,".sp0);
  fprintf(fq,".sp 00fB%d.1 A measure for project productivity\fP0,chapter);
  fprintf(fq,".sp 00he curve below shows the number of finished tasks on the WBS.
Measures are taken  day by day since early May 1998 and by the end of the month prior
to that.0);
  fprintf(fq,".sp0);
  if(plotOppgaver(fq,"Specific"))goto error;
  fprintf(fq,"The sudden fall from December to January is due to the fact that the
lists were updated at this moment by deleting all jobs that were finished.  The rela-
tive number of finished jobs were then set to nil.0);
  fprintf(fq,".sp0);
  fprintf(fq,".sp 00fB%d.2 A measure for project quality\fP0,chapter);
  fprintf(fq,".sp 00he curve below is based on the formula (T-F)/T where T is the to-
tal number of defined tasks according to WBS at the sample point while F is the number
of finished tasks.  The formula hence gives a measure for the relative number of un-
finished tasks day by day which is also a sort of defect measure or quality mea-
sure.0);
  fprintf(fq,".sp0);
  if(plotOppgaver(fq,"Relative"))goto error;
  fprintf(fq,".sp0fB%d.3 A measure for project efficiency\fP0,chapter);
  fprintf(fq,".sp 00elow is a plot showing how many days the average work task has
been on the WBS.  Dashed lines represent one standard deviation.0);
  fprintf(fq,".sp0);
  sprintf(buf,"/usr2/klima/people/kapo/drift2/binsrc/plotlog %04d %02d /usr2/kli-
ma/people/kapo/drift/FREM/log/oppgaver.log 3 > %s/%s.tmp",aar0,mnd0,path,name);
  if(system(buf)){
    fprintf(stderr,"ERROR: Cannot execute %s0,buf);
    goto error;
  }
  sprintf(buf,"%s/%s.tmp",path,name);
  fp=fopen(buf,"r");
  if(NULL==fp){
    fprintf(stderr,"ERROR: Cannot open %s0,buf);
    goto error;
```

```
  }
  while(NULL!=fgets(buf,BUFSIZ,fp)){
    fprintf(fq,"%s",buf);
  }
  fclose(fp);
  if(Wait(fq))goto error;
  fprintf(fq,".sp0fB%d.4 A list of major problems solved during %s %d\fP0,chap-
ter,month[mnd0],aar0);
  fprintf(fq,".sp 0011 major problems are documented in the KLIBAS system documenta-
tion report series as they are being solved.  Below is the list of problems solved
during %s %d.0,month[mnd0],aar0);
  if(read_documentation(fq))goto error;
  fprintf(fq,".sp0fBEND NOTES\fR0);
  fprintf(fq,".sp 00);
  fprintf(fq,".in 10);
  fprintf(fq,".ti -10);
  fprintf(fq,"1. Yourdon, Edward.0);
  fprintf(fq,"\fIDecline and Fall of the American Programmer\fR.  Yourdon Press, Pren-
tice Hall, 1993.  The choice of metrics for this chapter is based on an adaption of
Yourdon's discussion in chapter 7 in particular.0);
  fprintf(fq,".sp 00);
  fprintf(fq,".in 10);
  fprintf(fq,".ti -10);
  fprintf(fq,"2. Mitra, Amitava.0);
  fprintf(fq,"\fIFundamentals of Quality Control and Improvement\fR. Macmillan Pub-
lishing Company, New York, 1993.0);
  fprintf(fq,".in 00);
  return 0;
error:
  fprintf(stderr,"ERROR in adm0);
  return 1;
}
```

2.3.2 General KLIBAS system statistics

Several system statistics such as system size, system quality and system effort is collected and presented.

```
int klibas(FILE *fq,int chapter){
  int i;
  FILE *fp;
  char *text[100]={
    ".sp 00ps 80vs 10",
    ".PS 6.2",
    "movewid = 1",
    "moveht = 1",
    "boxwid = 20",
    "boxht = 4",
    "[",
    "boxwid = 5",
    "boxht = 1",
    "movewid = 1",
    "moveht = 1",
    "lineht = 1",
    "COLLECT: box
    "move from COLLECT.right right",
    "QUALITY: box
    "move from QUALITY.right right",
    "BACKUP: box
    "move from QUALITY.bot down",
```

```
    "STORE: box
    "move from STORE.right right",
    "PRODUCE: box
    "arrow from COLLECT.right to QUALITY.left",
    "arrow from QUALITY.right to BACKUP.left",
    "arrow from QUALITY.bot to STORE.top",
    "arrow from STORE.right to PRODUCE.left",
    "]",
    "B1: box dashed at last []",
    "move from B1.bot down",
    "boxwid = 15",
    "boxht = 2",
    "B2: [",
    "boxwid = 5",
    "boxht = 1",
    "movewid = 1",
    "moveht = 1",
    "lineht = 1",
    "INFO: box
    "move from INFO.right right",
    "CHANGE: box
    "arrow from INFO.right to CHANGE.left",
    "]",
    "box dashed at last []",
    "arrow from B1.sw to B2.nw",
    "arrow from B2.ne to B1.se",
    ".PE",
    ".ps 110vs 13",
    ".sp",
    NULL
};
struct progs{
  int data_inn,kontroll,data_ut,backup,adm,info;
  int others;
  int total;
}progs;
progs.data_inn=0;
progs.data_ut=0;
progs.kontroll=0;
progs.backup=0;
progs.info=0;
progs.adm=0;
progs.others=0;
progs.total=0;
if(collect_err_files())goto error;
sprintf(buf,"%s/%s.err-inp",path,name);
fp=fopen(buf,"r");
if(NULL==fp){
  fprintf(stderr,"ERROR: Cannot open %s0,buf);
  goto error;
}
while(NULL!=fgets(buf,BUFSIZ,fp)){
  if(NULL!=strstr(buf,"_ut"))progs.data_ut++;
  else if(NULL!=strstr(buf,"vsuke"))progs.data_ut++;
  else if(NULL!=strstr(buf,"ut1"))progs.data_ut++;
  else if(NULL!=strstr(buf,"rrut"))progs.data_ut++;
  else if(NULL!=strstr(buf,"inn"))progs.data_inn++;
  else if(NULL!=strstr(buf,"vnn"))progs.data_inn++;
  else if(NULL!=strstr(buf,"ala2hla"))progs.data_inn++;
  else if(NULL!=strstr(buf,"vind_reg"))progs.data_inn++;
```

```
      else if(NULL!=strstr(buf,"mkk"))progs.kontroll++;
      else if(NULL!=strstr(buf,"s-t-f"))progs.kontroll++;
      else if(NULL!=strstr(buf,"kontr"))progs.kontroll++;
      else if(NULL!=strstr(buf,"cont"))progs.kontroll++;
      else if(NULL!=strstr(buf,"met/"))progs.kontroll++;
      else if(NULL!=strstr(buf,"backup"))progs.backup++;
      else if(NULL!=strstr(buf,"export"))progs.backup++;
      else if(NULL!=strstr(buf,"mvtable"))progs.info++;
      else if(NULL!=strstr(buf,"info"))progs.info++;
      else if(NULL!=strstr(buf,"adm"))progs.adm++;
      else if(NULL!=strstr(buf,"drift"))progs.adm++;
      progs.total++;
    }
    progs.others=progs.total-(progs.data_inn+progs.data_ut+progs.kon-
troll+progs.adm+progs.info+progs.backup);
    fclose(fp);
    fprintf(fq,".bp0fB%d. KLIBAS - CLIMATOLOGICAL DATABASE SYSTEM\fR0,chapter);
    fprintf(fq,".sp 00);
    fprintf(fq,"At the end of %s %d the author of this note has been responsible for %d
computer programs running on the KLIBAS database system.0,month[mnd],aar,progs.total);
    fprintf(fq,"%d programs are used for loading and registering observations, %d pro-
grams are used for quality control, %d programs are used for backup and export, %d
programs are used for updating and changing info archive and database structures, %d
programs are used for end user products and %d programs are used for administrative
and auxhilary purposes.0,progs.data_inn,progs.kontroll,progs.backup,progs.in-
fo,progs.data_ut,progs.adm+progs.others);
    fprintf(fq,".sp0);
    for(i=0;NULL!=text[i];i++)
      fprintf(fq,"%s0,text[i]);
    fprintf(fq,"The system indicated above could be further expanded by adding external
producer of weather observations and external consumer of weather- or climate statis-
tics.0sp0);
    fprintf(fq,".sp 00fB%d.1. Problems still not solved %s %d.\fR0,chap-
ter,month[mnd0],aar0);
    fprintf(fq,".sp 00he curves below show the total number or errors/warnings recorded
day by day for the last 31 days.  The total numbers of errors with respect to each
program during this period is displayed by histograms.0);
    sprintf(buf,"/usr2/klima/people/kapo/drift2/erride/erride.csh %04d %02d
31",aar0,mnd0);
    if(system(buf)){
      fprintf(stderr,"ERROR: Cannot execute %s0,buf);
      goto error;
    }
    sprintf(buf,"/usr2/klima/people/kapo/drift2/erride/erride.%02d",mnd0);
    fp=fopen(buf,"r");
    if(NULL==fp){
      fprintf(stderr,"ERROR: Cannot open %s0,buf);
      goto error;
    }
    while(NULL!=fgets(buf,BUFSIZ,fp)){
      fprintf(fq,"%s",buf);
    }
    fclose(fp);
    fprintf(fq,".sp0);
    fprintf(fq,"Day-to-day decisions are made concerning which problems should be looked
into.  In this chapter, daily decisions are documented and statistics that support
these decisions are presented.0);
    fprintf(fq,".sp0);
    fprintf(fq,"The problems are ordered by importance and sequence of execution.0);
    sprintf(buf,"/usr2/klima/people/kapo/drift2/priplan/priplan.csh %04d %02d
```

```
 31",aar0,mnd0);
    if(system(buf)){
      fprintf(stderr,"ERROR: Cannot execute %s0,buf);
      goto error;
    }
    sprintf(buf,"/usr2/klima/people/kapo/drift2/priplan/priplan.%02d",mnd0);
    fp=fopen(buf,"r");
    if(NULL==fp){
      fprintf(stderr,"ERROR: Cannot open %s0,buf);
      goto error;
    }
    while(NULL!=fgets(buf,BUFSIZ,fp)){
      fprintf(fq,"%s",buf);
    }
    fclose(fp);
    fprintf(fq,".bp0fB%d.2 Description of daily work\fP0,chapter);
    fprintf(fq,".sp 00henever system code is altered and programs recompiled, this is
 logged by the system.  In most cases an alteration of a program is commnedted upon.0);
    fprintf(fq,"The list below is daily updated, and documents the latest revisions and
 additions.0);
    sprintf(buf,"/usr2/klima/people/kapo/drift2/errfix/errfix.csh %04d %02d
 31",aar0,mnd0);
    if(system(buf)){
      fprintf(stderr,"ERROR: Cannot execute %s0,buf);
      goto error;
    }
    sprintf(buf,"/usr2/klima/people/kapo/drift2/errfix/errfix.%02d",mnd0);
    fp=fopen(buf,"r");
    if(NULL==fp){
      fprintf(stderr,"ERROR: Cannot open %s0,buf);
      goto error;
    }
    while(NULL!=fgets(buf,BUFSIZ,fp)){
      fprintf(fq,"%s",buf);
    }
    fclose(fp);
    return 0;
error:
    fprintf(stderr,"ERROR in klibas0);
    return 1;
}
```

2.3.3 General klibas system statistic

Several system statistics such as system size, system quality and system effort is collected and presented.

```
int systemStat(FILE *fq,int chapter){
  FILE *fp;
  int i;
  char *text[100]={
    "The figure below is intended give a general overview of how different categories
of weather observations flow through the KLIBAS system and are stored in the main
storage unit HL.",
    ".sp",
    ".sp 00ps 80vs 10",
    ".PS 6.2",
    "boxwid = 5",
    "boxht = 1",
    "movewid = 1",
```

```
    "moveht = 1",
    "lineht = 1",
    "ALA: box
    "move from ALA.right right",
    "SYNOP: box
    "move from SYNOP.top up",
    "EDB: box
    "move from SYNOP.right right",
    "PIO: box
    "move from PIO.right right",
    "METAR: box
    "arrow from EDB.bot to SYNOP.top",
    "arrow from EDB.bot to ALA.top",
    "arrow from EDB.bot to PIO.top",
    "arrow from EDB.bot to METAR.top",
    "move from METAR.right right",
    "ALV: box
    "move from ALV.right right",
    "ALN: box
    "move from ALN.right right",
    "ALP: box
    "move from ALP.right right",
    "VINDREG: box
    "move from VINDREG.right right",
    "AANDERAA: box
    "move from AANDERAA.right right",
    "move from ALP.top up",
    "KLIMA: box
    "arrow from KLIMA.bot to ALV.top",
    "arrow from KLIMA.bot to ALN.top",
    "arrow from KLIMA.bot to ALP.top",
    "arrow from KLIMA.bot to VINDREG.top",
    "arrow from KLIMA.bot to AANDERAA.top",
    "boxwid = 10",
    "moveht = 4",
    "move from ALV.bot down",
    "HL: box
    "arrow from ALA.bot to HL.top",
    "arrow from METAR.bot to HL.top",
    "arrow from SYNOP.bot to HL.top",
    "arrow from PIO.bot to HL.top",
    "arrow from ALV.bot to HL.top",
    "arrow from ALN.bot to HL.top",
    "arrow from ALP.bot to HL.top",
    "arrow from VINDREG.bot to HL.top",
    "arrow from AANDERAA.bot to HL.top",
    ".PE",
    ".sp 00ps 110vs 13",
    ".sp",
    NULL
  };
  fprintf(fq,".bp0fB%d. GENERAL SYSTEM STATISTICS RELEVANT FOR KLIBAS DEVELOP-
MENT\fR0sp 00,chapter);
  sprintf(buf,"/usr/people/kapo/syslog/oracle_shutdown/oracle_shutdown.csh %04d %02d >
/dev/null 2> /dev/null",aar0,mnd0);
  if(system(buf)){
    fprintf(stderr,"ERROR: Cannot execute %s0,buf);
    goto error;
  }
  sprintf(buf,"/usr/people/kapo/syslog/oracle_shutdown/oracle_shutdown.txt");
```

```
    fp=fopen(buf,"r");
    if(NULL==fp){
      fprintf(stderr,"ERROR: Cannot open %s0,buf);
      goto error;
    }
    while(NULL!=fgets(buf,BUFSIZ,fp)){
      fprintf(fq,"%s",buf);
    }
    fclose(fp);
    for(i=0;NULL!=text[i];i++)
      fprintf(fq,"%s0,text[i]);
    fprintf(fq,".bp0fB%d.1 Disk usage monitoring for /usr/people\fR0sp 00,chapter);
    sprintf(buf,"/usr/people/kapo/grim_reaper/grim_reaper.csh %04d %02d > /dev/null 2>
/dev/null",aar0,mnd0);
    if(system(buf)){
      fprintf(stderr,"ERROR: Cannot execute %s0,buf);
      goto error;
    }
    sprintf(buf,"/usr/people/kapo/grim_reaper/grim_reaper.txt");
    fp=fopen(buf,"r");
    if(NULL==fp){
      fprintf(stderr,"ERROR: Cannot open %s0,buf);
      goto error;
    }
    while(NULL!=fgets(buf,BUFSIZ,fp)){
      fprintf(fq,"%s",buf);
    }
    fclose(fp);
    return 0;
error:
    fprintf(stderr,"ERROR in systemStat0);
    return 1;
}
```

2.3.4 System statistics for the SYNOP routine

Statistics for vital programs and system elements are collected and presented.

```
int archiveSynop(FILE *fq,int chapter){
  int i;
  char *text[100]={
     ".sp",
     ".sp 00ps 80vs 10",
     ".PS 6.2",
     "boxwid = 5",
     "boxht = 0.67",
     "movewid = 1",
     "moveht = 0.5",
     "lineht = 0.5",
     "EDB: box
     "move from EDB.right right",
     "ALA: box
     "move from ALA.top up",
     "SYNOP: box
     "move from ALA.bot down",
     "PIO: box
     "move from PIO.bot down",
     "METAR: box
     "move from ALA.right right",
```

```
    "arrow from EDB.right to SYNOP.left",
    "arrow from EDB.right to ALA.left",
    "arrow from EDB.right to PIO.left",
    "arrow from EDB.right to METAR.left",
    "move from ALA.right right",
    "TELE: box
    "arrow from SYNOP.right to TELE.left",
    "arrow from ALA.right to TELE.left",
    "arrow dotted from PIO.right to TELE.left",
    "arrow dotted from METAR.right to TELE.left",
    "move from TELE.right right",
    "KLIMA: box
    "move from KLIMA.top up",
    "VA: box
    "arrow from TELE.right to VA.left",
    "arrow from TELE.right to KLIMA.left",
    ".PE",
    ".sp 00ps 110vs 13",
    ".sp",
    NULL
  };
  FILE *fp;
  struct elem{
    char *name;
    char *explain;
  }
  elem[12]={
    "TT","temperature",
    "TN","max temperature",
    "TX","min temperature",
    "P0","air pressure at station level",
    "P","air pressure at sea level",
    "N","clouds",
    "RR","precipitation",
    NULL,NULL
  };
  fprintf(fq,".bp0fB%d. SYNOPTIC MANUAL WEATHER STATIONS (SYNOP/TELE)\fR0sp 00,chap-
ter);
  fprintf(fq,".sp 00he most critical factors in the SYNOP/TELE routine, investigated
here, are the way observations are entering the SYNOP/TELE tables, the way automatic
interpolation and correction of observations is carried out and how the monthly
KA_H_STAT statistics are coming along.0);
  for(i=0;NULL!=text[i];i++)
    fprintf(fq,"%s0,text[i]);
  fprintf(fq,"Dotted lines in the figure above indicates that dataflow is not yet es-
tablished.0);
  fprintf(fq,".sp0fB%d.1 Monitoring the SYNO_INN system\fR0,chapter);
  fprintf(fq,".sp 00);
  sprintf(buf,"/usr/people/kapo/synop/syno_kontr/syno_test/syno_test.txt.%02d",mnd0);
  fp=fopen(buf,"r");
  if(NULL==fp){
    fprintf(stderr,"ERROR: Cannot open %s0,buf);
    goto error;
  }
  while(NULL!=fgets(buf,BUFSIZ,fp)){
    fprintf(fq,"%s",buf);
  }
  fclose(fp);
  fprintf(fq,".sp0fB%d.2 Monitoring the SYNO_KONTR system\fR0,chapter);
  fprintf(fq,".sp 00he SYNO_KONTR system consists of several programs for used for au-
```

```
tomatical and manual quality control and treatment of observations stored in the dat-
able TELE.0sp0);
  sprintf(buf,"/usr/people/kapo/synop/syno_kontr/syno_kontr.txt");
  fp=fopen(buf,"r");
  if(NULL==fp){
    fprintf(stderr,"ERROR: Cannot open %s0,buf);
    goto error;
  }
  while(NULL!=fgets(buf,BUFSIZ,fp)){
    fprintf(fq,"%s",buf);
  }
  fclose(fp);
  fprintf(fq,".sp0elow is a performance analysis of the INTERPOL2 automatic interpola-
tion routine is given by a list of the ten greatest RMSEs (root mean sqare errors) ob-
served for each meteorological element during %s.0,month[mnd0]);
  for(i=0;NULL!=elem[i].name;i++){
    fprintf(fq,".sp0fBInterpolation RMSE for %s (%s)\fR0,elem[i].explain,el-
em[i].name);
    sprintf(buf,"/usr/people/kapo/synop/syno_kontr/interpol2/interpol2.%s.%02d",el-
em[i].name,mnd0);
    fp=fopen(buf,"r");
    if(NULL==fp){
      fprintf(stderr,"ERROR: Cannot open %s0,buf);
      goto error;
    }
    while(NULL!=fgets(buf,BUFSIZ,fp)){
      fprintf(fq,".sp 018s",buf);
    }
    fclose(fp);
  }
  fprintf(fq,".sp0elow are statistics from the program INTERPOL_P0 (report no. 46/98
KLIBAS) that is constructed in order to improve the air pressure interpolation done by
INTERPOL2.0);
  sprintf(buf,"/usr/people/kapo/synop/syno_kontr/interpol_p0/interpol_p0.txt");
  fp=fopen(buf,"r");
  if(NULL==fp){
    fprintf(stderr,"ERROR: Cannot open %s0,buf);
    goto error;
  }
  while(NULL!=fgets(buf,BUFSIZ,fp)){
    fprintf(fq,"%s",buf);
  }
  fclose(fp);
  fprintf(fq,".sp0fB%d.3 Monitoring the KA_H_STAT routine\fR0,chapter);
  fprintf(fq,".sp 00ne of the main purposes of the SYNOP/TELE routine is to generate
monthly climate statistics as soon as observations are stored on the KLIBAS database
system.  Numerical values for this monthly product is generated by the program
KA_H_STAT.  A program CHECK_H_STAT is run as a part of the SYNO_KONTR system in order
to monitor problems arising due to data quality used for the KA_H_STAT program.0sp0);
  sprintf(buf,"/usr/people/kapo/synop/syno_kontr/check_h_stat/check_h_stat.txt");
  fp=fopen(buf,"r");
  if(NULL==fp){
    fprintf(stderr,"ERROR: Cannot open %s0,buf);
    goto error;
  }
  i=0;
  while(NULL!=fgets(buf,BUFSIZ,fp)){
    fprintf(fq,".sp 00fB%d.\fR %s",++i,buf);
  }
  fclose(fp);
```

```
   fprintf(fq,".sp0fB%d.4 Monitoring the STATUT routine\fR0,chapter);
   fprintf(fq,".sp 00nother main purposes of the SYNOP/TELE routine is to generate dai-
ly statistics based on the last 30 days of weather observations in TELE.  The statis-
tics are produced by a program STATUT.  A program CHECK_STATUT is used for monitoring
problems arising due to data quality used for the STATUT program.0sp0);
   sprintf(buf,"/usr/people/kapo/synop/syno_kontr/check_statut/check_statut.txt");
   fp=fopen(buf,"r");
   if(NULL==fp){
     fprintf(stderr,"ERROR: Cannot open %s0,buf);
     goto error;
   }
   i=0;
   while(NULL!=fgets(buf,BUFSIZ,fp)){
     fprintf(fq,"%s",buf);
   }
   fclose(fp);
   fprintf(fq,".sp0fB%d.5 Monthly summary of problems in the SYNOP/TELE rou-
tine\fR0,chapter);
   fprintf(fq,".sp 00n the beginning of every month problems during production of the
monthly climatology statistics are usually noted.  Systematic digitalisation of such
problems commenced July 9th 1998.0sp0);
   sprintf(buf,"/usr/people/kapo/synop/synop.inp");
   fp=fopen(buf,"r");
   if(NULL==fp){
     fprintf(stderr,"ERROR: Cannot open %s0,buf);
     goto error;
   }
   i=0;
   while(NULL!=fgets(buf,BUFSIZ,fp)){
     fprintf(fq,".sp 019s",buf);
   }
   fclose(fp);
   return 0;
error:
   fprintf(stderr,"ERROR in archiveSynop0);
   return 1;
}
```

2.3.5 System statistics for the METAR routine

Statistics for vital programs and system elements are collected and presented.

```
int archiveMetar(FILE *fq,int chapter){
  FILE *fp;
  fprintf(fq,".bp0fB%d. WEATHER STATIONS REPORTING IN METAR CODE\fR0sp 00,chapter);
  fprintf(fq,"A test routine was constructed October 1995 in order to read and store
METAR messages from the disk /opdata/metdadm/msys8 on the computer Tornado.  Below is
a counting of how many observations that were recorded for each time of observation of
the day.0);
  fprintf(fq,".sp0);
  fprintf(fq,".ps 80);
  fprintf(fq,".vs 100);
  fprintf(fq,".TS0);
  fprintf(fq,"center expand box;0);
  fprintf(fq,"lB rB rB rB rB rB rB rB rB rB rB rB rB rB rB rB rB rB rB rB rB rB rB
rB rB rB rB rB rB0);
  fprintf(fq,"lB r r r r r r r r r r r r r r r r r r r r r r r r r r r r r.0);
  sprintf(buf,"/usr2/klima/people/kapo/drift/METAR/bin/metartid %04d %02d >
%s/%s.tmp",aar0,mnd0,path,name);
```

```
    if(system(buf)){
      fprintf(stderr,"ERROR: Cannot execute %s0,buf);
      goto error;
    }
    sprintf(buf,"%s/%s.tmp",path,name);
    fp=fopen(buf,"r");
    if(NULL==fp){
      fprintf(stderr,"ERROR: Cannot open %s0,buf);
      goto error;
    }
    while(NULL!=fgets(buf,BUFSIZ,fp)){
      fprintf(fq,"%s",buf);
    }
    fclose(fp);
    fprintf(fq,".TE0);
    fprintf(fq,".ps 110);
    fprintf(fq,".vs 130);
    fprintf(fq,".sp0);
    fprintf(fq,"Daily export is done by a cron job that places data files on the export
 disk area /usr/people/kapo/metar/METARexport/export and comprize these.0);
    fprintf(fq,".sp0);
    fprintf(fq,".ps 90);
    fprintf(fq,".vs 110);
    fprintf(fq,".ft C0);
    sprintf(buf,"ls -l /usr/people/kapo/metar/METARexport/export >
%s/%s.tmp",path,name);
    if(system(buf)){
      fprintf(stderr,"ERROR: Cannot execute %s0,buf);
      goto error;
    }
    sprintf(buf,"%s/%s.tmp",path,name);
    fp=fopen(buf,"r");
    if(NULL==fp){
      fprintf(stderr,"ERROR: Cannot open %s0,buf);
      goto error;
    }
    while(NULL!=fgets(buf,BUFSIZ,fp)){
      fprintf(fq,".sp 020s",buf);
    }
    fclose(fp);
    fprintf(fq,".ps 110);
    fprintf(fq,".vs 130);
    fprintf(fq,".ft R0TE0);
    return 0;
error:
    fprintf(stderr,"ERROR in archiveMetar0);
    return 1;
}
```

2.3.6 System statistics for the KLIMA routine

Statistics for vital programs and system elements are collected and presented.

```
int archiveKlima(FILE *fq,int chapter){

  FILE *fp;
  fprintf(fq,".bp0fB%d. RESULTS FROM THE KLIMA ROUTINE\fR0sp 00,chapter);
  fprintf(fq,"What is written below is a status of the routine according to program
KLIMA_KONTR that makes daily checks and updates.0);
```

```
    sprintf(buf,"/usr/people/kapo/klima/klima_kontr/klima_kontr.txt.%02d",mnd0);
    fp=fopen(buf,"r");
    if(NULL==fp){
      fprintf(stderr,"ERROR: Cannot open %s0,buf);
      goto error;
    }
    while(NULL!=fgets(buf,BUFSIZ,fp)){
      fprintf(fq,"%s",buf);
    }
    fclose(fp);
    return 0;
error:
    fprintf(stderr,"ERROR in archiveKlima0);
    return 1;
}
```

2.3.7 System statistics for the SAWS routine

Statistics for vital programs and system elements are collected and presented.

```
int archiveSAWS(FILE *fq,int chapter){
  FILE *fp;
  fprintf(fq,"0bp0fB%d SEMI-AUTOMATED WEATHER STATIONS (SAWS)\fR0sp 00,chapter);
  fprintf(fq,".sp0fB%d.1 PIO stations (
  fprintf(fq,".sp 00);
  sprintf(buf,"/usr/people/kapo/klima/pio_inn/pio_inn.txt.%02d",mnd0);
  fp=fopen(buf,"r");
  if(NULL==fp){
    fprintf(stderr,"ERROR: Cannot open %s0,buf);
    goto error;
  }
  while(NULL!=fgets(buf,BUFSIZ,fp)){
    fprintf(fq,"%s",buf);
  }
  fclose(fp);
  fprintf(fq,".sp0fB%d.2 Automated wind observations\fR0sp 00,chapter);
  fprintf(fq,".sp 00WS wind data are systematically collected and stored in datatable
VIND_REG.  The observations are to be used for climatological purposees but also as
reference data for correcting wind observations on other stations.0);
  fprintf(fq,"The table below shows datacoverage during last twelve months.0sp0);
  sprintf(buf,"/usr/people/kapo/klima/vind_reg/vind_reg.txt");
  fp=fopen(buf,"r");
  if(NULL==fp){
    fprintf(stderr,"ERROR: Cannot open %s0,buf);
    goto error;
  }
  while(NULL!=fgets(buf,BUFSIZ,fp)){
    fprintf(fq,"%s",buf);
  }
  fclose(fp);
  return 0;
error:
  fprintf(stderr,"ERROR in archiveSAWS0);
  return 1;
}
```

2.3.8 System statistics for the AWS routine

Statistics for vital programs and system elements are collected and presented.

```
int archiveAuto(FILE *fq,int chapter){
  FILE *fp;
  fprintf(fq,".bp0fB%d. AUTOMATIC WEATHER STATIONS (AWS)\fR0sp 00,chapter);
  fprintf(fq,".sp0fB%d.1 Realtime automatic weather stations\fR0sp 00,chapter);
  sprintf(buf,"/usr/people/kapo/auto/auto_inn/auto_inn.txt.%02d",mnd0);
  fp=fopen(buf,"r");
  if(NULL==fp){
    fprintf(stderr,"ERROR: Cannot open %s0,buf);
    goto error;
  }
  while(NULL!=fgets(buf,BUFSIZ,fp)){
    fprintf(fq,"%s",buf);
  }
  fclose(fp);
  fprintf(fq,".sp0aily export is done by a cron job that places data files on the ex-
port disk area /usr/people/kapo/auto/auto_backup/export and comprize these.0);
  sprintf(buf,"/usr/people/kapo/auto/auto_backup/auto_backup.txt.%02d",mnd0);
  fp=fopen(buf,"r");
  if(NULL==fp){
    fprintf(stderr,"ERROR: Cannot open %s0,buf);
    goto error;
  }
  while(NULL!=fgets(buf,BUFSIZ,fp)){
    fprintf(fq,"%s",buf);
  }
  fclose(fp);
  return 0;
error:
  fprintf(stderr,"ERROR in archiveAuto0);
  return 1;
}
```

2.3.9 Making plans for next month

The program tries to guess how much work that is likely to be done next month and lists the most vital problems to be solved.

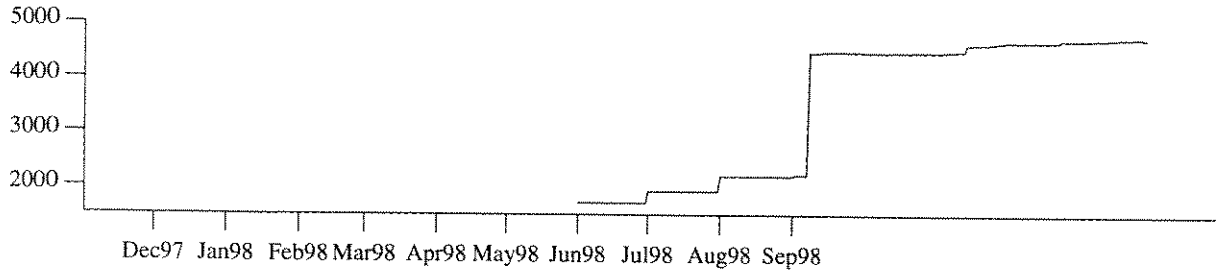
```
int newPlans(FILE *fq,int chapter){
  FILE *fp;
  int yyy,mmm,i;
  double count[13],tasks;
  yyy=aar0;
  mmm=mnd0+1;
  if(mmm>12){
    mmm=1;
    yyy++;
  }
  sprintf(buf,"%s ",month[mmm]);
  for(i=0;i<strlen(buf);i++)
    buf[i]=toupper(buf[i]);
  fprintf(fq,".bp0);
  fprintf(fq,"\fB%d. PLANS FOR %s %d\fR0sp 00,chapter,buf,yyy);
  fprintf(fq,".sp 00tatistics in chapter two shows the progression of problem solving
by programming.  As is illustrated in appendix 1, the solving of greater KLIBAS prob-
lems are often accopined with system documentation in the KLIBAS report series.  By
taking the average of the number of reports published during the last three months,
```

```
the number of expected greater problems to be solved in this manner for %s %d is esti-
mated.0,month[mmm],yyy);
  fprintf(fq,".sp0he problem decided to work upon are normally selected from the list
of unsolved problems in chapter two.  A complete list of KLIBAS reports published so
far is listed in appendix 2.0);
  fprintf(fq,".sp0);
  fprintf(fq,".TS0 1.0);
  sprintf(buf,"%s/dat/rapporter.txt",path);
  fp=fopen(buf,"r");
  if(NULL==fp){
    fprintf(stderr,"ERROR: cannot open %s0,buf);
    goto error;
  }
  mmm=mnd0;
  yyy=aar0-1;
  for(i=0;i<13;i++){
    count[i]=0.0;
    rewind(fp);
    sprintf(buf2,"%02d.%04d",mmm,yyy);
    while(NULL!=fgets(buf,BUFSIZ,fp)){
      if(NULL!=strstr(buf,buf2)&&NULL!=strstr(buf,"KLIBAS")&&NULL!=strstr(buf,"Rap-
port"))
       count[i]++;
    }
    if(i){
      if(count[i]==1)
       fprintf(fq,"%s %d%.0f KLIBAS program documentation re-
port.0,month[mmm],yyy,count[i]);
      else
       fprintf(fq,"%s %d%.0f KLIBAS program documentation re-
ports.0,month[mmm],yyy,count[i]);
    }
    mmm++;
    if(mmm>12){
      mmm=1;
      yyy++;
    }
  }
  fclose(fp);
  fprintf(fq,".TE0);
  for(i=2;i<13;i++)
    count[1]+=count[i];
  tasks=count[1]/12.0;
  fprintf(fq,".sp0he number of expected program documentation reports to be written
during %s %d is %.0f.0,month[mmm],yyy,tasks);
  fprintf(fq,".sp0elow is a list of the %.0f most important programming challenges for
%s %d according to list in chapter two.0sp0,tasks,month[mmm],yyy);
  sprintf(buf,"%s2/priplan/priplan.%02d",path,mnd0);
  fp=fopen(buf,"r");
  if(NULL==fp){
    fprintf(stderr,"ERROR: cannot open %s0,buf);
    goto error;
  }
  i=0;
  while(NULL!=fgets(buf,BUFSIZ,fp)){
    if(NULL!=strstr(buf,"\fB")){
      if(++i<((int)tasks)+2)
       fprintf(fq,".sp 023s",buf);
    }
  }
```

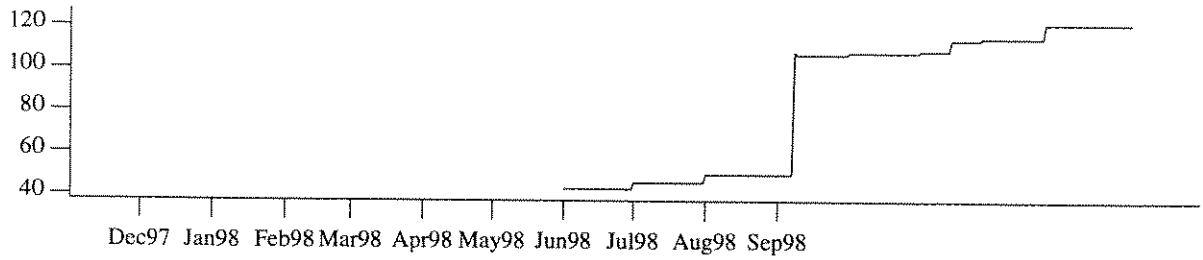
```
    fclose(fp);
    return 0;
error:
    fprintf(stderr,"ERROR in newPlans0);
    return 1;
}
```

3. SOFTWARE METRICS AND PROJECT HISTORY

As a measure for at what pace the project has been developing, the number of lines of program code on each run during September 1998 has been recorded and drawn on the curve below.



Lines of code measured at each run of September 1998



Number of procedures (functions) in source code measured at each run of September 1998

The maintenance log is updated manually on a daily basis. The complete log for all programs is displayed in monthly maintenance and performance statistics report.

Mon Sep 07 1998
A system specification for the present version of DRIFT was written. Minor problems and errors were corrected in the program.

Sat Sep 05 1998
The chapter on project statistics was redesigned and partly reprogrammed.

Wed Sep 02 1998
The KLIBAS statistics report was restructured. Chapter 1 was totally rewritten.

Tue Sep 01 1998
A first draft specification was written for DRIFT, based on thte AUTO program specification.

Sat Aug 29 1998
Statistics from INTERPOL_P0 was added to the program.

Wed Jul 15 1998
The curve showing progession in problem solving is displyed by units of one day pr measurement.

Fri Jul 10 1998
More diagrams were added to sections on the SYNOP routine explaining the topological data flow structure of the rouine.

Thu Jul 09 1998

Diagrams were added to sections on the SYNOP routine.

Wed Jun 03 1998
Some lines on the general maintenance and development was included.

Tue Apr 21 1998
The program drift was reimplemented as a C++ program.

Mon Mar 09 1998
The program was edited and recompiled. Documentation was made up to date.

Mon Mar 02 1998
A mixup of dates for chapter four on programming priorities was mended.

Fri Jan 02 1998
The computer programme DRIFT2 was edited in order to produce correct data for December 1997.

Thu Dec 04 1997
The script drift2.csh was constructed in order to have better quality control over Maintenance/Performance report.

REFERENCES

Rapport 32/91 KLIMA "Database/maskin prosjektet i Klimaavdelingen 1990-1991. Informasjonsmodell, flagging og kontroller. Status pr 30.06.91"
Rapport 40/92 KLIMA "Etablering av valgt datastruktur på Typhoon. Delprosjekt 3"
Rapport 42/92 KLIMA "Utarbeiding og testing av ulike datastruktur på Typhoon. Delprosjekt 2"
Rapport 44/92 KLIMA "Standarder for systemutvikling. Delprosjekt 4"
Rapport 45/92 KLIMA "Kvalitetsstyring for prosjektarbeid. Delprosjekt 5"
Rapport 53/92 KLIMA "Databaseprosjektet i Klimaavdelingen. Status pr 23.12.1992"
Rapport 08/93 KLIMA "Sikkerhetsrutiner. Delprosjekt 7.8"
Rapport 03/94 KLIBAS "Databaseprosjektet i Klimaavdelingen. Status pr 31.12.1993"
Rapport 10/94 KLIBAS "Databaseprosjektet i Klimaavdelingen. KLIBAS systemoversikt-applikasjoner. Teknisk løsning, systemoversikt, meny, aksessrettigheter, brukerdialog, applikasjonsarkitektur."
Rapport 17/94 KLIBAS "Rapport fra brukergruppen: Forslag til spesifikasjon for data-ut-programmer"
Rapport 24/94 KLIBAS "Databaseprosjektet i Klimaavdelingen. Status pr første halvår 1994"
Rapport 27/94 KLIBAS "Skisse til et generelt data-kontroll-system for geofysiske data"
Rapport 28/94 KLIBAS "Omlegging av databaserutiner ved overgang fra Oracle6 til Oracle7"
Rapport 33/94 KLIBAS "Praktisk rutine for kvalitetssikring av programvare"
Rapport 34/94 KLIBAS "Kvalitetshåndbok for databaseprosjektet i Klimaavdelingen"
Rapport 03/95 KLIBAS "Kvalitetshåndbok for databaseprosjektet i Klimaavdelingen. Del II"
Rapport 06/95 KLIBAS "Databaseprosjektet i Klimaavdelingen. Status pr årsskifte 1994/95"
Rapport 22/95 KLIMA "KLIBAS - The DNMI Climatological Database System"
Rapport 27/95 KLIBAS "Brukergruppens arbeid 1994-95"
Rapport 01/96 KLIBAS "Databasegruppen 1995"
Rapport 04/96 KLIBAS "Automatisering av kvalitetskontroll av geofysiske data ved Klimaavdelingen"
Rapport 05/96 KLIBAS "KS - Spesifikasjon av programmer - Utskriftsramme"
Rapport 06/96 KLIBAS "KS - Utvikling av programmer: Døgnekstremramme, månedsramme, årsramme"
Rapport 08/96 KLIBAS "Brukerveiledning for: - Utskriftsrammer"
Rapport 13/96 KLIBAS "KLIBAS - status 30.06.1996"

Rapport 03/97 KLIBAS "Referater fra møter i databasegruppen 1996"
Rapport 07/97 KLIBAS "Arbeid gjort av Brukergruppa i 1996"
Rapport 45/97 KLIBAS "Logging av driftsparametre for kvalitetssikring av driftsrutiner"
Rapport 46/97 KLIBAS "Kvalitetstrend QUAL_TREND i månedlig driftsrapportering"
Rapport 49/97 KLIBAS "Eksperiment med automatisk feilbehandling i KLIBAS"
Rapport 50/97 KLIBAS "Beregning og presentasjon av datakvalitet i månedlig driftsrapport"
Rapport 53/97 KLIBAS "Beregning og presentasjon av maskinvarekvalitet i månedlig driftsrapport"
Rapport 06/98 KLIMA "Kvalitetssikring av meteorologiske observasjonsdata"
Rapport 05/98 KLIBAS "Computer program SYNOP monitoring performance, quality and development of the TELE/SYNOP system"
Rapport 06/98 KLIBAS "Computer program CHECK_MAIL"
Rapport 07/98 KLIBAS "Arbeid i databasegruppen 1997"
Rapport 10/98 KLIBAS "Arbeid gjort av brukergruppa i 1997"
Rapport 13/98 KLIBAS "Analysing CRONTAB scheduling with computer program ORACLE_SHUT-DOWN"
Rapport 14/98 KLIBAS "Automatically altering CRONTAB with computer program CHECK_15MIN v.2.0"
Rapport 15/98 KLIBAS "Computer program GRIM_REAPER"