

Porting of the Downlink Software sub-system to LINUX

Version 2.5

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Aim: The steps below present a first cut on making code and makefile modifications to support downlink processing under *both* Linux (INTEL) and Sun/Solaris (Sun-FORTE) systems using the *same* source files and infrastructure. It will be a gradual process requiring thorough testing on both systems. The first stage of upgrades is to support *offline* pipeline processing.

Advisory: Only modify code that you have written. If your system depends on code written by other developers, let them know and tell them to modify it. We don't want developers committing old code from their private area in future.

I. Generic Updates to Makefiles (ensures FORTE and INTEL compatibility)

1. In all makefiles, replace any occurrence of the combination:
"-IF77 -lc -lsunmath" or "-IF77 -lsunmath" or "-IF77" with:
\$(LIBS_OPT_FORTRAN) below the LIBS_opt = ... and LIBS_dbg = ... sections.
If you're curious, this variable expands as: "-IF77 -lc -lsunmath" under FORTE and
"-ICEPCF90 -IPEPCF90 -lintrins -IF90" under INTEL.
2. In all Fortran makefiles, add the line \$(LIBS_OPT_FORTRAN) below the LIBS_opt = ...
and LIBS_dbg = ... sections.
3. In all C, C++, C-esql makefiles, include the following line above the "this:" rule:
DFLAG = \$(DFLAG_CC)
In all Fortran makefiles, include the following line above the "this:" rule:
DFLAG = \$(DFLAG_FC)
If you're curious, these variables are set to nothing in the environment (macro) makefiles
for now. They are placeholders for the nightly and I&T builds to suppress verbose warning
messages when compiling. If you do **not** want to see these warning messages when unit
compiling under Linux, append either a "-w0" or "-w" to these lines for C or Fortran
makefiles respectively, e.g:
DFLAG = \$(DFLAG_CC) -w0
DFLAG = \$(DFLAG_FC) -w
**Remember to remove the "-w0" or "-w" flags prior to committing to CVS since
otherwise your code will not build under FORTE.
4. In all library makefiles which make shared objects, add
\$(LIB_POST_FLAGS) to the end of the following lines:
@\$(SHLIB_LD) \$(SHLIB_LD_FLAGS) -o \$(SHLIB_opt1) \$(LIB_opt1)
@\$(SHLIB_LD) \$(SHLIB_LD_FLAGS) -o \$(SHLIB_dbg1) \$(LIB_dbg1)
NOTE: F. Masci has already taken care of libcfitsio, libcalkywrds, libcaltrans, libim_fitsio,
libmathc90, libtbl, libtimecv, libumfpack and libwcs.
5. Refer to Ted's list below for changes in specific makefiles (section IV).

II. Generic Updates to Source Code (may be incomplete)

To keep software as robust as possible and minimize any possible undue incompatibility under Linux or Sun/Solaris, **all source code changes** must use the following conditional-directive syntax to be pre-processed by the appropriate compiler. The default (or priority) is compilation/execution under Sun-Solaris. The same syntax will work under C/C++/Fortran/C-embedded ESQL.

```
#ifndef __INTEL_COMPILER
..."New" Linux (Intel) specific code...
#else
..."Existing" Sun/Solaris specific code...
#endif
```

The generic changes below refer to new code (*Linux*) and existing code (*Sun*). Ensure you encapsulate each corresponding code snippet under the respective conditional branch above.

1. Fortran IDate call arguments:
Sun: IDate(JDate(1:1), Jdate(2:2), Jdate(3:3))
Linux: IDate(JDate)
2. Nan-handling functions:
Sun: dnan(*(short *) &x)
Linux: isnan(x).
#include <math.h> (if you have not already done so).
3. Specific character-string copies:
Sun: strncpy(...)
Linux: strncpy(...)
4. IEEE functions/extensions:
Sun: #include <ieeefp.h>
Linux: #include <math.h> (if you have not already done so).
5. Only if you are using libtableio. There is a problem under Linux when you want to read a table from the beginning. Otherwise it will start 5 or 6 lines into the table. Iffat is looking into whether this can be fixed in the library itself.
Sun: ...tblread(iu)...
Linux: trwnd(iu);
tblread(iu);
trwnd(iu);
6. Date/time handling include files:
Sun: #include <sys/time.h> (or #include <sys/stat.h>)
Linux: #include <time.h>
7. **CogE's only:** All wrappers/scripts which make system calls to dbaccess: Remove the "-e" flag from the args of the dbaccess call. Intel's version of dbaccess under informix (isql) doesn't recognize "-e". The purpose of "-e" is to echo all inputs to stdout.
8. Refer to Ted's list below for changes in specific files (section V).

III. Module Testing (All developers: under Sun, CogE's: under Linux and Sun)

- Following modifications (as above), make sure your software builds with no errors first on a FORTE system (e.g. segdnl or your dev machine) and then on an INTEL system:
 - You can ssh into sscpipe20 using your segdnl username/passwd.
 - I have already checked out a version of downlink under /scr/L9.1
 - Before performing unit/module compilations, source /scr/L9.1/downlink/builds/downlink_generic_linux.env . If your module depends on a library which is not already built under /lib, coordinate this with the responsible developer.
 - CVS check-ins/updates from within /scr/L9.1/downlink will have to be performed by including the option “-d :pserver:<username>@ssccm2:/ssc/cvs/root” after the cvs command where <username> is your unix login (not your segdnl account login).
For example, to check files in:
cvs -d :pserver:<username>@ssccm2:/ssc/cvs/root commit <file(s)>
To update your local area:
cvs -d :pserver:<username>@ssccm2:/ssc/cvs/root commit <file(s)>
- Test the code on both a FORTE (Solaris) system and on an INTEL (Linux) system via either module unit tests or offline pipelines.

IV. Changes to Specific Makefiles (from Ted H. – S8.0 delivery)

Makefile	Changes	Comments
dimage/Makefile	list sources and objects explicitly	Shell 'ls' command doesn't work
uprop/Makefile	SHLIB_LD_CC -> SHLIB_LD	using icc
uprop/Makefile	Remove cp *.h ... line	Using runtime directory structure.
tblf/Makefile	Remove line defining PLTF RM_FFLAGS	Overwrites upper-level makefile def.
tblf/Makefile	Remove line defining PLTFRM_FFLAGS	Overwrites upper-level makefile def.
tblf/Makefile	Comment out DFLAG = -g	"-g" turns off optimization
tblf/Makefile	SIRTF_LIB -> SIRTFROOT	To point to source directory.
qatool/Makefile	Set DFLAG = -g \${DFLAG_CC}	Problem at dsort in compute_reslts
job/Makefile	Remove -L/usr/lib -lgen	Solaris-specific
job/Makefile	Remove "-g" flag from esql call	Don't need debugging
job/Makefile	Add mkdirp and gethrtime to src, obj lists	Provide functions specific to Solaris
sdm/c/dnlapi/Makefile	Use CC=icc, DBX =, CFLAGS = \${DBX}	"-Kpic" is default
sdm/c/dnlapi/Makefile	Remove "-Kpic" from esql command	
sdm/c/dnlapi/Makefile	Remove "install" from all:	Install by hand. Copy to sdm/lib
sdm/c/dnlapi/Makefile	Remove "-G" from \${DNLLIB}	Not needed
APES/Makefile	Remove -lposix4 -lthread -lsocket	Not needed.
APES/Makefile	Use line bin_opt: \$(BIN_opt2)	Compile jobber only

APES/Makefile	Remove "-mt -g" flags from compile cmd	Forte-specific
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V. Changes to Specific Source Code Files (from Ted H. – S8.0 delivery)

Source Code File	Changes	Comments
dlimage/Namelist.cpp	Add #include <time.h> above <sys/stat.h>	Needed for struct timespec
dlimage/Image.cpp	Add #include <math.h>	Needed for isnan()
im/iraftime.c	Add line #include <time.h>	Need as well as <sys/time.h>
tblf/topenr_f.f	Add four lines at ~373 to not allow format to start with an empty field, e.g., changes (,8x,1a) to (8x, 1a) if(tformf(ifr)(2:2) .eq. ',') tformf(ifr)(2:2)=' ' if(tformd(ifr)(2:2) .eq. ',') tformd(ifr)(2:2)=' ' if(tforma(ifr)(2:2) .eq. ',') tforma(ifr)(2:2)=' ' if(tformi(ifr)(2:2) .eq. ',') tformi(ifr)(2:2)=' '	Worked OK as undocumented feature of forte fortran compiler, does not work with intel compiler. Add just before c Remove blanks from format strings
tblf/topenr_f.f	Add lines read(unit,infmt(ifr),iostat=iterr) line(ifr) nch = len_trim(line(ifr)) before 105. Use nch instead of 105 and 106.	Fortran compiler documentation states that streams-type and formatted-type file IO should not be mixed. Many other instances.
tblf/thdrwf.f	Remove thdrwf.o before linking	Duplicate subroutine definition.
tblf/thdrw.f	Comment out lines referring to thdrwf	Evidently this function is not used.
tblf/tcls_f.f	Comment out lines 121-149	Alleviates segmentation fault.
tblf/tread.f	l. 58, add if(iterr .NE. 0) goto 200 after read	
sanity/sanity_datatype.c	Add trwnd(iu1); tblread(iu1); trwnd(iu1); before the tblread loop at line 202.	Otherwise, first five lines of table may not be read.
sanity/sanity_datatype.c	Add trwnd(iu2); tblread(iu2); trwnd(iu2); before the tblread loop at line 462.	Otherwise, first five lines of table may not be read.
sanity/sanity_check.c	Add trwnd(iu); tblread(iu); trwnd(iu); before the tblread loop at line 125.	Otherwise, first five lines of table may not be read.
job/job.h	Add hrtime_t gethrtime();	For new gethrtime function
job/jrdb.c	Add #include <byteswap.h>	To support byte-order adjustment.
job/jrdb.c	Use bswap_32_asm to adjust members of r	To match intel architecture.
job/sys/ipc.h	Remove #include <bits/ipctypes.h> after copying from /usr/include/sys/ipc.h	Conflict with /opt/intel/compiler70/ia32/substitute_headers/bits/types.h
downlink/include/apes.h	Remove #include <synch.h>	Solaris-specific
downlink/include/apes.h	Copy sema_t structure definition from Sun-owned, proprietary, copyrighted synch.h	
downlink/include/apes.h	Remove structure metadata_t	Depends on sema_t from synch.h

downlink/include/apes.h	Remove structure APESbrain_args_t	Depends on metadata_t
sdm/c/dnlapi/sdm_sigEvents.ec	Remove #include <nan.h>	Solaris-specific
sdm/c/dnlapi/sdm_sigEvents.ec	errno -> input_errno in sdm_register_SigEvent	Reserved word
sdm/c/dnlapi/sdm_sigEvents.h	Change declaration of sdm_registerSigEvent to use input_errno	For renaming of input variable
sdm/c/dnlapi/sdm_sodbc.c	Remove #include <nan.h>	Solaris-specific
sdm/c/dnlapi/sdm_sodbc.c	Change three instances of NaN() to atof() starting at line 300	To avoid the use of nan.h
APES/net.c	lines 65, 248 Use getprotobyname_r("tcp", &proto, buffer, 8096, &pr);	Gnu-c form is slightly different from that of Forte
APES/net.c	line 114 Use if(gethostbyname_r(machine, &host, buffer, 8096, &hr, &errno)==0)	Gnu-c form is slightly different from that of Forte. Returns 0 on success (Forte returns an address)
APES/net.c	line 295 Use if(gethostbyname_r(hostname, &host, buffer, 8096, &hr, &errno)==0)	Gnu-c form is slightly different from that of Forte. Returns 0 on success (Forte returns an address)
APES/net.c	line 445 Initialize timeout.tv_usec	Could have large value otherwise

VI. Changes to Specific Makefiles and Source Code Continued... (from Ted H. – S7.0 delivery)

Source Code File	Changes	Comments
mosaic_int/Makefile	Change SIRTFLIB -> SIRTROOT	To point to source directory.
mosaic_int/Makefile	Remove -lmathc90	
mosaic_int/*.c	Remove #include <ieeefp.h> lines	Not in distribution, not needed.
mosaic_coadd/*	Same as mosaic_int	Same changes to Makefile and *.c
mosaic_dual_outlier/*	Same as mosaic_combine	Same changes to Makefile and *.c
mosaic_dual_outlier/Makefile	LIBS_dbg -> LIBS_opt at BIN_opt1 line	LIBS_dbg is for BIN_dbg1
mosaic_geom/*	Same as mosaic_int	Same changes to Makefile and *.c
mosaic_int/*	Same as mosaic_int	Same changes to Makefile and *.c
mosaic_outlier/*	Same as mosaic_int	Same changes to Makefile and *.c
mosaic_reint/*	Same as mosaic_int	Same changes to Makefile and *.c
mosaic_rmask/*	Same as mosaic_int	Same changes to Makefile and *.c
mosaic_split/*	Same as mosaic_int	Same changes to Makefile and *.c
aperture/Makefile	Remove line defining SIRTFLIB	Overwrites upper-level makefile def.
c2strans/Makefile	SIRTFLIB -> SIRTROOT	To point to source directory.
c2strans/*.c	Remove #include <ieeefp.h> lines	Not in distribution, not needed.
catfits/catfits.f	Remove spaces at end of three lines longer than 72 characters.	Check compiler error message to see which three lines.
distort/initdistdata.c	Change all strcpy to strncpy	Arguments need not be changed.
combine_header_image	No changes needed.	
fit_radius/Makefile	Remove line defining PLTFRM_CCINCLUDE	Overwrites upper-level makefile def.
gaussnoise/Makefile	Remove line defining SIRTFLIB	Overwrites upper-level makefile

		def.
interp_back/Makefile	Remove line defining PLTFRM_CCINCLUDE	Overwrites upper-level makefile def.
level/Makefile	Remove line defining PLTFRM_CCINCLUDE	Overwrites upper-level makefile def.
level/Node.cpp	Add line #include <math.h>	Needed for nan check.
linmatchfilt/Makefile	Remove line defining SIRTFLIB	Overwrites upper-level makefile def.
linmatchfilt/Filter.cpp	Add line #include <math.h>	Needed for nan check.
medfilter/Makefile	Remove line defining SIRTFLIB	Overwrites upper-level makefile def.
pointsourceprob/Makefile	Remove line defining SIRTFLIB	Overwrites upper-level makefile def.
removedetect/Makefile	Remove line defining SIRTFLIB	Overwrites upper-level makefile def.
rhdetect/Makefile	Remove line defining SIRTFLIB	Overwrites upper-level makefile def.
sourceestimate/Makefile	Remove line defining SIRTFLIB	Overwrites upper-level makefile def.
sourceestimate/MyTableOutputList.cpp	Add line #include <math.h>	Needed for nan check.
sourceestimate/MyTableOutputList.cpp	Change all strcpy to strncpy	Arguments need not be changed.
sourceestimate/BufferFile.cpp	Replace "delete[]" with "delete"	To match allocation with "new"
satmask/*.c	Change dnan() calls to isnan()	Byte-order reversal breaks dnan. Use sed "s/dnan[()]*[(]short \[*]) \&/isnan\(/" on source code file.
dnlstats	No changes needed.	
dntoflux/*.c	Change dnan() calls to isnan()	Byte-order reversal breaks dnan. Use sed "s/dnan[()]*[(]short \[*]) \&/isnan\(/" on source code file.
sloperorr/*.c	Change dnan() calls to isnan()	Byte-order reversal breaks dnan. Use sed "s/dnan[()]*[(]short \[*]) \&/isnan\(/" on source code file.
droopop/*	Remove #include <ieee754.h> lines	Not in distribution, not needed.
rowdroop/Makefile	Change target of cp *_errcodes.h from \$(SIRTFROOT)/include to \$(SIRTF_ARCH)/include	To point to runtime directory.
rowdroop/*	Remove #include <ieee754.h> lines	Not in distribution, not needed.
rowdroop/rowdroop_compute.c	Make fclose conditional on I_Verbose	fopen is conditional on I_Verbose
cubesub/*.c	Remove #include <ieee754.h> lines	Not in distribution, not needed.
slopecorr	Change dnan() calls to isnan()	Byte-order reversal breaks dnan. Use sed "s/dnan[()]*[(]short \[*]) \&/isnan\(/" on source code file.
flatap/*.c	Remove #include <ieee754.h> lines	Not in distribution, not needed.
uprop	No changes needed.	
radhitmedfilt	No changes needed.	
sfdc/sfdc.f	Replace IDate(JDate) with IDate(JDate(1:1), Jdate(2:2), Jdate(3:3))	Gnu form of this built-in function is slightly different from forte form. May need ifdef lines for cross-platform compatibility.
qatool/Makefile	Set DFLAG = -g	Problem at dsort in compute_reslts

qatool/*.c	Change dnan() calls to isnan()	Byte-order reversal breaks dnan. Use sed "s/dnan[()]*[(]short \[*])] \&/isnan\(/" on source code file.
chkmask/chkmask.f	Replace IDate(JDate) with IDate(JDate(1:1), Jdate(2:2), Jdate(3:3))	Gnu form differs from forteform. May need ifdef lines for cross-platform.
cvti2r4/cvti2r4.f	Replace IDate(JDate) with IDate(JDate(1:1), Jdate(2:2), Jdate(3:3))	Gnu form differs from forteform. May need ifdef lines for cross-platform.
cspice	Use provided scripts, then copy to "common/include" and "common/lib"	Non-SSC source code, comes with its own make scripts
tranhead	Copy *errcodes.h to \$(SIRTF_ARCH)/include	Needs to be done for every module that uses a *errcodes.h
tranhead/*.c	Change dnan() calls to isnan()	Byte-order reversal breaks dnan. Use sed "s/dnan[()]*[(]short \[*])] \&/isnan\(/" on source code file.
sanity_datatype.c	Possible need for extra file rewind statement.	First five lines of table may not be read. No runtime errors seen.
imheader	Copy and build under "common", then copy executable to \$(SIRTF_ARCH)/bin	May be used in some offline scripts.
detect_radhit/Makefile	Remove line defining PLTFRM_CCINCLUDE	Overwrites upper-level makefile def.
detect_radhit/node.cpp	Add line #include <math.h>	Needed for nan check.
darkdrift/*.c	Change dnan() calls to isnan()	Byte-order reversal breaks dnan. Use sed "s/dnan[()]*[(]short \[*])] \&/isnan\(/" on source code file.
desatslope/*.c	Change dnan() calls to isnan()	Byte-order reversal breaks dnan. Use sed "s/dnan[()]*[(]short \[*])] \&/isnan\(/" on source code file.
snestimator/Makefile	Remove line defining PLTFRM_CCINCLUDE	Overwrites upper-level makefile def.
pointing_refine.pl	Change select -> bin/select or use system("csh -c \"\\${sys_command}\"") for select	Wrong "select" invoked.
tmasspsc/Makefile	SIRTF_LIB -> SIRTFROOT	To point to source directory.
tmasspsc/Makefile	Change gcc to icc	Equivalent for Intel compiler
tmasspsc/Makefile	Remove LIBSNET definitions	Must be built-in
tmasspsc/Makefile	Set CFLAG1 = -O0	urlget only works unoptimized.
tmasspsc/Makefile	Delete run_httpget from src, obj lists	Not needed, won't compile (esql)
tmasspsc/Makefile	\$(ESQL) -> \$(CC) for tmasspsc compile	Don't have esql compiler
tmasspsc/Makefile	mv binaries to \$(SIRTF_ARCH)/bin instead of \$(SIRTFROOT)/bin	Move into runtime directory structure.
umfpack/Makefile	Get and run Make.linux with no CFLAGS definitions	Non-SSC source code, comes with its own makefile
tblf/Makefile	Remove line defining PLTFRM_FFLAGS	Overwrites upper-level makefile def.
tblf/Makefile	Remove line defining PLTFRM_FFLAGS	Overwrites upper-level makefile def.
tblf/Makefile	Comment out DFLAG = -g	"-g" turns off optimization
tblf/Makefile	SIRTF_LIB -> SIRTFROOT	To point to source directory.

tblf/topenr_f.f	Add four lines at ~373 to not allow format to start with an empty field, e.g., changes (,8x,1a) to (8x, 1a) if(tformf(ifr)(2:2) .eq. ',') tformf(ifr)(2:2)=' ' if(tformd(ifr)(2:2) .eq. ',') tformd(ifr)(2:2)=' ' if(tforma(ifr)(2:2) .eq. ',') tforma(ifr)(2:2)=' ' if(tformi(ifr)(2:2) .eq. ',') tformi(ifr)(2:2)=' '	Worked OK as undocumented feature of forte fortran compiler, does not work with intel compiler. Add just before c Remove blanks from format strings
tblf/topenr_f.f	Add lines read(unit,infmt(ifr),iostat=iterr) line(ifr) nch = len_trim(line(ifr)) before 105. Use nch instead of 105 and 106.	Fortran compiler documentation states that streams-type and formatted-type file IO should not be mixed. Many other instances.
tblf/thdrwf.f	Remove thdrwf.o before linking	Duplicate subroutine definition.
tblf/thdrw.f	Comment out lines referring to thdrwf	Evidently this function is not used.
tblf/tcls_f.f	Comment out lines 121-149	Alleviates segmentation fault.
tbl/Makefile	Add line DFLAG = -O0	Only works unoptimized.
libwcs/Makefile	Remove tnxpos2 from src, obj lists	Source not present.
im/iraftime.c	Add line #include <time.h>	Need as well as <sys/time.h>