

ALADIN and GMKPACK at ECMWF

Ryad El Khatib

Météo-France/CNRM/GMAP

1. Introduction

This is a short report of my work to port the ALADIN libraries of cycle 28T1 on IBM at ECMWF (*hpca*) with the help of **gmckpack.5.5** : more complete than the mail sent on July 21st, but without the joint pieces.

2. Explicit interface blocks:

Note that cycle 28T1 use auto-generated explicit interface blocks for the F90 procedures in the project *arp* and *ald*. They appear as included files suffixed ".intfb.h" in the source code. You can possibly ignore them in cycle 28T1, having dummy empty files instead. But this will not be possible in the next cycles because of the further code cleanings programmed for cycle 29 and the enhancements allowed by the use of these explicit interface blocks.

Some scripts were sent by e-mail, written by Mats Hamrud (Perl scripts) and slightly adapted by myself, and actually used in **gmckpack.5.5** to generate these explicit interface blocks :

- *Fortran90_stuff.pm* : Perl module used in the Perl scripts
- *make_intfb.pl* : interface generator
- *my_check_inc_intfb.pl* : included-interfaces checker
- *my_check_norm.pl* : norms checker

All interfaces are supposed to be generated before starting the compilation in order to enable the use of the included-interfaces checker.

In addition you will find the "korn shell" scripts used in **gmckpack** to plug the above scripts :

- *mkintfb.sh* : wrapper of *make_intfb.pl*
- *intfbF90.sh* : wrapper of checkers and F90 compiler

I have not tested them on other platforms than Fujitsu and IBM.

3. Compilation:

First of all if you are not on a VPP machine you must exclude from the compilation the following subroutines :

- ✓ *xrd/not_used/minv.vpp.F*
- ✓ *xrd/not_used/sgemmx.vpp.F*

I hope that in the next release they will really be removed !!

In this cycle a huge number of useless subroutines have been removed. But the *xrd* library in this package is not yet ready for use on other platforms than IBM or VPP : we still have to compound this *xrd* with the one in PALADIN.

All the source code compiles alright on Fujitsu and IBM.

However if you exclude *odb*, *coh*, *ost* and *sat* projects you should have the following headers available as dummy files (in **gmckpack** directory *unsxref/quiet*) to achieve the compilation :

- ✓ *abortdb.h*
- ✓ *bool_setparam_obsort.h*
- ✓ *closedb.h*
- ✓ *getdb.h*
- ✓ *int_setparam_obsort.h*
- ✓ *opendb.h*
- ✓ *putdb.h*
- ✓ *shuffle_odb.h*
- ✓ *storedb.h*
- ✓ *swapoutdb.h*

4. Links:

To solve all the links you should have the following routines defined as dummies, in *gmkpack* directory *unsxref/verbose* :

4.1 Dummies which are machine-dependent:

- ✓ util_cputime
- ✓ getstackusage (may also be set in *unsxref/quiet*)

4.2 Dummies which are probably old-fashioned CRAY routines:

- ✓ ystbl
- ✓ ranset
- ✓ ranf

4.3 Dummies which come from projects not used at Météo-France:

- ✓ blackbox_init
- ✓ blackbox
- ✓ dvssmi
- ✓ advar
- ✓ incdate
- ✓ wvalloc
- ✓ wavemdl
- ✓ wvdealloc

4.4 Dummies which are used for operations at Météo-France only:

- ✓ wdhlis

4.5 Dummies which are used for operations at ECMWF only:

- ✓ iinitfdb_vpp
- ✓ iinitfdb
- ✓ iopenfdb
- ✓ isetvalfdb
- ✓ isetfieldcountfdb
- ✓ iwritefdb
- ✓ iclosefdb
- ✓ iflushfdb

4.6 Furthermore :

If you exclude *odb*, *coh*, *ost* and *sat* you should have the following supplementary dummy routines :

- ✓ abortdb
- ✓ amsu_sfc
- ✓ closedb
- ✓ co2cld
- ✓ getbias
- ✓ getdb
- ✓ helber
- ✓ opendb
- ✓ putdb
- ✓ rttov
- ✓ rttovad
- ✓ rttovcld
- ✓ rttovtl

- ✓ rttvi
- ✓ shuffle_odb
- ✓ srgevent
- ✓ storedb
- ✓ util_cgetenv
- ✓ suadvar
- ✓ swapoutdb
- ✓ bool_setparam_obsort
- ✓ int_setparam_obsort
- ✓ setup_obsort
- ✓ wtfunc_obsort

4.7 Last but not least :

I had to compile `getcurheap.c` with `-D_64BIT_` in order to link `profile_heap_get` .
So alternatively, you could add `profile_heap_get` as a dummy.

5. Execution:

5.1 Caution

The OPEN-MP directives in `suegeo2.F90` are bugged, I really had to remove them to run ALADIN.

5.2 Namelists

Starting from the VPP namelists I had to, or I was recommended to, or I recommend to do the following modifications :

In NAMPAR0 :

- `MP_TYPE=2` (the technique used for message passing) is necessary (the default, which is 1, fits for the VPP)
- Better have `LIMP=.TRUE.` and `LIMP_NOOLAP=.TRUE.` (immediate message passing and no overlap of communications/calculations)
- If you want to switch off the message passing while running on a single processor, you have to set both `LMPOFF=.TRUE.` and `LIMP_NOOLAP=.FALSE.` .
- Better not use `NPROCA` or `NPROCB` to setup the numbers of processors in the distribution because they are obsolescent. One should setup :
 - `NPRTRW` (distribution of spectral waves),
 - `NPRTRV` (distribution of vertical levels in spectral space),
 - `NPRGPNS` (distribution of latitudes in gridpoint space),
 - `NPRGPEW` (distribution of longitudes in gridpoint space),
 with the rule : `NPROC=NPRTRW*NPRTRV=NPRGPNS*NPRGPEW` .
- Mailbox size : while we are used to setting it as an environment variable on Fujitsu, it is better in all cases to have it set via the namelist parameter `MBX_SIZE` ; for instance : `MBX_SIZE=64000000` .

In NAMPAR1 :

- `NCOMBFLEN=64000000` (size of communication buffer)
- `LSLONDEM=.TRUE.` (semi-Lagrangian on demand; more efficient with a large number of processors)

In NAMDIM :

- NPROMA=-17 : It MUST be a small value on scalar machines. The minus sign forces the software not to change the absolute value in an "optimization" attempt.

In NAMCT0 :

- N_VMASS=0 is necessary in ALADIN (the use of IBM mass libraries is not yet coded). In ARPEGE you can set N_VMASS=8 to improve the efficiency of the run. Note that in cycle 28T1, the IBM mass libraries are used only in the semi-Lagrangian scheme and in ECMWF physics.

Miscellaneous :

- ➔ Blank characters inside brackets causes an abort while reading the namelists file. Hence one should replace in the namelists lines like :

ARRAY(1)= ...

by

ARRAY(1)=

5.3 Runs

I tested my current scripts on ALADIN configurations 001 and Full-Pos (post-processing, coupling, nesting). Everything works fine in A-level and B-level distribution. Tests on ARPEGE are under progress.

I didn't tested OPEN-MP yet because my executables were not built for it. However, from the benchmark report we suspect ALADIN configuration 001 not to work yet properly with OPEN-MP on cycle 28T1.

6. About *gmckpack*

The amazing 😊 last version *gmckpack.5.5* can be used to install the code.

It is able to compile the whole code at once including *odb* and its pre-compiler, providing that the source code is exactly what is in the *clearcase* database, i.e. no "filter" has been applied to the source files and the symbolic links between files are preserved in *odb*.

The export package has been re-made on July 20th, 2004 to restore these links (*andante:~marp001/public/export/export_CY28T1_01.tar.gz*).

If you decide to use *gmckpack.5.5* to install the code, be aware that :

- ✓ The procedure is (still) very slow to install such a huge piece of code. Actually it should be re-written in Perl (or Python ?) to be fast. I hope that Eric Sevault will help soon me in this job !!
- ✓ You will have to invest a bit yourself to learn about an advanced usage of *gmckpack* !
- ✓ If you work on an IBM machine things will be easier since a configuration file for such machines is available. Note that due to a bug in the compiler you need to use a wrapper to compile with OPEN-MP.
- ✓ If you work on a LINUX or NEC platform, note that the porting of *gmckpack* is under (good) progress.

The package *gmckpack.5.5* was sent by e-mail as well (including the wrapper for IBM). It is better to forget the beta-version 5.4 where I found lately some bugs. In the package you will find there a "read-me" file, and two html files below *doc/* to start with. After installation you will get more detailed "man" pages.

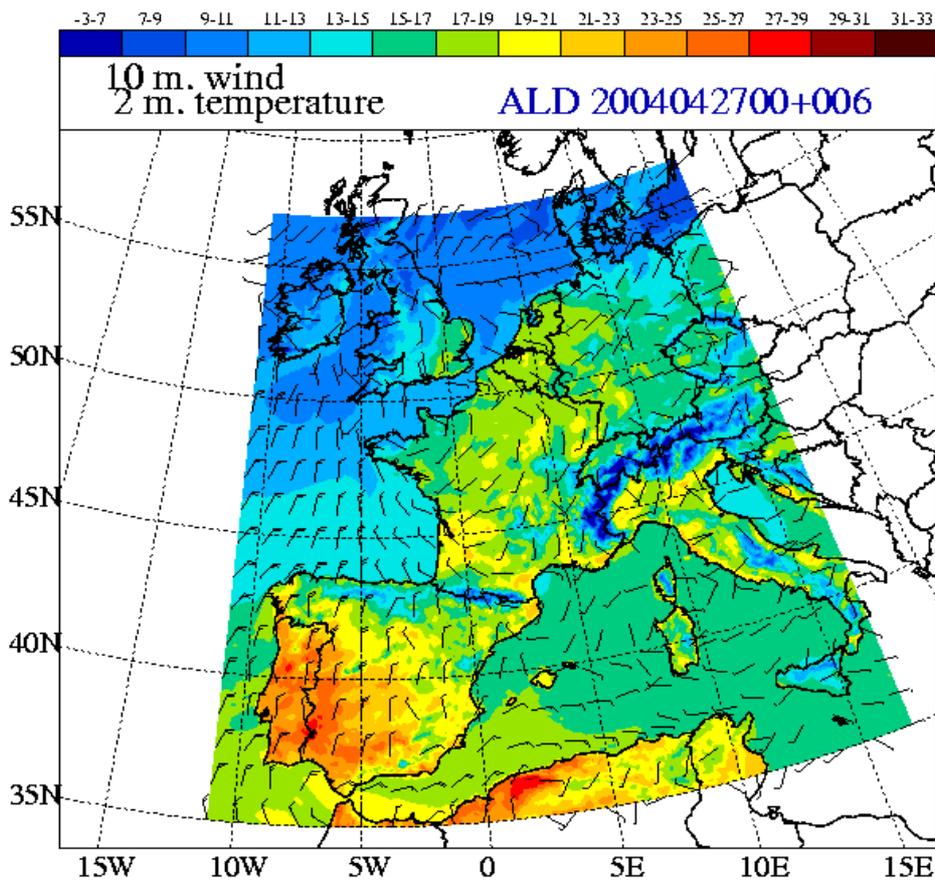
7. A dedicated ALADIN-HIRLAM account at ECMWF

A new "super group" for ALADIN and HIRLAM users was created at ECMWF : *hird* . The following tools and libraries are already available :

- . gmckpack 5.5 ;
- . ALADIN cycle 26T1, together with PROGRID, scripts and namelists for configurations 001 and 927.

Cycle 28T1 (or 28T3 ?) should be implemented soon.

Here is the first ALADIN forecast run on *hird*, by a few HIRLAM pioneers under the guru's supervision.



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