OOPS technical meeting of September 19th 2012
IFS cleaning and re-factoring (post CY39): Part 1

Participants (MF) : Florence Rabier, Claude Fischer, Karim Yessad, Yves Bouteloup, Ludovic Auger, Ryad El Khatib, Alexandre Mary, Etienne Arbogast
Participants (EC) : Deborah Salmond, Yannick Trémolet, Tomas Wilhelmsson, Sylvie Malardel
Participants (HIRLAM): Ulf Andrae, Niko Sokka (from SMHI location)
Participants (ALADIN): Daan Degrauwe (from Brussels location)

1. Introduction

This conference probably was one of the very first attempts to perform a 4-point video-meeting. That did not fully work out, and we might have to re-test this later with all 4 sites.

2. Reorganization of Setup; disentangling of geometry/grid and related MPI parameters

Tomas explained that the disentangling eventually might be less problematic than he thought before the summer. He now has some clearer ideas on which modules to break & reorganize. He will now start coding some prototype re-factored modules, and send any consolidated code proposal to MF (Karim & Claude). We agree that information exchange should be done as frequently as relevant, based on these code exchanges (no exhaustive technical notes would be produced). MF indicated that it would be ready to help in this recoding (to be discussed when necessary). For instance, Karim does have a few hints on further arranging parameters in YOMDYN (move some of them to YOMDYNA). Daan mentioned that he faced several difficult points when arranging the setup to introduce LAM specifications in the Fieldsets.

A more general discussion about the place and status of the Geometry Object in OOPS took place. We outline here the following major information:

- Yannick pointed out that OOPS does not know any more about a specific Geometry class. The Geometry only is an attribute to a State or an Increment, and its content mostly is described at the Fortran/IFS level; Geometry settings may be passed via the Config/XML or via reading a model input file while constructing a State for instance;
- States cannot be added together, but Increments can. So far, OOPS assumes that only Increments with identical Geometry are added together or to States. The addition may be extended to multiple Geometry objects, with a forced change of geometry in the "addition method" (for instance, IFS regular grid spectral data could be truncated or zero-padded easily). For MF's Arpège 4D-VAR, forbidding such simple operations for multiple Geometry might be just fine, as they use Full-POS/927 systematically to change resolution. This action might better be explicitly stated in an OOPS task (*Note by Claude while typing: yet, a change of geometry might be "forced/hidden" into an operator like "s+=incr" ?*)
- The issue whether developing the TL of Full-POS was raised => no conclusion on this / MF will implement Arpège 4D-VAR with the usual steps of changes of resolution using the regular FP/927 code
- Yannick mentioned that the standard manner of creating an Increment in OOPS probably will be by constructing it from a B-matrix object, as B does have all the information to do that. The same would hold for a model error increment from a Q-matrix object.

Further discussions about Setup+Geometry questions: ECMWF will set a specific email diffusion

list so that all relevant contact persons can liaise and exchange information in an electronic forum mode => Action to MF/Aladin/Hirlam: send list of relevant correspondents including email addresses to Yannick & Deborah

3. LAM aspects

Daan is working on the extension of the Fieldsets to include pointers to lateral boundary data for the LAM models. So far, the strategy retained is to avoid having to define different types of (abstract) classes for global and LAM States.
On the side of test programs: Daan has coded a Fortran test program able to create two States/Fieldsets; Alexandre is working on a C++ version of it (he also has a simplified prototype code to illustrate the Tomas-trick now). Daan pointed out that this test program probably won't be sufficient to address the major LBC aspects. One problem is that it stops right after the initialization, and doesn't go into a time loop. This means that LBC swapping (done in the Fortran level of the LAM) can't be tested, because this swapping occurs during the time integration, not during initialization. So creating three or more states still won't allow to thoroughly test the oopsification of the LBC variables. To that purpose, we need a test program that actually does a time integration.
Claude mentioned that more OO-brainstorming on LAM aspects might be good in future, beyond learning C++ (for instance in terms of design patterns). This could be part of some of the future coordinated video-conferences.

4. Pruning of logical keys in the assimilation

We have listed a set of logical keys for pruning, all related to assimilation/sensitivity sort of computations. As a result:

- "prunable" for CY40:
  - LSKF=.TRUE. (ECMWF)
  - L131TL=.FALSE.; LOBSTL=.FALSE. (MF)
  - LMINI=.TRUE. (completely) and the combination LMINI=.FALSE. && L801TL=.TRUE. (MF) => *so only LMINI=.F. && L801TL=.F. Will be kept*
  - LAVARC=.TRUE. (MF)
  - LJCNMI=.TRUE. (some trailing code) (ECMWF)
- kept for the time being: LSIMOB (true for defining a "Jr" cost function in 801)
- not discussed (kept …): LTLINT, LOBSREF

5. Command line option

This item merely was a wrap-up discussion: MF will remove the command line options, either for CY40 or CY41. They will carefully check with the various downstream users that those are aware and prepared to this change (GCO/Olive users; MF's operational scripting team, Aladin and Hirlam partners). Ryad suggested that a converter could be developed enabling to (1) re-build the command line from a namelist version or (2) extend a namelist with command line option (*Note: (2) is how we will remove these options => they will mostly enter a new namelist block NAMARGS*). ECMWF confirmed they're not using the command line any more.

6. Wrap-up on CY39 (as of Sept 18 status)

Various questions raised recently while merging CY38T1 and R2 have been addressed:

- JB_STRUCT: IF(ASSOCIATED) recurrent errors on NEC => a proper solution seems to be

to unconditionally NULLIFY the pointer after its declaration

- reproducibility of results: adiabatic forecasts should be reproducible up to (growing) numerical noise (so no bit-reproducibility over time); with physics => still several problems to be investigated in Arpège (instantaneous fluxes, simplified physics aspects).
- CPU consumption: a specific, extreme over-cost has been noticed in one RRTM routine. Ryad probably found the guilty code (a large number of PRINT statements) => JJ Morcrette has been contacted. Deborah said these PRINTs very likely could be removed.
- MF have implemented code for "Full-POS2" (by Ryad): this FP version will avoid the I/O step between two geometries in (e(e))927 and is a more modular and multi-grid flexible version. A STEPO_FP routine also has been created (i.e. FP taken out of model STEPO).
- Sylvie asked about DDH budgets: MF have completed the budget computations for dynamics terms (Fabrice Voitus) in their CY38T1, in the new DDH dataflow version. So this version of DDH can now be tested and used for all model terms. One limitation still is that the new DDH structure is not yet Open-MP compatible, but one way out is to embed the DDH part into a thread-protected Open-MP section when Open-MP is used elsewhere in the model forecast.

7. List of topics for next video-conference and possible dates

Several items have been shortly addressed already today, in order to relieve a little the agenda for the next video-conf:

1. externalized interpolators: Karim has now stopped developing/cleaning this code. We will keep this topic on hold, until ECMWF is ready to propose further scientific and structural improvements. There is some remaining cleaning to be done by ECMWF (removal of the last dependencies in the SL interpolators).
2. New model field structure: Alan Geer is preparing a proposal to overhaul the model field structure, in a spirit close to what he proposed for the GOMs earlier (now in CY39). Alan is preparing a prototype code => Deborah will send this code to MF before the next video-conf (Karim&Claude)
3. GFL attributes: no specific news. This topic is partly linked with the model field evolution, so there may be some overlapping issue here.
4. Move all relevant calls in the IFS to GPHPRE: Karim has implemented all calls to his new routine, but those that only affect the IFS have been kept commented. ECMWF should check these lines and activate them. The old calling sequences should be removed after validation. This action is described in Appendix L of Karim's rolling cleaning document.
5. Other cleanings: Karim has prepared a new version of his rolling cleaning document => Claude will send the link where all new docs by Karim can be found.

Draft agenda for next video-conference (to be scheduled on October 29-31):

1. Proposal for a new structure of the model fields, and related aspects with GFL attributes if relevant (Alan Geer's proposal)
2. desirable cleanings for CY40 (Karim's list sent after the meeting plus older stuff):
    - appendix L: activate new call to GPHPRE in routines marked with (ECMWF).
    - appendix C: reduce calling tree complexity listed in paragraph C1.
    - GRID_FROM_GRIB: validate call to SUGAWC, and remove obsolete piece of code calling SUGAWA. => *this code actually already has been pruned by ECMWF (on top of CY38R2; Tomas) and is ready for CY39R1*

- Remaining CDCONF occurrences under STEPO: discuss which could be removed

3. wrap-up of video-conf 1:
    - wrap-up on CY39
    - wrap-up on setup/geometry and/or LAM aspects, if required

AOB

None.

List of Actions (other than agreed coding/cleaning actions):

1. About setup and Geometry object: Tomas will now start coding some prototype re-factored setup and related modules, and send any consolidated code proposal to MF (Karim & Claude)
2. Further discussions about Setup+Geometry questions: ECMWF will set a specific email diffusion list so that all relevant contact persons can liaise and exchange information in an electronic forum mode => Action to MF/Aladin/Hirlam: send list of relevant correspondents including email addresses to Yannick & Deborah
3. New model field structure: Alan Geer is preparing a proposal to overhaul the model field structure, in a spirit close to what he proposed for the GOMs earlier (now in CY39). Alan is preparing a prototype code => Deborah will send this code to MF before the next video-conf (Karim&Claude)
4. Karim has prepared a new version of his rolling cleaning document => Claude will send the link where all new docs by Karim can be found