OOPS technical video-conference of August 22, 2013
meeting number 2 towards CY41

Participants (MF) : Claude Fischer, Karim Yessad, Alexandre Mary, Ryad El Khatib
Participants (EC) : Deborah Salmond, Tomas Wilhelmsson, Yannick Trémolet, John Hague
Participants (LAM): Daan Degrauwe (RMI/Aladin) [only partly because of technical connection problems], Ulf Andrae (SMHI/Hirlam)

This meeting was the second among three, planned for discussing the Fortran re-factoring until CY41, and perhaps a bit beyond until CY42.

1. wrap-up of actions from July 11:

Action 1 (code cleaning): Appendix E has been updated by Karim after Ryad had sent his recommendations of Full-POS routines that should not be touched by the renames/moves. Deborah and Stéphane shall liaise during the phasing process of CY41 in order to perform these changes in the most optimal way. The Aladin "ald" routines will be changed in MF during the same phasing.

Action 2 (Fortran 2003): all 16 Aladin teams replied to the inquiry about their compiler compliance with respect to the proposed six F2003 features. Ulf and Toon provided an analysis and recommendations for the Hirlam group.
In terms of compilers, most standard compilers support the six features, provided a recent enough version is used: **gfortran** 4.7 and 4.8 (note: 4.8.1 is recommended), **pgf90** from 10.8 onwards (so 11 and 12 versions are OK), **Intel Fortran ifort** version 11 does not support the remapping feature but all others, and versions 12 and 13 are fine for all. EC use **IBM compiler xlf** version 13 that has all the features implemented.. **NEC SX compiler sxf90** only supports features 2-5-6 for the time being, not 1-3-4.
In the discussion that followed this overview, the group expressed a strong interest to have all six features accepted in the IFS and IFS-related codes from CY41 onwards, as this was felt now as highly necessary in order to modernize the code. The group recommends those partners who at present do have difficulties with some of the suggested features, to make contact with their compiler / vendor support in order to upgrade their system. The test programs can certainly be used as simple benchmarks here. In terms of calendar, the F2003 features will enter the official common codes with CY41 (June 2014), and experience tells that a distributed export version available to remote partners for local installation usually follows about one year later (June 2015 ?). On the whole, this scheduling leaves between 1 to 2 years for compiler upgrades, which was felt sufficient by the group.
The decision is taken to (1) accept the six proposed features in CY41, (2) continue in future to allow F2003 coding to enter the IFS only by specific features at a time, (3) to announce the suggested features about one year ahead of the target common cycle. Reminder from July 11 meeting: it is furthermore recommended that the OOPS C++ layer and the C++/Fortran toy model codes are added by partners to any future benchmark, in view of any Call for Tender for HPC. General compliance of compilers with C++ and F2003 norms should also be included in the Technical requirements submitted to vendors.
An action for Claude: hand over this information to the Aladin partners (Programme management,

Local Team Managers)

Action 3 (“alias” coding feature suggested by Ryad last time): this feature was not fully working in the test programs, and is abandoned. MF will remove the Command Line Options anyhow, for CY41.

Action 4 (run IFS forecast from OOPS layer and related code changes, John): John had sent his presently modified IFS code to MF, based on CY40. With those changes, he succeeds running the forecast model from the last OOPS code (version tagged CY40.1 in EC's OOPS-GIT repository). The 3D-VAR IFS prototype also works when adding John's changes. In this version, the YOMSP module is not used any more below CNT3 for the forecast configuration (other configurations still use YOMSP for the time being). Instead, spectral data is addressed by the derived type structure passed by pointer arguments.
John now looks at performance issues with a T255 forecast version. EC think they will have completed the whole task in September, and then will send the finalized code changes to MF. MF would start work towards an Arpège forecast configuration run from the OOPS layer, based on CY40 + John's code. The precise timing and staffing must be finalized (Alexandre and Karim will be involved).
Action for ECMWF: John to send finalized code changes for the IFS forecast OOPS prototype & complete technical discussion (all) at the Sept 19 video-conference. MF to finalize timing and staffing of work towards an Arpège forecast prototype.

Action 5: left over for the next video-conference.

2. follow-on discussion about geometry and setup re-factoring:

Tomas has re-organized most of the geometry-related module data/parameters, and setup routines, that are called under SU0YOMA. His new code is developed on top of Karims's already changed code (sent to EC in July). Tomas and Karim shall liaise in order to solve pending issues. Karim also indicated he'd like to see the remaining recoding he proposed in his April note (“Object Geometry: plans for CY41”) to enter this modset. Tomas and Karim shall agree on the share of work to complete these features. Tomas will also upload the modset on the OOPS-GIT repository.

In link with the work by John, Claude asked about the precise strategy of changing STEPO for CY41. EC explained that there are many (~43) calls to STEPO in the IFS code. John has focussed on the three STEPO calls from CNT4 for an IFS forecast. STEPO_OOPS is a new stripped down version of STEPO code used by the OOPS/forecast prototype - but doing all necessary for these 3 STEPO calls in CNT4 for a simple IFS forecast. Also for the time being for testing purposes these 3 STEPO calls in CNT4 can either be STEPO_OOPS or STEPO giving bit-reproducible answers either way - controlled by a namelist L_OOPS.
The final aim is that STEPO_OOPS is to be the only routine for any forecast version (OOPS driven or not).
It is agreed that we'll have a final update about the new code for Geometry, the break of setup and the STEPO re-factoring strategy at the next video-conference.

EC and MF entered a discussion about how to arrange the feedback of the finalized modset into

CY41 (basically, the strategy for phasing next year). A two-stage process starting in April was discussed, with step 1 rather devoted to technical changes (including as much as possible of the OOPS re-factoring) and step 2 containing the scientific changes from ECMWF. The alternative would be a single step strategy starting rather late (May 2014). However, MF felt that this option would mean a completion of CY41 very late in July, which is not optimal with respect to staff availability nor phasing with partners. Karim expressed a strong wish to get any modset as early as possible for scrutiny and pre-phasing, anyhow. The strategy for CY41 shall be re-addressed at the Sept 19 video-conference (two stage or not, and some precision about calendar).

Ryad mentioned, in the two-stage process, the rather time-critical aspect of the second step. Indeed, technical or validation problems become particularly crucial in stage 2 because there already would have been a significant amount of effort spent in stage 1, and because the term of the final deadline of the whole phasing then becomes a short term matter. Deborah and Claude raised the issue that late commitments are a regular event, with sometimes a project-critical character for some partners locally or remotely. So what to do in that case ? The group did not come to a firm conclusion or statement about this dilemma, but it raised a set of strong recommendations: (1) ensure deadlines for commitments are respected, (2) ensure commitments have been tested by contributors with respect to bit reproducibility, or non-reproducibility is well announced, explained and numerically evaluated, (3) depart as little as possible from the list of known contributors when the build of a cycle starts. In the event of a project-critical late contribution, enough management should be informed about the drawbacks of such “forced” choices (in particular, significant shifts in calendar of cycles, with a potential negative impact on many other applications and users).

Ulf asked about how LAM aspects would be treated within the recoding and phasing for CY41. Claude said that, in the two-stage case, LAM features should be phased with respect to the Geometry and Setup re-factoring in the stage 1 phasing (pre-phasing). *Note: it could be even earlier, if ECMWF send code before April, and MF/Hirlam/Aladin should then agree on the practical organization of such pre-phasing*.

EC asked about MF's plans for implementing Full-POS2 (FP2). MF said operational (E-suite) testing could take place within the (next) high resolution E-suite planned to start in an operational context in September 2014 (based on either CY39T1 or CY40T1). EC have tested FP2 and are now feeling they can plan it for implementation in the IFS post-processing with CY40R2 (spring/summer 2014). Tomas mentioned the “old” FP configuration (FP1), more specifically its LFPART2 mechanism, was calling for a significant extra amount of work with respect to Geometry/Setup re-factoring. Therefore, it would be a simplification for OOPS re-factoring if the old FP version could be abandoned and pruned already in CY41. MF said this decision should be left open for the time being, as all technical consequences of pruning FP1 must first be evaluated. At least one necessary condition before pruning FP1 was that the Boyd option (for LAM LBC) is recoded in FP2 (it's not there yet). Claude also wished to make sure MF and Aladin management is well informed about this pruning possibility (actions on MF).

3. Full-POS in OOPS (as post-processing)

A specific exchange took place about the requirements for interfacing FP in OOPS (mostly Yannick and Ryad). Most of the effort with respect to the PostProcessor class is to ensure all input model

data are handled as INTENT(IN) type of arguments. The input data must be gridpoint in contrast to the classical interface of FP from the "old" STEPO (which assumes input data are spectral). The new FP2 algorithm enables to tackle these aspects in an easier manner than with FP1. In addition, specific model-related features eventually should be removed from FP (T/RT conversion, IFS spectral filtering option of surface pressure field). For OOPS-IFS, only the post-processing mode (PostProcessor observer class) of FP is necessary, so output data basically can be handled like today (output on file, various grids of post-processing etc.).

For later, MF are then specifically interested to understand how FP should be further adapted for change of geometry calculations of multi-incremental 4D-VAR inside a single (OOPS) binary. At this meeting, cleaning the output arguments (when those are model fields) and then externalizing the algorithm from the model code were listed as necessary tasks. Nevertheless, MF feel more investigations are needed in order to well understand the requirements for a "OOPS-FP" able to handle the change of geometry calculations. Also, evaluation of the required manpower for this task remains uncertain.

MF also explained that they had at least two priority topics to deal with in FP, in view of CY41: adapt the Boyd option to FP2, recode the interpolation halos changing the strategy of distribution (from input grid type to output grid type). The latter work should significantly enhance load balancing on MPP for global-to-LAM, LAM-to-LAM and global-stretched to global-stretched (+ a change of position of the pole of stretching) changes of geometry. EC said this effort could be beneficial for any FP2 application.

Staffing of the "FP in OOPS" tasks remains open for the time being.

4. cross-information from MF and EC about their plans and progress on migration to their next HPC

Both MF and EC are now concerned by migration issues. MF are already right in the middle of their porting efforts to BULL. Claude said a few words about the calendar:

- Cluster 1 ("*beaufix*"): Acceptance test has been completed in mid-August; porting of NWP configurations was under way and the plan is to hand over all elements to the Operations Dept in mid-September. A mirror suite on BULL, with respect to NEC operations, was planned over October/November, and the switch of operations to BULL was scheduled for December. The NEC SX computers will be stopped by end of February 2014.
- Cluster 2: the plan is to perform and complete the Acceptance test in April 2014, and port operations in May/June. This cluster 2 ("*prolix*") is being built in the remote computing centre "Clément Ader", shared with other research institutes in Toulouse.

EC have started their preparations for the migration effort. The plan is to implement CY40R1 in operations by November 2013 on the IBM, then perform migration with a target to declare the mirror configuration operational on CRAY in February 2014. CY40R2 would be built in April/May. This calendar means that at least scientific contributions from ECMWF cannot be committed for CY41 before May next year (see this aspect in relation with the possible strategies for phasing to CY41, Section 2).

5. AOB and date/draft agenda for next video-conference

The next video-conference will be held on Thursday September 19, 1.30 UK / 14h30 MEST. A tentative agenda was briefly drawn:

- final update about new code for Geometry, break of setup and STEPO re-factoring strategy
- wrap-up of other Actions decided today, August 22
- Action 5 from July 11 (single call to COBSALL; trajectory). Any other re-factoring aspects for CY41 ?
- Come back to procedure and calendar of phasing steps for CY41

List of Actions :

1. Deborah and Stéphane shall liaise during the phasing process of CY41 in order to perform the rename/move changes of Appendix E in the most optimal way. The Aladin "ald" routines will be changed in MF during the same phasing.
2. Claude to hand over decisions and recommendations about F2003 features, to the Aladin partners (Programme management, Local Team Managers)
3. Action for ECMWF: John to send finalized code changes for the IFS forecast OOPS prototype & complete technical discussion (all) at the Sept 19 video-conference. MF to finalize timing and staffing of work towards an Arpège forecast prototype.
4. All: have a final update about the new code for Geometry, the break of setup and the STEPO re-factoring strategy at the Sept 19 video-conference.
5. MF/Full-POS: all technical consequences of pruning FP1 must be evaluated. At least one necessary condition before pruning FP1 was that the Boyd option (for LAM LBC) is recoded in FP2 (it's not there yet). Claude also wished to make sure MF and Aladin management is well informed about this pruning possibility.
6. Towards Level 2 actions (Action 5 from July 11):
    6.1. Alan Geer would write a short note about the work towards a single call to COBSALL
    6.2. Filip Vana would write a short note about the encapsulation of the trajectory code
7. The strategy for phasing of CY41 shall be re-addressed at the Sept 19 video-conference (two stage or not, and some precision about calendar).