



VERSUS Technical Users Seminar- WG 5 Meeting

Date: 24-25.06.2014

Place: Bologna, ARPA-SIMC, Italy

Participants:

Maco Bogdan-MB (NMA), Dimitra Boukouvala-DB (HNMS), Angela Celozzi-AC (USAM), Ulrich Damrath-UD (DWD), Flora Gofa-FG (HNMS), Pirmin Kaufmann-PK (MCH), Joanna Linkowska-JL (IMGW), Massimo Panti-MP (USAM), Filodea Pastorelli-FP (Elsag), Francis Schubiger-FS (MCH), Maria Stefania Tesini-MST (ARPA-SIM), Naima Vela-NV (ARPA-PT), Mikhail Zaichenko-MZ (RHM)

Invited: Andrea Montani-AM (ARPA-SIMC) – NWP Test Suite

Minutes (per session): F. Gofa (day 1), Pirmin Kaufmann (day 2)

Agenda Item 1: VERSUS overview

A general overview of VERSUS system was given by AC. The main goal of the creation of a common software was to provide the same tool for each member in order to use the same methodology and the same approach to verification. She explained the architectural design and the different components of the system that it was based on licenses free software. A short description was given on Relation database management system, MySQL, R software, Phoenix libraries, SWING, JpGraph. The main php file (CommonDefine.php) that holds all the necessary paths for softwares and libraries associated with VERsUs installation was described as well as the path structure of VERSUS in the linux environment.

Agenda Item 2: Installation Issues

MP presented some important information connected to the Operating System, the Installation procedure and Common mistakes of the this stage of work. A new detailed document for "Versus and software installation step by step" is available since June 9, 2014 in meteoam ftp area. VERSUS can work with SUSE and SLES operating system and some information was given for both. It was directed

however the need for all users to migrate to SLES system with any new VERSUS installation they perform, or upgrade their current openSUSE version 11.4 (support from Evergreen will cease on 072014). A series of preliminary checks through the installation process was given to avoid mistakes that can be found in the presentation. An important note was that the DB optimization must be performed BEFORE the VERSUS installation, and information on InnoDB engine definition was given. MP reported that the next step to improve further performance of the system is to create partitioning of tables and this is implemented in the version 3.2_extra patch. This patch updates the php code and permits the removal of foreign keys from the tables of the DB. Finally, information was given on how someone can check if all stages of installation were rightly performed by the users in order to give confidence on the use of system.

Agenda Item 3: Database Overview

During this agenda item, FP gave a detailed overview of RDBMS and VERSUS DB structure. Her presentation consisted of a SQL overview, RDBMS concept, VERSUS logical schema and VERSUS logical/physical areas.

A series of main commands to use and interact with relation DB were given together with an explanation of how the data are stored in RDBMS. VERSUS consists of a MySQL RDBMS with InnoDB engine with 9 logical areas (FE loading, User, Observation, Forecast, Verification Configuration, Numerical Output, Graphic Configuration/Output, Views) and physically by 72 tables and 8 views.

Through a diagram, the VERSUS DB schema was given with all the associations, files and tables and then she went through each one of the logical areas and the work that each one performs. All this information is very important for any skilled user that intends to perform changes in the system. Importance was given in the explanation of VIEWS that are a result of a stored query on the DB and are virtual tables computed dynamically from data of the DB when access to that view is requested. In VERSUS there are views on precipitation field of surface data coded as 130XX bufr code in order to simplify the managing of precipitation parameters on various validity times but Views can be implemented also for other kind of cumulated parameters in the future (e.g. snow).

A user useful information was given on how through web gui of meteoam test machine (80.17.44.25/versus/report) one can get the table structure of VERSUS.

Agenda Item 4: Installation Patch 3.2extra (DB partitioning)

A presentation was given by MP related to the issue addressed in Agenda item 2. The DB partitioning activity aims to the partitioning of GRIB table of VERSUS DB. The partitioning increases query performance since it is possible to assess smaller datasets instead of the whole table. A series of the operation actions that the installation package performs, were given. The time that is needed to install and execute the partitioning of the GRIB table depends on its size (55min for a 11044688 rows of Grib table for meteoam machine). The process of the partitioning includes the removal of Foreign keys from the GRIB table. The reason that PL team, disseminates this 3.2 version as EXTRA is because it does not affect any other functionality in the system and the user can choose to not install this upgrade without losing the alignment with current Versus version. A test phase (already the patch is installed and checked on Italian installation) is needed to be performed by some other member.

[Decision] ARPA-SIMC has agreed to check patch 3.2_extra on their machine, results and performance change of the system need to be reported to the group.

Agenda Item 5: Doxygen and examples

MP gave again after the last year implementation, of Doxygen within VERSUS. Only on CNMCA test machine is currently installed Doxygen (vs. 1.8.3.1). He reported that in the next VERSUS patch the documentation generated by Doxygen will be provided. Once someone has the output of Doxygen produced documentation, it holds great tool for all developing processes. The quality of a software is measure also from its documentation and together with technical manual increase the quality of VERSUS software. Currently Doxygen provides a 363 pages document for the system with all the information about its functions, classes and php files. In order to produce documentation also for the R-modules a similar product called Roxygen has to be installed. A user can get an example of Doxygen from test machine (<http://80.17.44.25/versus/html>). A DB model report can also be retrieved by <http://80.17.44.25/versus/html>.

Agenda Item 6: HTML overview – small changes in the GUI

The PL AC, gave a presentation of the source files of the web pages in the system, the structure of the web page but also on the possibility by a user to introduce small changes in the GUI. A list of all php files associated with the GUI process was given. Then a technical explanation presentation was given on the PHP file structure (see presentation). It should be noted that: a process can be activated from command line besides web gui, but the web gui interface has been introduced to give a more user friendly system, any functionality can be implemented without necessarily updating the graphical interface component as such activity requires an expert user with a global point of view of the system.

Following examples were given on how one could implement a change in the system related to the web gui. Specifically the processes chosen as examples were: Modification to the link that a newer version of user manual is located, insert a new menu item in the Menu Configuration.

Agenda Item 7: R Software

A presentation on R software in VERSUS was given by FP. VERSUS installs version 2.15.0 of R software together with all R libraries and the additional packages of Verification and EnsembleBMA. All scores in VERSUS are based on R language, explanation of the whole architecture was given and can be found in the presentation.

Agenda Item 8: R software: Standard problems and solutions

Following the previous presentation, an overview was given on software general remarks, frequent issues of VERSUS users with R and possible solutions. It was stated that R does not upgrade the performance for the available logical CPU and memory resources for current system. A possible solution to improve R performance is to install a list of packages provided by CRAN for high performance computing but this should be a future task of the project. The a list of possible occurrences with VERSUS system that a user can face and are attributed to R, was given together with the actions that have to be followed in order to locate the source or error.

Agenda Item 9: FE Common problems and solutions

As AC explained, during the loading phase many VERSUS areas are involved and thus many system weaknesses are possible. After giving a short demonstration of the way to register a new loading phase, she gave examples of common sources of error within this procedure (see presentation).

Agenda Item 10: Configuration Area

AC explained that after several questions from the users, it was realized that some arguments as New Parameter Definition, Forecast Model and Suspect Observation need to be clarified. In the relevant presentation she gave an overview of these processes and how can some common error of problems in the web gui can be corrected or personalized by the users. When the suspect observation of precipitation issue was discussed, it was decided after discussion with the participants that such implementation is not necessary.

Agenda Item 11: New features of VERSUS 3.1 and VERSUS 3.2

AC presented this item. VERSUS 3.1 has been released October 2013 and includes new features such as mapping of WMO BUFR, 1 h and 3 h accumulated precipitation.

The loading of 6 h and 12 h precipitation follows the WMO rules for SYNOP messages with alternating accumulations of 6 h / 12 h / 6 h / 12 h at 00, 06, 12, 18 UTC, respectively. With WMO BUFR, it would instead be possible to encode 6 h precipitation every 6 hours. For VERSUS to work with this, it is necessary to adapt the respective MySQL view on precipitation data accordingly.

[Action] FP looks into this possibility to load always 6 h precipitation for 00, 06, 12, 18 UTC WMO BUFR messages.

EPS verification produces three kind of files: txt, pdf with multiple plots, png.

[Action] There is a wish to provide the plots currently in the PDF also as single-plot png

Other enhancements concern the time range indicator, the plots for EPS, the copying of an existing verification to create a new one ('Duplicate' button), Doxygen download, and pages with MySQL reports (see presentation for details). VERSUS 3.2 was released March 2014 and contains enhancements concerning the setting of a condition on observation and forecast simultaneously and suspect values for precipitation with only one value for all precipitation accumulations (i.e. independent of accumulated periods). A cross-model validation for time series (TS) has been implemented ('+' button). However missing points and dates are ignored and lines connect between last and next available data point. This makes comparison between models with different time stepping difficult, and also missing dates are difficult to see.

[Action] The time axis should be linear in time without skipping dates and points adjacent to missing data points should not be connected.

[Action] Request from FG to implement an option to download data to be able to plot the data in Excel

A package is available to install VERSUS version 3.0 directly. After the installation of 3.0, the patches 3.1 and 3.2 have to be applied in turn. Patch 3.2_extra is in the test phase and will contain additional optimization for the MySQL DB.

Agenda Item 12: Future automation

FP presented issues to be enhanced in the near future ('changes for stability', details see presentation):

- Ingestion of data with different time range indicator -> manage according to user requirements
- Erroneous grib1.xml leads to big disasters -> validate xml file
- Problem with installation -> more pre-installation checks
- Improvement in verification archive, search for newer fields
- For every verification form, take into account the level field of fcs and obs
- For every verification form, take into account time range indicator connected to fcs
- Should take into account level, time range indicator and step in data availability and delete fcs/obs forms
- Choose scores also for probabilistic models, at the moment hardwired in the code. This feature is seen as of low importance by the working group, more important it the automatic transition between MECE and non-MECE intervals for the two kinds of probabilistic scores.
- Provide a 'live' (installation) CD/DVD for VERSUS.
- Provide the functionality for deleting data in the GUI.
- Provide the functionality to backup/restore data

[Action] 2015 is last year of the VERSUS project. A discussion between FG, AC, and FP evolved about how these suggestions fit into project plan. This needs to be coordinated.

FP further provided an outlook on future development: Face lift of VERSUS needed – e.g. touch screen capability, SOA (service oriented architecture), VERSUS as a collection of services.

[Decision] Such developments at present seem far-fetched for the members of the WG5.

Agenda Item 13: XML Loading Procedure

FP presented this item. This feature is meant for the import of station related forecast data, such as post-processed model data. The XML import could replace the part of libsim that applies non-standard 'tricks' to import station-oriented data via the GRIB format. Such an import enables parameters that are not in the WMO standard, primarily for forecast, and as a second step possibly also for observations.

[Action] An XML template should be agreed upon that uses the existing possibilities of fieldextra and satisfies the needs of VERSUS for the import of station oriented data. MeteoSwiss sent on 28.05.14 details of the XML format used in fieldextra that must be used in VERSUS.

The Feedback files feasibility study carried out recently has shown that while there was the agreement to use ASCII feedback files, the feedback files are in fact only available in NetCDF. Either the production of ASCII from NetCDF or reading of NetCDF is needed in VERSUS. This task is delayed since Christoph Schraff has no resources to help.

[Decision] Feedback files are the first priority. A decision is needed until mid-July how NetCDF feedback files can be used. The implementation of feedback files in VERSUS is needed before the GM 2014.

EPS refinements: Urgently needed features are the scores CRPS/CRPSS, spread-skill relation, cross-model plots, automatic use on non-MECE threshold to generate MECE intervals for RPS, RPSS. RPS and

RPSS plots are implemented but need corrections. Further corrections concern the legends of the different plots (pdf and png).

[Decision] Create patch 3.3 with these EPS refinements, available by end of July 2014

Currently the verification with analysis fields is not possible for precipitation. This needs to be implemented if it is to be used with gridded data.

[Decisions]

- Important activities in the view of WG5 are:
 - full documentation
 - improve stability of the system (automatic testing of system, delete wrongly loaded data, reading of grib files)
- These 'small' tasks need to be put also into the project plan
- Feedback about EPS verification will be given by users at GM
- Versioning of system: A rigorous and consistent numbering is indispensable
- Patch 3.2.1 will be prepared ASAP to solve all problems discovered through the forum discussions, such as 24 h precipitation bug, incorrect VERSUS_include.R file, upper-air problem, etc.

Agenda Item 14: WG5 issues

LIBSIM

MS presented in depth this development. LIBSIM is the Fortran 90 software used at ARPA-SIMC that manages sparse point data (similar to station related data mentioned in point 13, XML loading procedure). It can (not a complete list):

- Upscale observations and optionally forecast considering geographical areas defined in shape files. Creates pseudo-observations.
- Upscale onto grids with different resolution, up-scaling to common grid for all models and the observations
- Create WMO flat file for pseudo station information
- Create pseudo GRIB for sparse point data
- Create pseudo BUFR for spatially aggregated observations
- Convert ASCII to BUFR

NWP Meteorological Test suite at ECMWF: A. Montani, F. Gofa

COSMO Version 4.26 and 5.0 have been tested for 1 month in winter (Jan 2011) and 1 month in summer. The initial and boundary conditions are taken from IFS-HRES (using INT2LM2.0). Verification uses 3500 stations and is made for 72 h forecasts of the 12 UTC runs. This activity is embedded in ECMWF as a special project for first 3 years.

Virtual machine is installed on the new ecgate on a system running with 8 GB 2 CPU. In the future, the test suite should also be used for COSMO-LEPS. The uploading and running of the VERSUS verification takes about 12 days for standard parameters, including precipitation with 15 km radius, for two deterministic runs. In the installation phase of VERSUS many problems had to be solved (i.e. no root access for COSMO, ...).

PT proposal: POWERS: Alon Shtivelman

POWERS: Profile of wind energy verification classified by surface layer stability

POWERS would provide a verification tool for wind speed profiles and wind power in the lower PBL for the needs of the wind energy industry. Measurements are made with a wind Lidar to compare with COSMO forecasts at the lowest 5- 10 model levels. The relevant height is 30-200 m.

The aim is a conditional verification, classified by surface layer stability, which is defined in terms of Monin–Obukhov length L or Bulk Richardson Number (BRN).

If VERSUS is used, there is the difficulty that the VERSUS time resolution is 1 h max, while Lidar data is measured every 10 min. The current version of VERSUS does not support this kind of high vertical resolution and high temporal resolution. UD mentioned that this is strongly related to the DWD project for renewable energy directed towards wind power, thermoelectric (solar) energy, photovoltaic. FS announces the interest of MeteoSwiss for verification of BL data like Lidar, radiometer, and profiler.

Fuzzy toolbox development project VAST: Naima Vela

VAST provides the fuzzy verification toolbox of Beth Ebert translated to Fortran 90. It will be outside VERSUS but fulfilling VERSUS needs. The Fortran program output are R files containing an R script to produce the plot. It produces plots like of fuzzy verification dependence on threshold and grid box size, line plots with dependence on threshold, RMSE for each box size and threshold.

Components and results of scores are stored in a logfile. The logfile structure depends on commands that are given to the program. The grid of the input fields for observations and forecast has to agree. Observations can be a gridded combination of radar estimates calibrated with precipitation measurements (raingauges). Preprocessing could be done using libsim, fieldextra, or both, does not necessarily need to be included.

[Actions] Francis provides test input files for idealized tests according to Felix Ament

Project must be restricted to one year. It will include the reading of GRIB2. The exploring of the SAL method could so not be part of the project.

MesoVICT and other advances in spatial methods: Flora Gofa

MesoVICT is an extension of the former ICP project, targeted for verification over complex terrain. The idea is to provide a test bed where common data sets are available with 12'000 stations over Europe, gridded using VERA interpolation and downscaled to 8 km using the 'fingerprint' technique . Participating NWP models are COSMO-2, GEM-LAM, COSMO-CLEPS (all already used during MAP D-PHASE). Six Cases have been defined. Software methods include the SpatialVx R package ([see MesoVICT software page at RAL](#)).

The kick-off meeting is at October 2-3 in Vienna. Points to discuss in WG5 are: How can COSMO participate actively to MesoVICT? Is there a gain from this activity for WG5? Is there a need to have a PT to support this activity? How can we link it to the new Science Plan main objectives? Can we use the tools that will be disseminated and even incorporate them to the current VAST project outcome?

[Action] MeteoSwiss is willing to participate at MesoVICT.

Organization of GM14 WG5 parallel session: Flora Gofa

Other WG5 issues (VERSUS software, Common Plots, Science Plan)

[Action] JL will prepare the plenum presentation concerning the common plots results of the last four seasons and needs some ideas which plots are interesting. Joanna will send the presentation a few days before the meeting for feedback from the group. The common plots for winter 13/14 (MeteoSwiss still missing) showed again ambiguous results for 24h-precipitation (COSMO-ME and COSMO-I7 are very similar over Italy but completely different over the common area)

[Action] Analyze discrepancy between Italy and common area results for COSMO-ME and COSMO-I7

[Action] WG5 through a web conference in mid August will browse through the plots and looks what is interesting.

Francis Schubiger MCH presentations on open points

FS presents some remaining open points in VERSUS that need to be rectified to allow an operational application.

[Action] AC as the PL took notes and will give solutions or recommendations to the addressed points

All: Miscellaneous

[Action] Send presentation titles for the GM until end of this month (June) to FG.

Comment of Angela Celozzi: VERSUS project has only this year and next year, new features are not possible.