

New operational ALADIN setup at SHMI

Maria DERKOVA (maria.derkova@shmu.sk)

Martin BELLUŠ (martin.bellus@shmu.sk)

Ján MAŠEK (jan.masek@shmu.sk)

Oldřich ŠPANIEL (oldrich.spaniel@shmu.sk)

Jozef VIVODA (jozef.vivoda@shmu.sk)

1. Summary

In the past, the LAM NWP data used at Slovak Hydro-meteorological Institute were received from the ALADIN/LACE applications running at Météo-France in Toulouse and later at CHMI in Prague. After the end of common LACE operations, the kind offer of our colleagues from ZAMG, Vienna to use their ALADIN outputs covered our needs. Also, the local version of ALADIN/Slovakia was running at SHMI on the workstation over a rather small domain. However, in the course of time the ALADIN model products became the main source of information for our forecasters and also serve as a basic input for numerous other applications. The need for our own operational ALADIN application over a European domain was obvious, both to fulfill increasing requirements for new products and to have own control of the model timing and behaviour.

The purchase of the supercomputer at the beginning of 2004 allowed us to substantially upgrade the ALADIN operational suite at SHMI. The model is now running over the whole LACE domain. All local applications were ported to the new computer under a unified operational framework (*run_app* system). Almost all manpower of our NWP team was devoted to this task during the first half of 2004. Full operational status of ALADIN/SHMU started on July the 1st, 2004.

The new HPC computer, ALADIN model version, domain and operational suite are described below.

2. The new operational ALADIN setup

2.1 The new computer

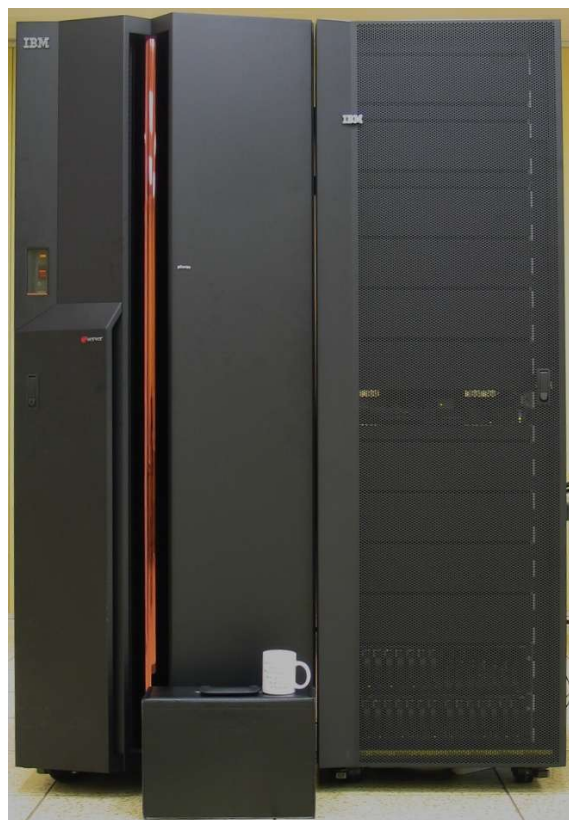
The new computer at SHMI is an IBM @server p690 with code name Regatta. Its hardware and software characteristics are described below and a picture is shown. More details can be found on www.zamg.ac.at/workshop2004/presentations/olda.ppt.

HW :

IBM @server pSeries 690
Type 7040 Model 681
32 CPUs POWER 4 Turbo+ 1.7 Ghz
32 GB RAM Memory
IBM FAST T600 Storage Server
EXP700, 1.5 TB

SW :

AIX 5.2
Fortran compiler XLF 8.1.1.0
C,C++ compiler
Engineering and Scientific Library ESSL
Mathematics Library MASS 3.0
Parallel Environment (MPI): PE 3.2.0.16
LoadLeveler 3.2



Brief historical outlook : The Invitation To Tender was declared in June 2003, the evaluations ran during October 2003 and according to final decision of evaluation committee IBM @server Regatta p690 was chosen. The contract was signed in December 2003 and the computer was delivered, tested and accepted in January 2004. The porting, optimization and validation of ALADIN source code together with other applications and tools could start. For this, some help was obtained from The Products & Solutions Support Centre of IBM in Montpellier (porting of ALADIN code, optimisation of the code, optimization of memory manager and I/O, provision of reliability of operational suite: AIX Work Load Manager & LoadLeveler & Vsrac).

2.2 The ALADIN model

The domain of ALADIN/SHMU covers the whole RC LACE area with an horizontal resolution of 9 km, having 320×288 points in quadratic grid. There are 37 vertical levels. More details are in the table below, the model domain is also displayed.

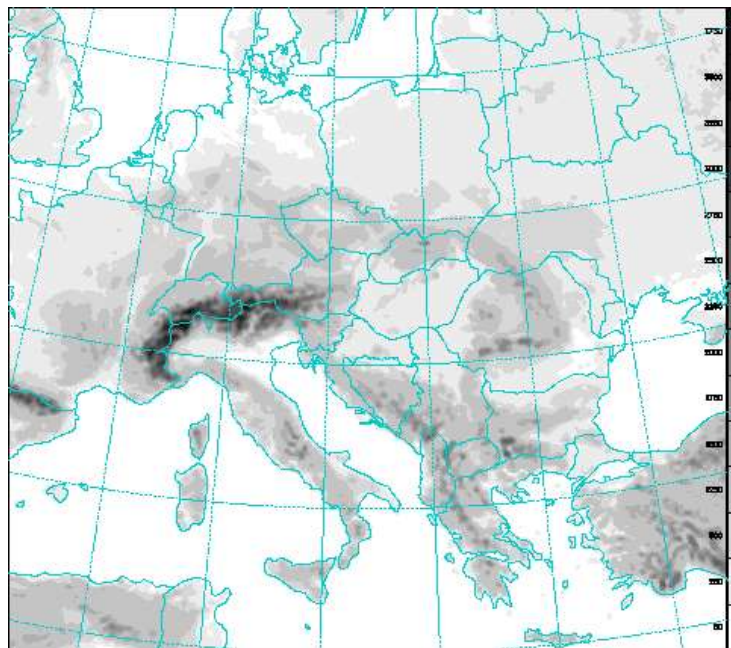


Illustration 1: ALADIN/SHMU model domain and orography

Domain size	2882×2594 km (320×288 points in quadratic grid)
Domain corners	[2.19 ; 33.99 SW] [39.06 ; 55.63 NE]
Horizontal resolution	9.0 km
Vertical resolution	37 levels
Time step	400 s
LBC data	ARPEGE, 3 h frequency
Code version	AL25T2

The model runs twice per day up to 48 hours in dynamical adaptation mode. Lateral boundary data provided by ARPEGE are downloaded using internet, and backup is done by RETIM2000 system (about 40 minutes slower than internet). Whole suite in optimal case needs about 60 minutes to finish. Hourly model outputs are available for further post-processing and visualization. They also serve as the basic input for numerous applications like automatic point forecasts, dispersion models, hydrological models etc. Data for the PEPS project are provided as well.

The verification of ALADIN/SHMU outputs is done in two ways : locally only surface parameters are compared against observations over Slovakia, and data are also sent for processing in the ALADIN verification project.

2.3 The operational environment

The operational suite is based on the in-house developed system of Perl scripts and programs, and enables on-line monitoring and documentation (accessible via pocket communicator as well). More details can be found at web page www.zamg.ac.at/workshop2004/presentations/martinb.sxi. An example of the diagnostics for last 30 days is plotted on Figures 2-5. Given the importance of the ALADIN/SHMU products, the non-stop human monitoring of the operational suite started recently. One of the handy on-line monitoring diagnostic tool (number of processes of nwp001 user) is shown on Figure 6.

In case of unexpected failure of the operational ALADIN run, a mutual backup was agreed with our colleagues at ZAMG. The remains of the system used in the past to produce data for SHMI at ZAMG are used now to generate the minimum dataset needed for SHMI. These data are daily downloaded.

The privilege of the operational jobs on the machine is guaranteed by submitting all jobs through LoadLeveler batch queueing system, which together with Work Load Manager controls and allocates the system resources (CPU, MEM etc.). The operational suite is launched via a special Perl script scheduled in the crontab. This script reads all operational configuration files and sets the application dependencies, number of used processors, memory requirements etc. All operational applications are then submitted as a single multi-step job into a dedicated LoadLeveler class (except the applications monitoring the products transmission which are submitted into another class with lower priorities but within the same multi-step job). However, there is still some residual problem with the preempting of non-operational jobs.

Active monitoring of the applications is done internally by the *run_app* system itself. It is possible to switch on/off an ALERT for each application separately. In case of application failure the automatic ALERT will be sent immediately to the mobile device and the person on duty will be informed (or even woken up). Using the "pocket" version of the monitoring system he/she can browse the application logs, statuses and documentation then and if possible repair the suite remotely.

3. Local R&D work and Future plans

Though the implementation of the new ALADIN operational suite was a quite huge task, the new computer was used for other R&D work. In NH dynamics, the technical cleaning of the code was done and the theoretical study of the pathological behaviour related to horizontal diffusion treatment (so-called chimneys) was performed. The dynamical adaptation of the wind field over the territory of Slovakia with a 2.5 km resolution and hourly outputs, for the purpose of atmospheric dispersion modelling, was run. New diagnostics indexes to identify severe weather phenomena (Storm to Relative Environmental Helicity – SREH, Bulk Richardson Number – BRN) were implemented and validated. CY28T1 and T3 export versions were ported. Testing in parallel suite is planned for the nearest future.

For the longer term plans, first of all the prolongation to 54 h (and possibly up to 72 h) is scheduled. Then the investigation of blending assimilation is planned together with porting, implementation and testing of ODB software during the first half of 2005. Also some LAM EPS activities will start in cooperation with other RC LACE partners. Systematic improvement of the operational ALADIN model version via ALADIN-2 and AROME projects is implicit.

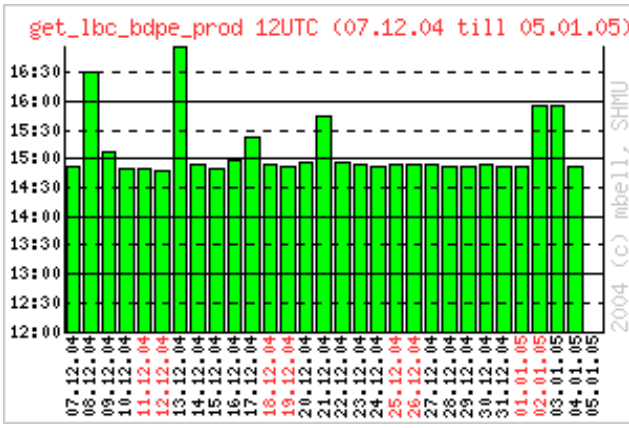


Illustration 2 : LBC download (12 UTC), internet

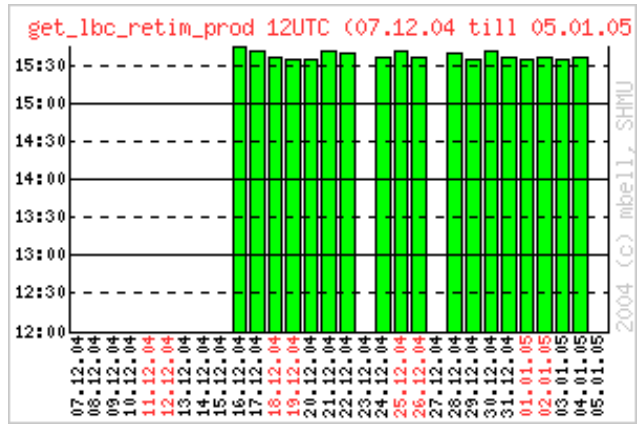


Illustration 3 : LBC download (12 UTC), RETIM2000

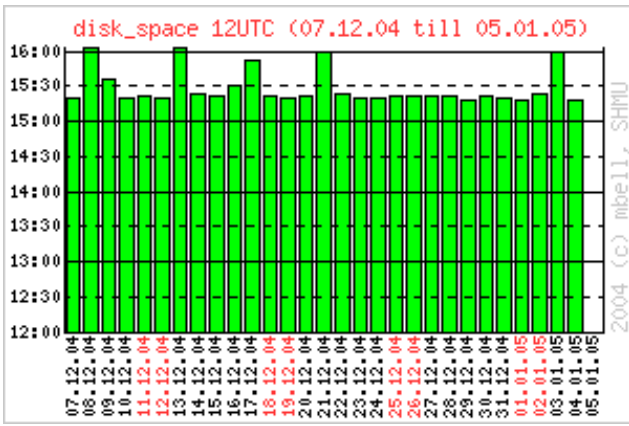


Illustration 4 : end of the suite (12 UTC)

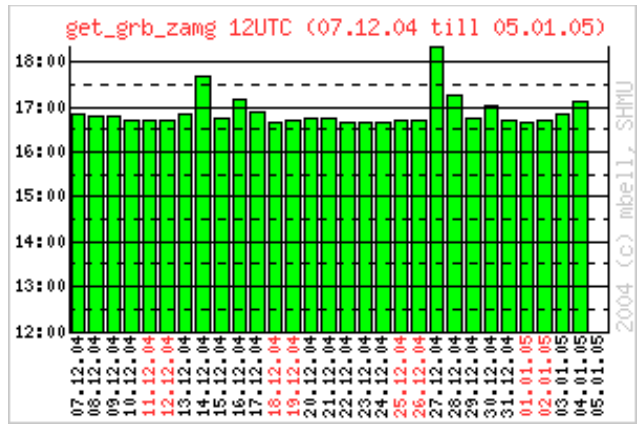


Illustration 5 : backup data(ZAMG) download (12UTC)

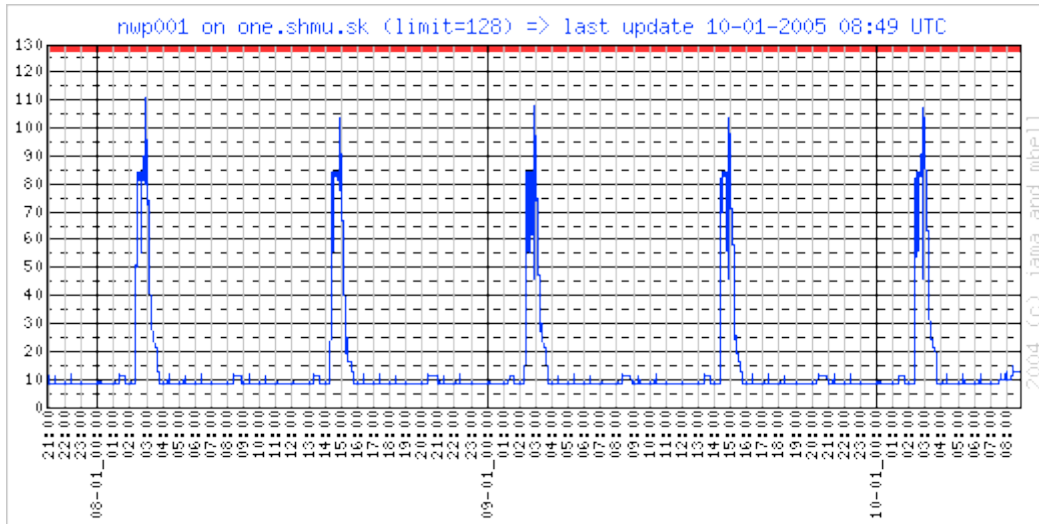


Illustration 6 : Monitoring of operational suite - "EKG"

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