

ER-flow Application Description Template

<p>Application Name: (will be used as workflow name in the repo) COMCAPT</p>
<p>Application domain: (choose one existing in the repo, otherwise will be created) Astrophysics</p> <p>Brief description of application (explain implemented function, inputs, outputs, usage) The trajectories of interstellar comets passing the Solar System are gravitationally influenced by the Galactic tide. A combination of this influence and gravity of the Sun can change the trajectories in the way that the comets become bound to the Solar System, i.e. they become a part of the comet Oort cloud. For the current position of the Sun in the Galaxy and considering its relatively high peculiar velocity, the intervals of the comet orbital phase space, where the “capture” happens, occur to be extremely narrow. In addition, a preliminary analysis of the problem revealed that the problem is non-linear. So, the appropriate “capture window” can appear for an unexpected combination of comet orbital parameters (one cannot simply look for a mathematical local minimum). The application calculates the critical parameters of the capture for a huge number of interstellar-comet trajectories (of order of magnitude equal to 10^{16}) and evaluates if the condition of the capture is satisfied for the given combination of 4-D orbital characteristics or not. The application is expected to be re-run for various combinations of two input values: distance of the Sun from the Galactic center and magnitude of the peculiar velocity of the Sun with respect to the LSR (Local Standard of Rest). From the computational point of view, the application is a parametric study. Using the input data and specific astronomical software (created by users), it calculates some critical parameters and, based on these parameters, evaluates if the expected phenomenon (capture of interstellar comets into the comet Oort cloud) happens for a given combination of input data.</p> <p>data: input data format: tar gz archive input data value range: 1 single tar gz file output data format: tar gz archive output data value range: 1 single tar gz archive sample data (link): http://www.astro.sk/~mjakubik/WORKFLOWS/COMCAPT/ application (link): ---- documentation (link): http://www.astro.sk/~mjakubik/WORKFLOWS/COMCAPT/ publication (link): ----</p>
<p>Execution environment DCI: (computing, data, VO, etc): VOCE VO, astro VO middleware: gLite workflow system: WS-PGRADE</p>
<p>Execution characteristics data size (per unit, typical number of units): input temporary output 40 MB (250 units) 40 MB (250 units) processing time (per unit): 1 single job lasts typically 6 days (7 days as highest limit);</p>

this estimation is done under the assumption that 250 CPUs are used

memory usage: 40 MB (per 1 CPU) disk usage: 20 GB (80 MB per 1 CPU)

Target users

Community: astronomical; comet dynamics; cosmogony of the Solar System.
Projects (link): Slovak Grant Agency for Science (VEGA), Grant N. 0011

number of users:

user type: developer: 6 end-user: ----

Usage scenario for workflow in the ER-FLOW (how workflow will be reused, meta-workflow, how expected to contribute to project indicators, etc.).

The COMCAPT workflow can easily be modified for another application of parametric type. The user (astronomer) writes the source code doing calculations in a studied scientific problem and creates the appropriate input data.

After the division of the data to N parts corresponding to N available CPUs, the executable code and data can be brought on the UI and the workflow can be used to perform the computations required by the application. The output data from the extensive computation are, then, further processed using a common personal computer to create the tables, figures, movies, etc. which describe the result of the study.

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