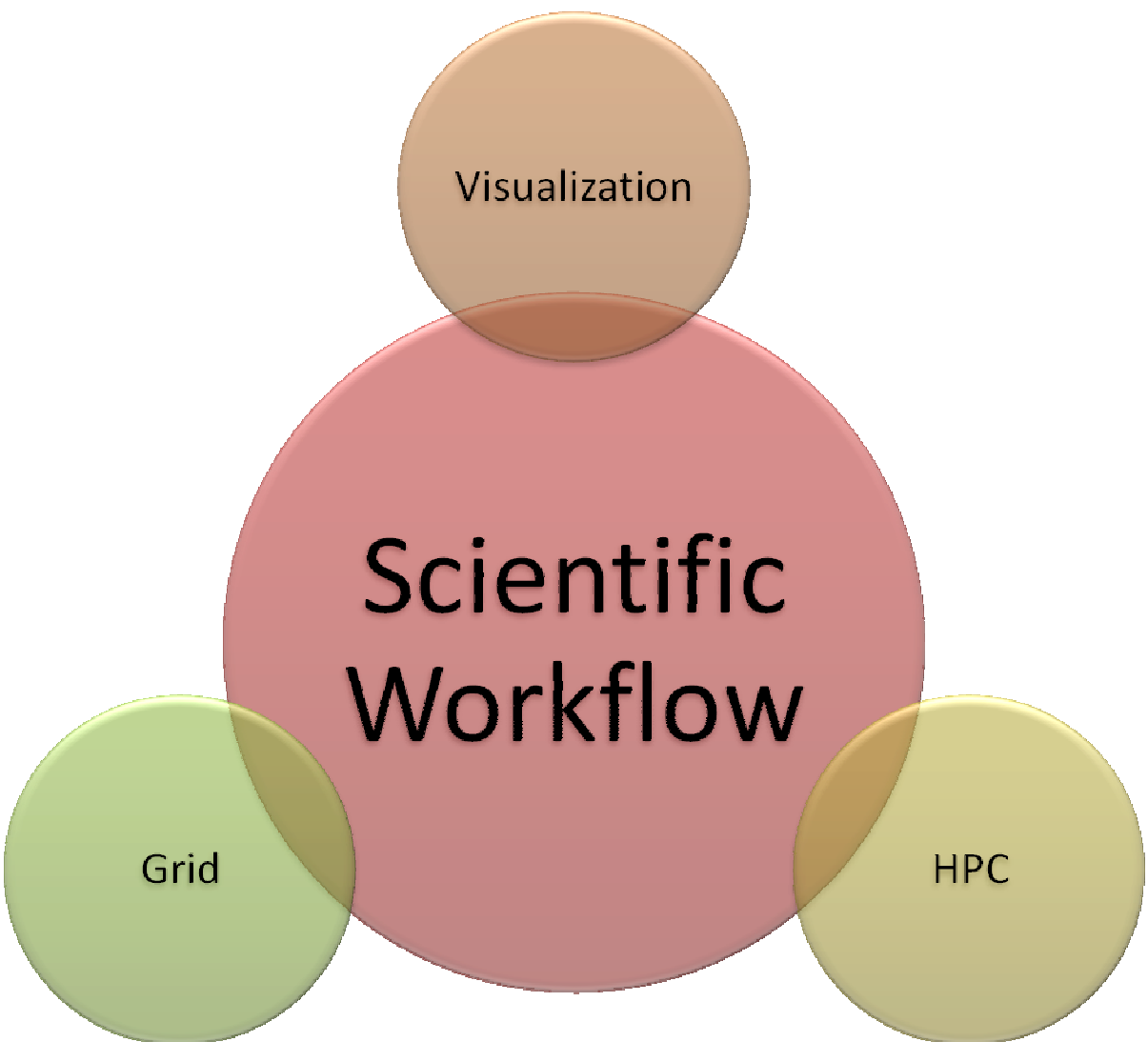


VMEC-Visualization-VisIt

Mixed Workflow + Visualization

Brussels

30 March 2011

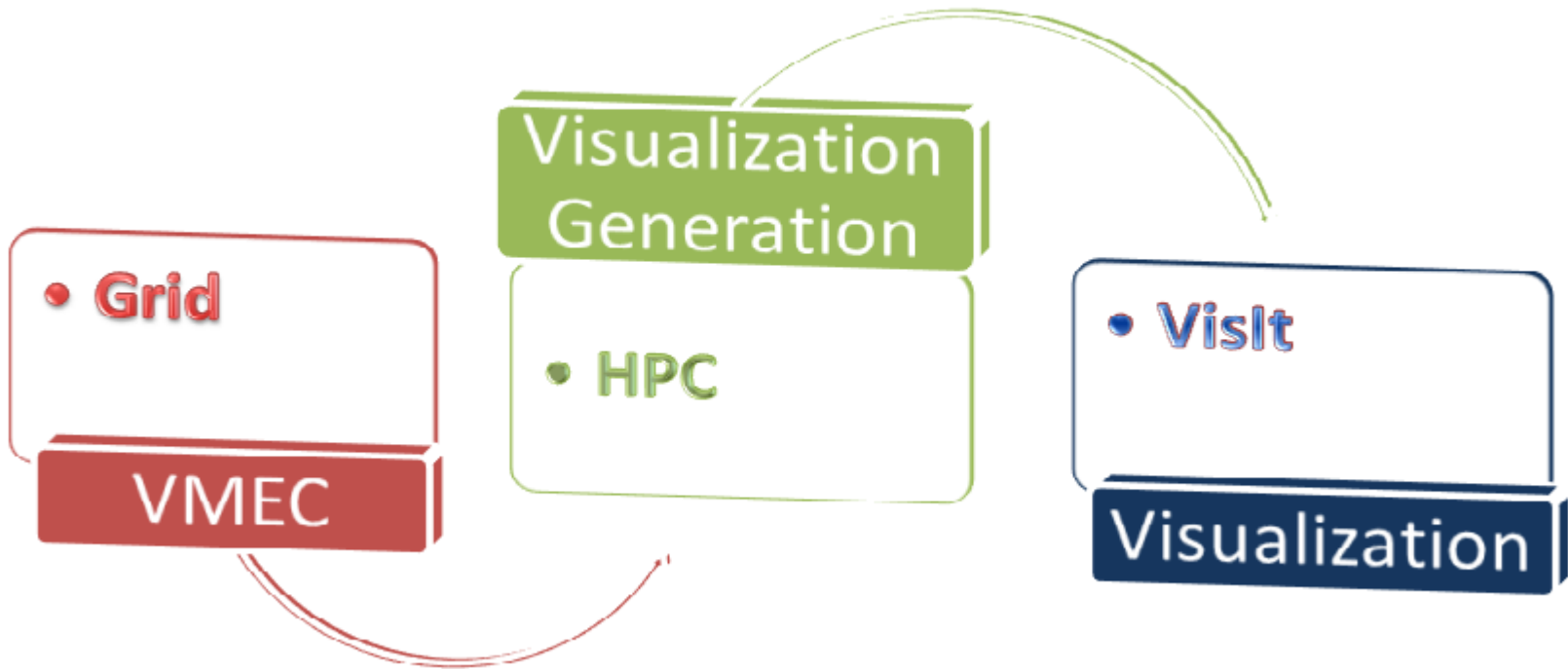


Scientific Workflow

Visualization

Grid

HPC



KEPLER

VMEC

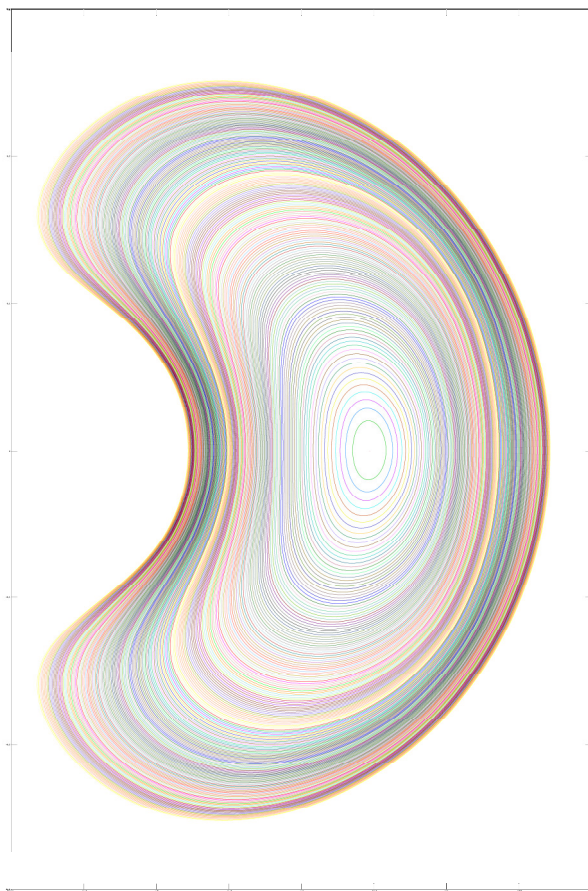
- VMEC (Variational Moments Equilibrium Code), serial code running on one processor.

- It solves the 3D Magnetohydrodynamic (MHD) equilibrium equation.

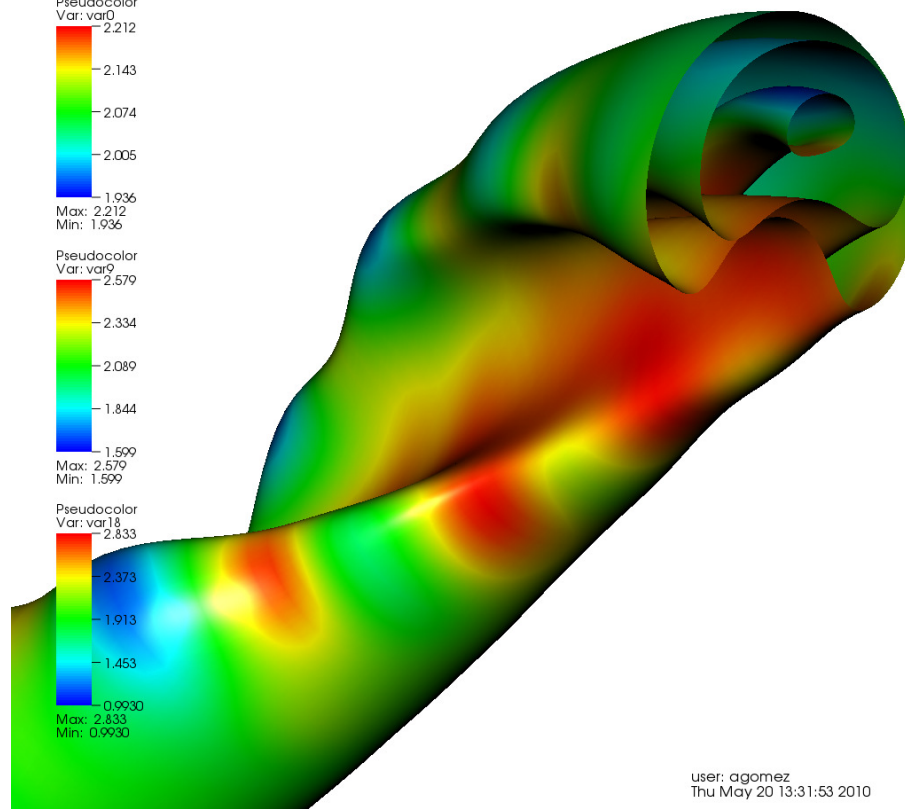
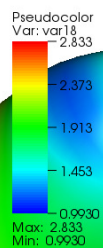
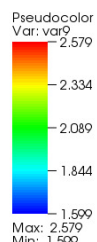
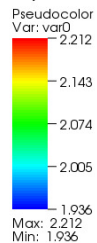
$$\nabla p = j \times B$$

- A magnetic configuration composed of magnetic surfaces, described by a set of Fourier modes for every radial position (typically 100 modes per position).
- Magnetic field and current tangent to the surfaces. Pressure constant on every surface.

VMEC



DB: superficies.silo
Cycle: 0



user: agomez
Thu May 20 13:31:53 2010

Visualization Generation

- Uses the output of an execution of VMEC.
- Extracts the relevant information about the magnetic field.
- Generates a Silo file with the three-dimensional representation of the magnetic surfaces of the plasma plus the intensity of the magnetic field at each point of the plasma.
- OpenMP code running on 8 processors.

Kepler integration

- Use case scenario integrated easily inside Kepler using standard Unicore and gLite modules

Job specification

Below are all job's parameters:

- inputFiles: list of local files to be uploaded
- jobType: normal, opening or parameteric
- environment: list of variables to be set in format "name=value"
- outputFiles: list of output files to be downloaded
- commandLine: command to be executed
- nodes: number of nodes to be used (mandatory for opening jobs)
- parameterType: list or numeric
- parameterList: if parameterType = "list" then this is the list of values
- parameterStart: if parameterType = "numeric" then this is starting value
- parameterStep: if parameterType = "numeric" then this is step value
- parameterLimit: if parameterType = "numeric" then this is final value
- requirements: requirement expression (as in SL specification) note: some policy for some type "help" have to get list of possible values

PARAMETERS
You MUST check if these are correct

- \$HOME: directory location
- \$PWD: job location
- \$RAJ_ADDRESS: RAJ address

Leave these unchanged

- predefined RAJ addresses
- job's name in the internal database
- job's automatic counter
- file with main job's id stored

```
display x UNICORE job status x
11:15:46.109] READY
11:15:56.733] QUEUED
11:16:07.347] QUEUED
11:16:17.997] QUEUED
11:16:28.659] QUEUED
11:16:39.265] RUNNING
11:16:49.892] RUNNING
11:17:01.061] RUNNING
11:17:11.706] RUNNING
11:17:22.349] RUNNING
11:17:32.989] RUNNING
11:17:43.593] RUNNING
11:17:54.222] RUNNING
11:18:05.146] RUNNING
11:18:15.777] RUNNING
11:18:26.415] RUNNING
11:18:37.050] RUNNING
11:18:47.716] RUNNING
11:18:58.458] RUNNING
11:19:09.155] RUNNING
11:19:20.173] RUNNING
11:19:30.910] RUNNING
11:19:41.585] RUNNING
11:19:52.218] RUNNING
11:20:02.860] RUNNING
11:20:13.553] SUCCESSFUL exit code: 0
```

```
11:13:44.180] Loading previous job
11:13:44.500] Successfully loaded previous job
11:13:44.511] Job is ready to be processed
11:13:44.572] READY/SCHEDULED/RUNNING
11:13:44.581] ABORTED: 0
11:13:44.589] DONE: 1
11:13:44.589] CLEARED: 0
```

Publications

[1] Distributed and Asynchronous Bees Algorithm Applied to Plasma Confinement. IAEA 2010

[2] Stellarator optimization using metaheuristics, EPS 2010

[3] Artificial Bee Colony Inspired Algorithm Applied to Fusion Research in a Grid Computing Environment, PDP 2010

[4] Distributed and Asynchronous Bees Algorithm Applied to Nuclear Fusion Research, PDP 2011