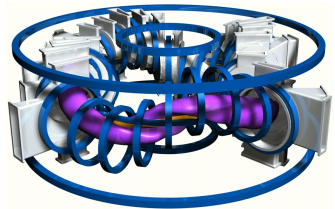# Fusion Community

Antonio Gómez, Marcin Plociennik, Francisco Castejón

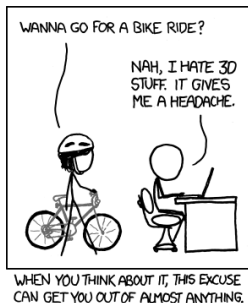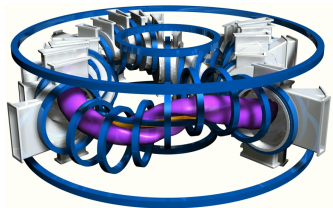Motivation

Complex Workflows

Fusion Applications

- Huge computing requirements

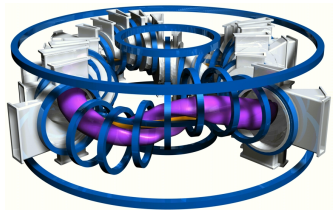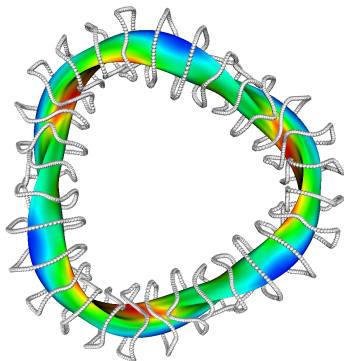# Fusion Applications

- Huge computing requirements
- 5D problems (6D in the future)

- Huge computing requirements
- 5D problems (6D in the future)
- Different scales (time and space)
  - 10^{-10}s - 10s
  - 10^{-3}m - 10m

- Fusion = Plasma Physics + Materials
    - Complex systems
    - Kinetic theory
    - Fluids and turbulence
   - Non linear problems
- Grid and HPC
- Visualization

- New users after the sucess of Euforia project
- All partners agreed on keep on supporting the VO
- Developments used by the fusion community in Europe (EFDA, ITM, ...)

Complex Workflows

- We need:
  - To exchange information between applications focused on different research fields and/or time scales.
  - To use different computing platforms.
  - To hide the differences and complexities of the computing paradigms.
  - To create different types of workflows.
    - Single task - single task
    - Loops
    - Single task - parametric task
    - ...
- We don't need specific tools that can't be used by other communities.

Kepler

- Free (BSD license) software
- *De facto* standard in the fusion community
- Graphical $\rightarrow$ drag & drop
- Kepler actors
    - New actors can be added, adding or extending the functionalities of existing actors (Serpens)
    - http://serpens.psnc.pl/ Serpens wiki, repository, bugtracker, tutorials,...

Key results from the services for heavy user communities (SA3) workpackage. St Clair 3. Thursday 16:50.

VMEC+COBRA

- Measure the transport in the plasma
- Consider ballooning stability
- Single+single model (apply a parametric scan)
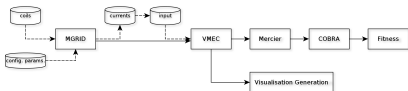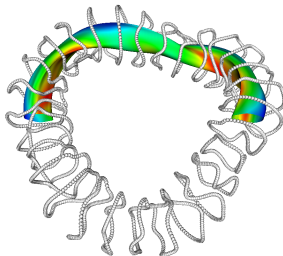
- Additional coils calculation
- Visualization using HPC resources

- Characterize neoclassical diffusion
- VMEC: solves magnetohidrodynamic plasma equilibrium in 3D geometries
- DKES: solves drift kinetic equation in 3D geometries
- Parametric + parametric
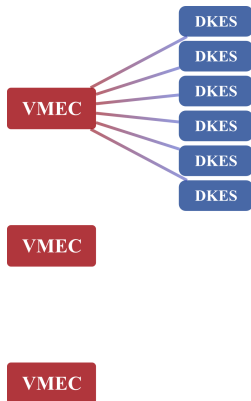
Astra+Truba

- Loop workflow
  - Astra (Plasma Evolution)
  - Truba (Heating Properties)
  - Astra (Plasma Evolution)
  - Truba (Heating Properties)
  - ...
- Mixed HPC-Grid
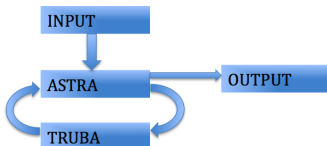
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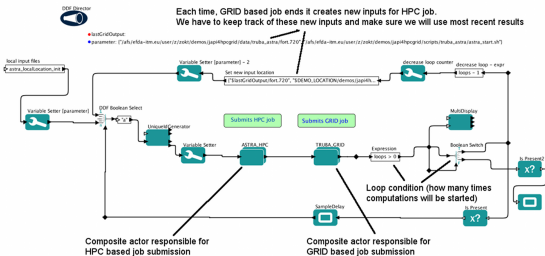
FAFNER+ISDEP

- Solve the dynamic of NBI fast ions
- FAFNER estimates the birth of fast ions
- ISDEP calculates the trajectories of fast ions using the starting positions obtained by FAFNER
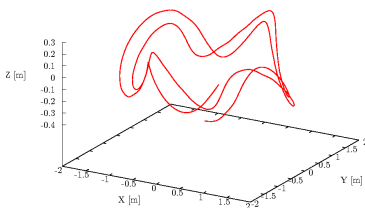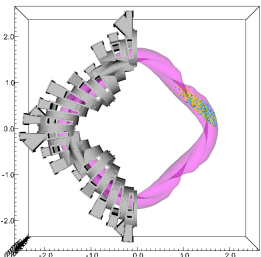
Visit **http://www.bifi-ciemat.es/** under 'Laboratory' you'll find some nice apps.

- Growing community
- New and growing computational requirements
- As generic as posible
- New challenges coming

Thank you for your attention