Coordination of the ITER Research Programme Between the ITER IO and the ITER Parties

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Collaborative Development of the ITER Research Programme

The ITER IO will be very limited in size:

→ It must rely heavily on the Parties' physics communities that have an extensive reservoir of expertise and talent to develop a research programme that effectively exploits ITER's potential

Opportunities for effective involvement of the Parties are being developed:

→Off-site:

- ITPA
- Task Agreements

→On-site:

- Visiting Researcher programme
- Post-doctoral programme

In FST and Integrated Modelling, we also plan to establish:

- An Integrated Modelling Advisory Group
- An ITER Fusion Science & Technology (FST) Department web site

Items in red to be covered in more detail

Organization of ITER Physics Activities:
(means of implementation)

In July 2007, the ITER Interim Council approved the 'Organization of ITER Physics Activities' that included an outline of plans for:

- A programme of Physics Design and Research Tasks defined to provide the physics input required by the ITER construction project and the associated licensing activities. (Task Agreements)
- Co-ordinated research activities aimed at developing the physics basis for ITER operation that would be implemented on an international scale using an appropriate framework within the ITER collaboration. (ITPA)
- Establishment of a programme on integrated modelling and control of fusion plasmas, including benchmarking and validation activities, which would be co-ordinated by the ITER Organization, but which would be developed using the relevant expertise within the Members' fusion programmes, making use of existing co-ordination structures where possible. (IMAG)
- Attachment of Visiting Researchers to the ITER Organization to contribute to specific aspects of the ITER Physics Design and R&D studies and to the co-ordination of the programmatic activities.
- Establishment of a Post-Doctoral fellowship programme.

ITPA Reorganization under ITER

As of February 25, 2008 ITPA operates under the auspices of ITER in order to provide the framework for coordinated physics research activities:

- ITPA will retain its role as voluntary/advisory organization (not a 'job shop' for ITER tasks)
- The Topical Groups will see some reorganization:
  - Transport and Confinement (combines TP and CDBM core physics)
  - Edge Pedestal
  - Stability
  - SOL and Divertor
  - Energetic Particle Physics (new)
  - Integrated Operational Scenarios (broadens present SS scope + modelling all scenarios)
  - Diagnostics
- New Chairs from Parties + Deputy from Parties + Deputy from ITER
  - Chairs are for 3 years, Party Deputy succeeds Chair
- New organization to be effective after ITPA CC meeting in July

ITPA Objectives (from Charter)

- Provision of validated experimental data according to agreed formats
- Presentation of analyzed results of experiments to advance understanding of fusion plasma physics
- Organization, management, and updating of qualified databases
- Development of theoretical models and simulation results to explain and reproduce experimental results
- Fostering of joint experiments among the world's tokamak devices
- Demonstration of experimental techniques in such areas as wall conditioning/cleaning, plasma control, etc. which can be exploited to optimize ITER's performance
- Investigation and documentation of plasma scenarios suitable for exploitation in ITER
- Exploration of ITER's potential as a burning plasma experiment by modelling and simulation experiments in present devices
- Identification and resolution of key heating and current drive, diagnostics, and fuelling issues which might arise in plasma control and analysis of ITER plasmas
- Creating annually a list of High Priority R&D Issues which can lead to definition of elements of a research program and which meet the needs of ITER and advance international research in tokamaks generally
- Undertaking scientific studies agreed with the ITER-IO as being of high importance for the pursuit of the ITER project goals
- Supporting emerging research in new relevant areas of physics in the future

Task Agreements

Task Agreements (TAs) cover specific ITER project needs:

- Design and Technology R&D
- Visiting Researchers
- …

Task Agreements include:

- Background and objectives
- Scope of the task
- Task Description, schedule, estimated voluntary contribution by PT/DA, agreed credit to be allocated to PT/DA in kIUA and planned fund allocation by IO in Euro
- Responsibility sharing (including customs and other logistics)
- Deliverables and their schedule
- Acceptance criteria including rules and criteria to allocate actual credit
- Meeting schedule
- Project management structure

IO financial support of physics tasks will be very limited:

- Policy is being formulated

ITER Visiting Researcher Programme

Attachment of Visiting Researchers (VR) to the ITER Organization:

- To contribute to specific aspects of the ITER Physics Design and R&D studies and to the co-ordination of the programmatic activities.
- VRs would join the ITER team for periods ranging from 3 months (to address specific problems) to 2 years (for more extensive problems or to contribute to co-ordination activities).
- If each ITER Member were to provide up to 2 ppy per year from its own resources for the Physics VR programme, it would significantly strengthen the capabilities of the ITER team and would also allow individual researchers in the Members' programmes to develop a greater familiarity with the ITER priorities, which would benefit the domestic preparations for ITER exploitation.

Detailed guidelines for the VR programme are now being developed

ITER Post Doctoral Programme

The ITER Organization and the Principality of Monaco on 16 January 2008 signed a Partnership Agreement that sets up five Postdoctoral Fellowships

- 400k € annually (~$600k to cover all costs) for Postdoctoral Fellowships
- This will support five young scientists from the seven ITER Member countries or from the Principality of Monaco to be trained over two years in research areas related to the ITER project

The arrangement will cover a ten year period

A selection committee has been established and proposals are being collected (internally to ITER) describing possible research topics

- The expectation is that the positions may be staggered to start over a two-year period
- Application deadline 30 April 2008

For more details see:

- http://www.iter.org/monaco-partnership/

Integrated Modelling Advisory Group

We will be proposing the establishment of an Integrated Modelling Advisory Group (IMAG):

- Representation from each of the ITER Parties
- Advise ITER IO/FST on IM programme:
  - Infrastructure and network
  - Standards for V&V and documentation (BPO sponsored report by Terry et al would be an excellent guiding resource)
  - Application of modelling to design, experimental program planning, scenario development, control systems, data analysis, …
- Coordinate development and applications among the ITER Parties:
  - Identification of ITER needs
  - Development of tasks to meet those needs
  - Communicating needs to the ITER Parties (e.g. US: IPO, BPO, TTF, OFES)

Fusion Science & Technology Web Site

Later in 2008 we plan to develop a web site for the ITER FST Department:

- Enhance communication between ITER and Parties
- Include access to reports, and other programmatic information

We will also propose to use this site to serve ITPA needs:

- Meeting schedules, agendas, presentations, minutes
- Reports, publications
- Other communications

Progress and Plans for Establishing the ITER Integrated Modelling Program

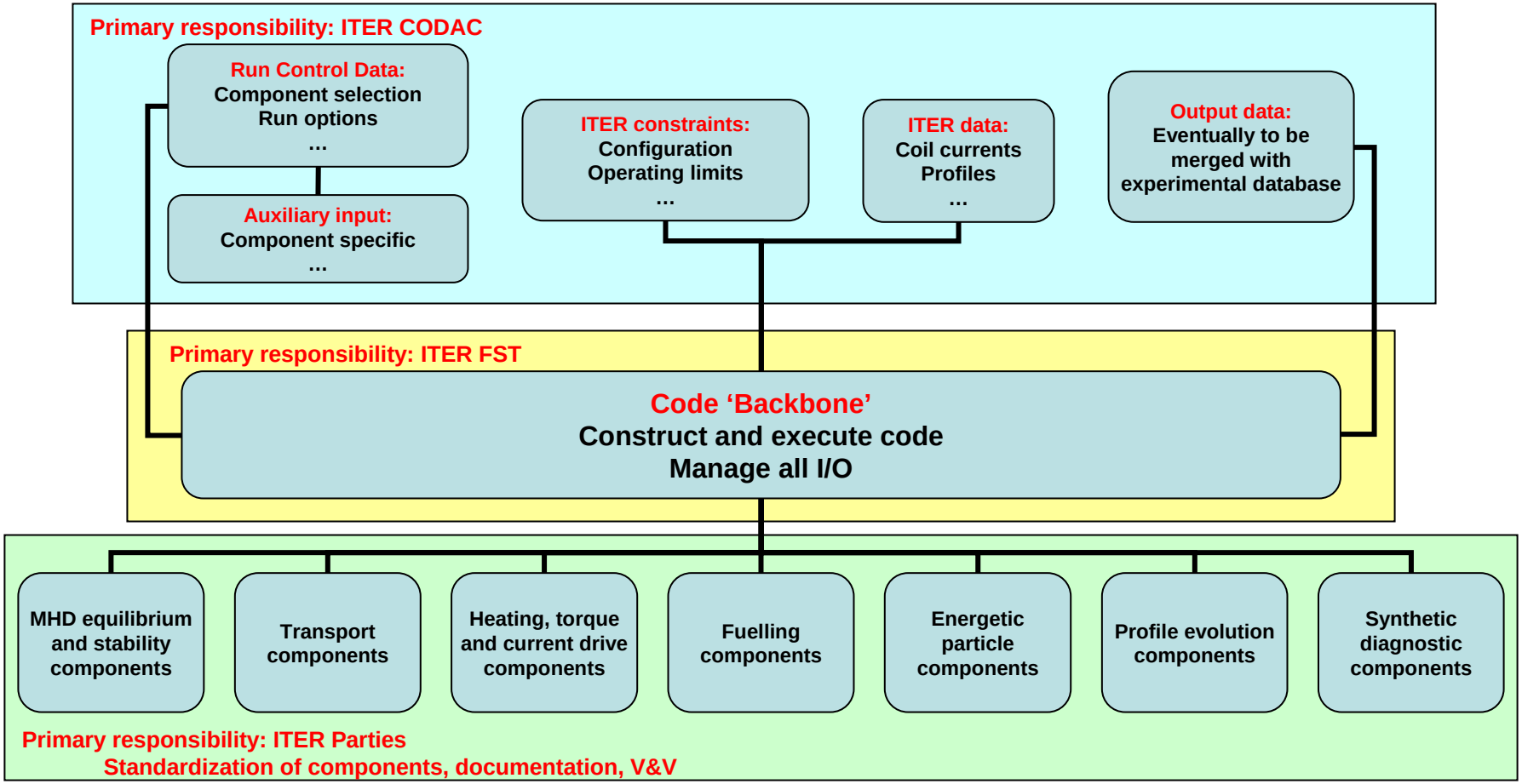
Progress:

- September 2007 – week-long Workshop on Component Interfaces
- February 2008 – WBS and Resource Estimate for developed for 2008-2019
- March 2008 – IM Workplan for 2008-2009

Plans 2008-2009:

- Establish Integrated Modelling Advisory Group
- Establish website
- Draft standards for code V&V, documentation
- Draft standards for component interfaces, data structures
- Identify code management tools for initial implementation (e.g. Kepler Workflow Management)
- Begin implementing code infrastructure, assembling components, …

Schematic of Integrated Modelling Infrastructure



This structure would be implemented with a Scientific Workflow Manager

Scientific Workflow Requirements

A. Shoshani - LBNL

Design tools

- Especially for non-expert users

Ease of use

- Fairly simple user interface having more complex features hidden in the background

Reusable generic features

- Generic enough to serve to different communities but specific enough to serve one domain (e.g. Fusion) → customizable

Extensibility

- For the expert user

Registration, publication & provenance of data and process products

- = workflows

Dynamic plug-in of data and processes from registries/repositories

Distributed Workflow execution

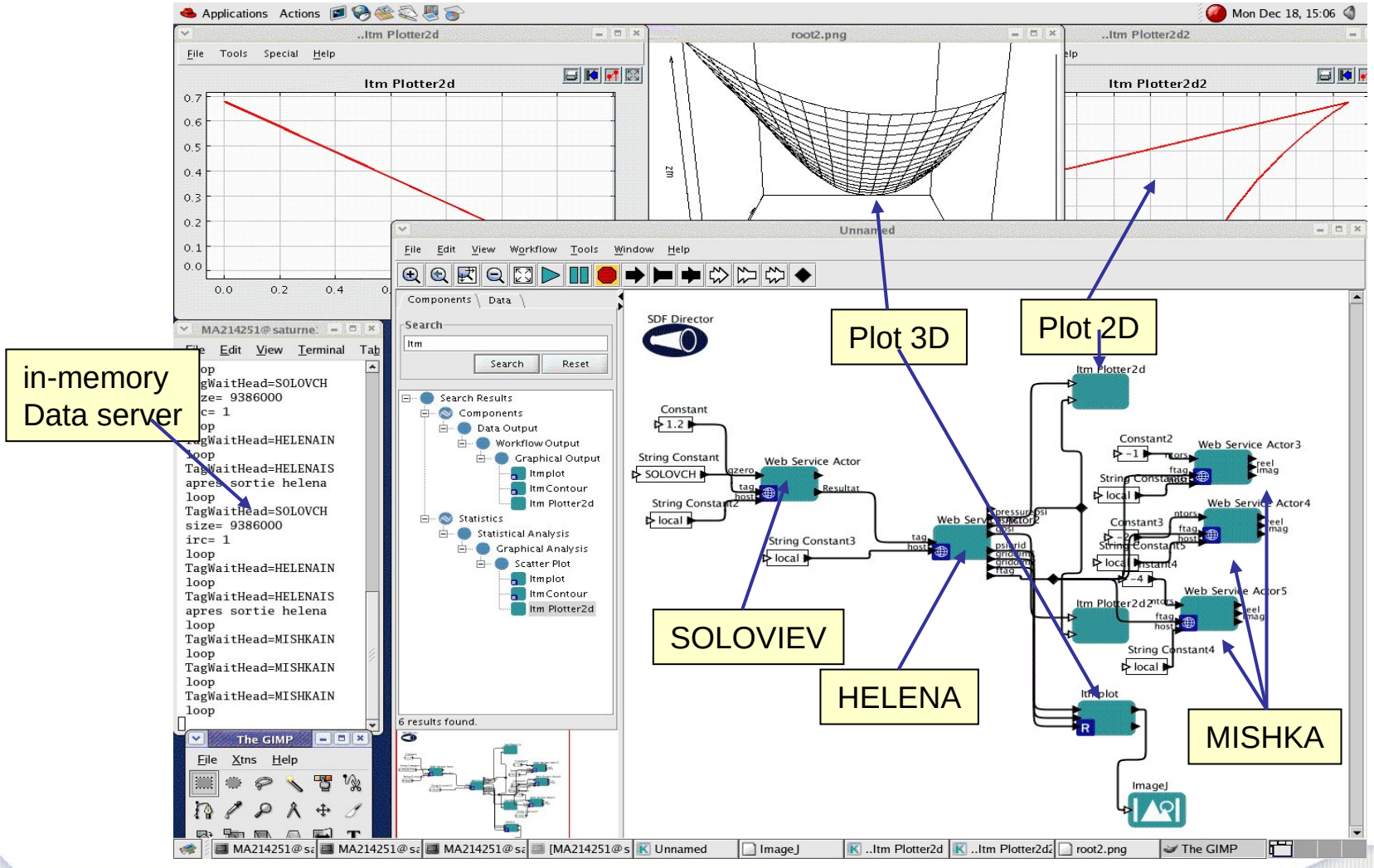
- Web and Grid awareness

WF Deployment

- As a web site, as a web service, power applications

Kepler Workflow Example from EU – ITM

B. Guillerminet, CEA Cadarache



Summary

The ITER IO is developing a wide range of opportunities to enhance the collaboration with the physics community

These are not exhaustive – they are expected to evolve based on experience and feedback from the community

The Integrated Modelling program will be particularly dependent on broad community participation

- The challenge of developing a computational framework for studying burning plasma physics is widely recognized
- In the US the FSP, BPO, TTF, and ITPA efforts will all provide channels for participation
- Direct communication will be required, implemented through IMAG and a web site
- The Visiting Researcher and Post-Doctoral programmes will offer opportunities for direct participation

Constructive feedback is WELCOME!