

HET Funding and Utilisation Model

This section discusses the design objectives for funding and utilisation of a European tier-0 supercomputer infrastructure and proposes a funding and utilisation model for its creation.

Rationale

Establishing an internationally competitive European HPC infrastructure with a couple of tier-0 centres requires continuous funding of both hardware procurement and support structures. The funding has to be provided by several sources, primarily the member states, which host the infrastructure, and, in addition, the European Commission. While the allocation of resources to research projects should follow scientific criteria, the funding organisations also have legitimate interests of their own. The different interests of science and funding agencies have to be brought together, in order to create a world-leading tier-0 infrastructure within the European e-Science ecosystem.

General Goals / Design Objectives

Utilisation: The formulation of proper design objectives for an utilisation model is guided by the strategic goal to provide European researchers and industry with HPC resources, which are competitive on an international level, and the requirement to make the best possible usage of these resources:

- Resources of tier-0 systems (computing time, storage, support) should be allocated only to projects with resource requirements for true capability computing. These requirements cannot be fulfilled on smaller national systems.
- The resource allocation must strictly follow scientific criteria.
- A smallish partitioning of the tier-0 resource would compromise capability computing and has to be avoided.
- The development of world-class support structures and efficient software for capability computing is a mandatory prerequisite for an efficient tier-0 usage.

Funding: The design objectives for the funding model have to take into account the interests of the funding agencies and potential innovative funding sources:

- Scientists of those EU member states which provide tier-0 funding should get access to all European tier-0 systems according to their countries' total contribution and that of the EC.
- Scientists from EU member states not providing tier-0 funding should get access to all the tier-0 systems with respect to the contribution of the EC.
- The tight integration of the European tier-0 centres with existing international and national tier-1 centres, following the DEISA project model, is to be funded.

- While the major part of the available EC-funding is required for the tier-0 resources itself, a substantial part of the EC-funding has to be reserved for capability computing oriented software development and the development of community oriented support structures at the tier-0 as well as at national tier-1 centres.
- It should be considered that the EC intends a 40 percent participation of the European investment bank in form of loans for EC funding of production systems.
- The creation of pan-European science communities should be supported.
- In addition to the core investments by EC and contributing EU member states refunds from selling computer time and services to industry as well as science should be considered.

In particular, the funding objectives should include the very strong interest of the EC to include a pre-commercial procurement phase in order to open up European pathways to Petaflop prototype systems: A pre-commercial procurement phase of about two years

- should influence the solution development of major non-European HPC-vendors to correspond to European needs;
- should impact the timings for hardware roadmaps when considering European needs;
- should initiate the transfer of a part of the R&D activities as well as the production of non-European vendors to Europe.

Mutual Utilisation Model

The Mutual Utilisation Model (MUM) largely meets the above design goals by combining the advantages of a variety of funding models (*cf.* Figure 2), without retaining their various drawbacks.

In the MUM, a tier-0 system is seen in analogy to some other large-scale instruments in Europe. However, while suitable funding models for such European centres operating accelerators or observatories exist, a one-to-one transfer of these solutions is limited due to the significantly shorter investment cycles of supercomputer systems.

The guiding principle of MUM is the establishment of co-ordinated procurements by two or three EU member states, following each other within an interval of about 1 to 2 years. On top of this funding, the European Commission contributes with a significant share in order to complement the national funding for every tier-0 system. Only such a “procurement spiral” can guarantee a sustained world-class leadership HPC infrastructure in Europe.

A major fraction of the resources that corresponds to the contribution of the EC to the costs of the infrastructure will be allocated to projects that are open to all EU member states. The rest of the resources are shared among projects of the states that have committed themselves to carry out the successive procurements; on each of the systems all the latter member states should get a substantial and fair amount of resources following their contribution.

Within these two pools, the resources are allocated according to proper scientific criteria only, following a peer review procedure as described elsewhere

in this report. This peer review procedure or committee has to ensure and guarantee that the European capability computing resources are used as such. This means that only projects requiring exceptional resources, in terms of CPUs, memory, data storage, application support, should be granted access. If requirements of projects can also be fulfilled on national (tier-1) or even regional (tier-2) resources, they should be allocated to the latter. Fig. 1 provides a sketch of the MUM scheme.

It is expected, that, on the long run, a fair distribution of loads can be achieved, while undesirable fixed quotas can be avoided. The model also assures that researchers of all member states have continuously access to the capability of world-class HPC resources. It should be noted that DEISA uses a similar model already today.

HPC systems have a typical life cycle of about 5 to 6 years. Due to the rapid development of hardware, national tier-1 systems will catch up with the performances of European tier-0 systems after about four years. However, the former tier-0 systems then could be made available for all EU member states during the last phase of their operation. This opens up a natural way to give support to smaller HPC projects of those countries, which do not have own national HPC resources, without compromising the requirement for strict capability computing on the tier-0 installations.

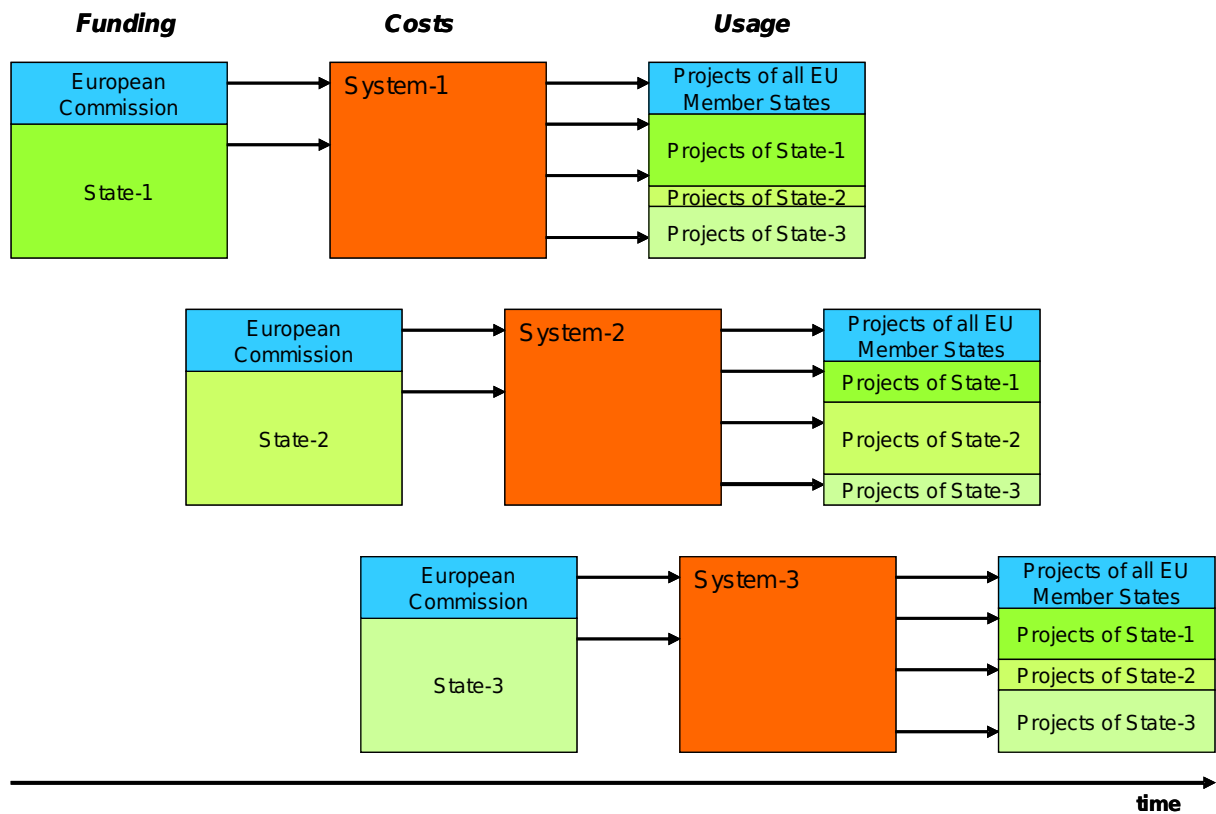


Figure 1 Funding and usage in the Mutual Utilisation Model (MUM).

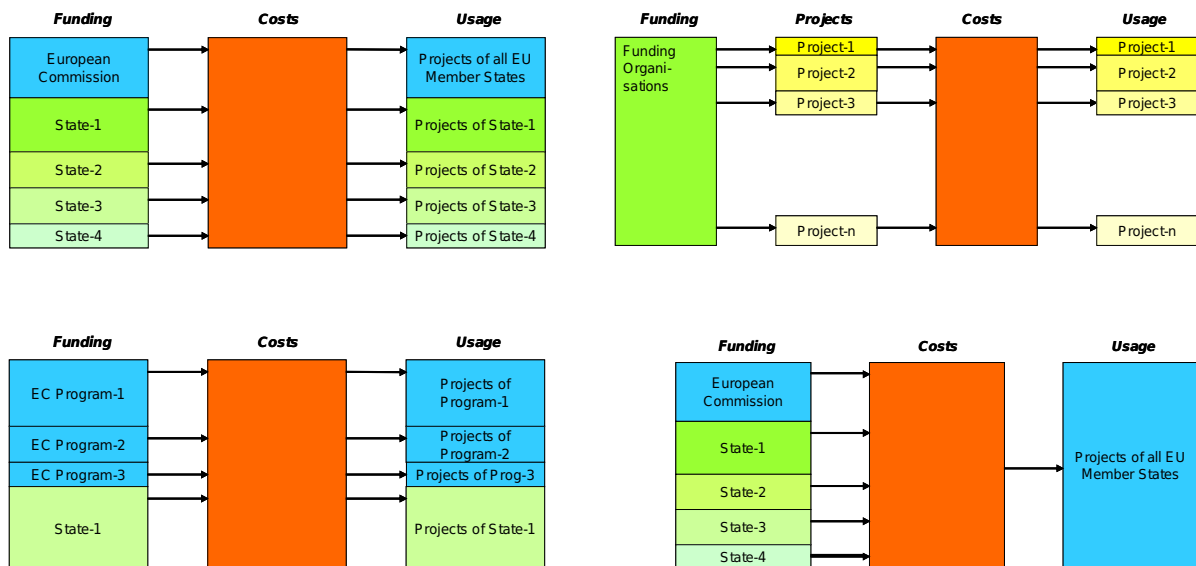


Figure 2 The figure depicts various funding scenarios, the participation model (upper left), characterised by resource utilization according to a member states contribution, the pay-by-use model (upper right), with project-wise funding, the research program model (lower left), where EC and member state research programs contribute to and use the resources, and the global model (lower right),