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ALICE Collaboration

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8.1 Computing Project responsibilities

The scope of the ALICE Computing Project is to provide the Collaboration with the framework, resources and software needed to extract the physics content from the data collected by the ALICE experiment and thus realize its physics potential and ultimate goal. The ALICE Computing Project is organized as shown in the chart of Fig. 8.1.

It has the ultimate responsibility for the coordination of the following activities, classified by responsibility:

1. Subdetector Software. This is the software for the simulation, reconstruction and analysis of the data coming from a subdetector and for its calibration and alignment. The responsibility for the development and maintenance of this software lies with the subdetector project.

2. Physics Analysis Software. This is the software that analyses the reconstructed data and extracts the physics results. The responsibility for this software rests with the Physics Working Groups organized by the Physics Board that is chaired by the Physics Coordinator.

3. Core computing

   (a) Core Software. This is the software that is common to all the subdetectors such as the transport Monte Carlo and the general framework for I/O, event processing, visualization, simulation, calibration, alignment and reconstruction. ALICE-specific services that interface with the Grid middleware belong to this category. Responsibility for this software rests with the Core Computing Project.

   (b) Infrastructure and Services. This includes the main areas:

      i. Central Support. Coordination, distribution and first line support of the ALICE software, coordination of data processing activities and the coordination of the ALICE Virtual Organization (VO) and distributed computing environment. It also covers relations with the LCG project.

      ii. Offline Coordination. Planning of the computing resources for the processing of ALICE data, management of relations with the computing centres and institutions providing these resources and with the LCG bodies that coordinate these resources.

   All these activities are a shared responsibility of the whole Collaboration, as they are services for all the ALICE physicists and are hosted by the Core Computing Project at CERN.

8.2 Computing Project organization

- The Computing Project (Fig. 8.2) is under the leadership of the Computing Coordinator, who is also the chair of the Computing Board..

- The Offline infrastructure is coordinated by the Offline Coordinator, who is also the chair of the Offline Board.

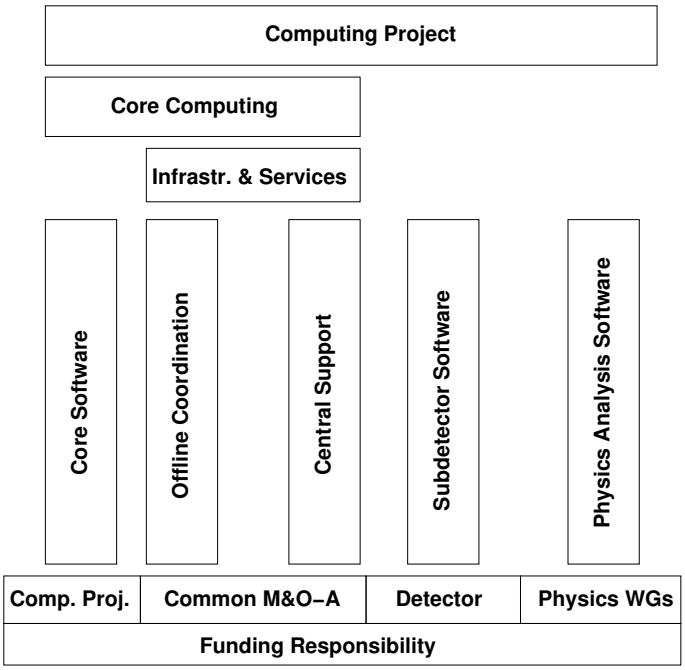

Figure 8.1: Organization of the ALICE Computing Project.

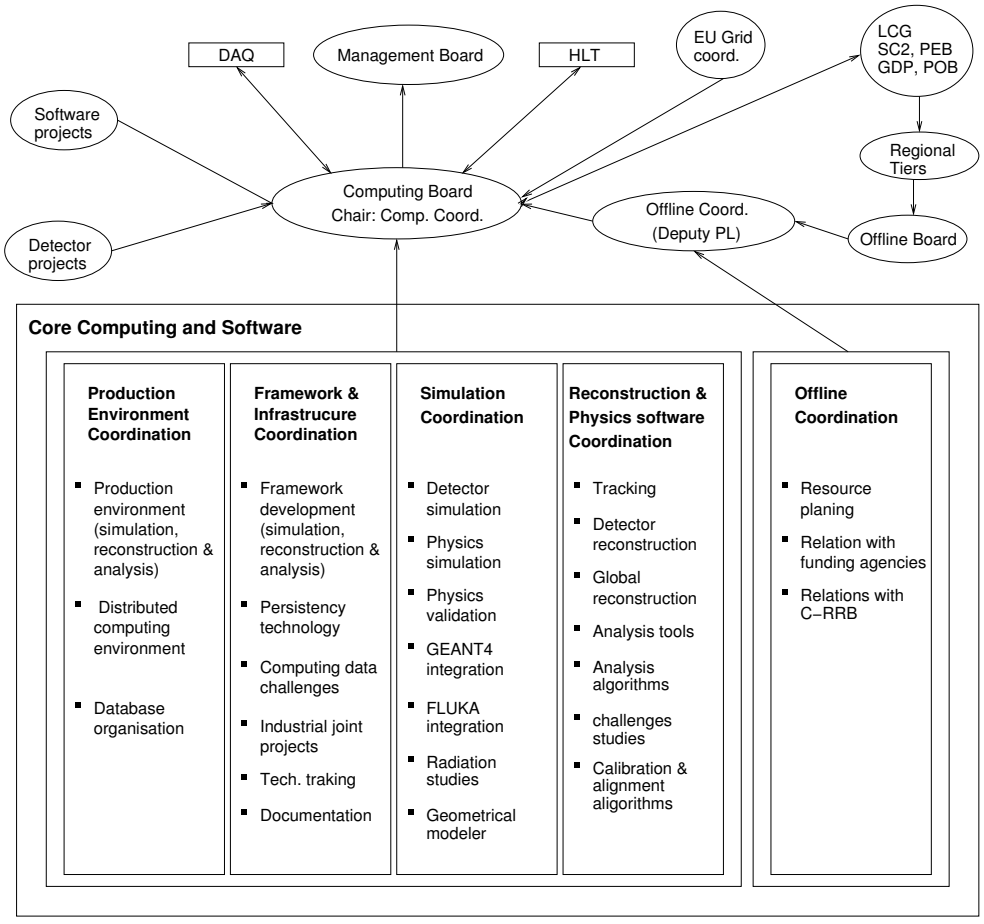

Figure 8.2: Organigramme of the Core Computing.

- Four Project Activity Area coordinators coordinate the software development: Simulation, Reconstruction and algorithms, Production Infrastructure and Databases, and Framework.
- Overall coordination for all project activities is realized through the Software and Computing Board (SCB) chaired by the Computing Coordinator and composed of the Offline Coordinator, the coordinators of the Computing Project Activity Areas, one or two representatives for each detector project, and one representative for major national computing facilities. The DAQ and HLT project leaders are ex officio members of the SCB.
- Coordination of the provision of the computing resources in collaborating institutions is performed via the Offline Board, chaired by the Offline Coordinator.
- Coordination with the ALICE Physics Working Groups is ensured through the ALICE Physics Coordinator.
- Representation within the ALICE Management is ensured through the Computing Coordinator being an ex officio member of the ALICE Management Board.
- The Computing and Offline coordinators ensure representation within the LCG project.

8.3 Organization of the Core Computing Project

The scope and responsibilities in the domain of Core Computing activity is described next.

1. Scope: The scope of the ALICE Core Computing Project (hereafter AC2) is defined as the development and maintenance of the experiment software framework and condition databases, the documentation and Web, the software infrastructure, visualization, and the production tools. It also includes ALICE software distribution and support, and its interfacing to the Grid and LCG software. Some areas of the project are shared with the ALICE DAQ and HLT project.
2. Responsibilities: The AC2 has the following responsibilities:
   (a) Design, prototyping, deployment, maintenance and documentation of the software framework.
   (b) Support for the possible central database services not provided by LCG.
   (c) First line support and distribution of all software produced. Detailed questions may need to be reported to the original authors or current maintainer of the software.
   (d) Development of a computing model and its validation in series of Physics and Computing Data Challenges. These are executed in collaboration with DAQ and HLT. These challenges imply organization and operation of large-scale testing of increasingly complex prototypes for the distributed production of simulated data, and the subsequent reconstruction and analysis of these data.
   (e) Implementation of the offline framework in the LCG Grid infrastructure and its interfacing with the LCG middleware.
   (f) Provision of continuously operational software enabling the physicists to assess the functionality of the framework toward the final goal of extracting physics from the data.
   (g) Liaison with the LCG project and with the regional centres providing the computing resources for ALICE.
   (h) Preparation of the ALICE Software and Computing TDR describing the ALICE Computing model.

(i) Review of the planned ALICE computing resource needs.

(j) Provide the Collaboration with the necessary justification of the present and planned computing needs to support negotiations with the funding agencies to obtain the computing resources.

(k) Preparation and update of the multiyear resource planning.

(l) Preparation and update of the multiyear manpower planning

(m) Review of the resources actually used by the Collaboration.

(n) Relations with the LCG management.

3. Project structure: ALICE has opted for a very lightweight AC2 team located mostly at CERN. The CERN team is constituted of a few personnel with long-term positions and a majority of personnel with short-term assignments. CERN and a few Collaboration institutes provide, on a voluntary basis, personnel for AC2, both locally and at CERN. CERN has taken the major responsibility for this activity, while well-identified sub-projects are executed either by institutes participating in the Computing Project having adequate skills (examples are the detector construction database project, the LCG integration, the Virtual Monte Carlo or the ALICE Web) or via collaboration with institutes not belonging to the Collaboration (e.g. for the coding rule checker project).

4. Project resources: The personnel for the Core Computing are people skilled in physics data processing and simulation, but also in areas such as OO analysis and design, C++ and other languages, databases and data management systems, computing systems, software process, quality control etc. In ALICE a large majority of these people are trained physicist.

8.4 Activities in the Core Computing Project

The complete activities in the ALICE Core Computing are described in task-oriented Activity Areas.

- **AA1**: Project (Computing & offline) coordination
- **AA2**: Framework development
- **AA3**: Simulation coordination
- **AA4**: Reconstruction coordination
- **AA5**: Analysis tools coordination
- **AA6**: Databases and production infrastructure
- **AA7**: Production and quality assurance
- **AA8**: Program librarian
- **AA9**: Persistency and computing data challenge
- **AA10**: System support
- **AA11**: Radiation studies
- **AA12**: Documentation and Web
- **AA13**: Detector construction database
- **AA14**: LCG integration

8.5 Institutes participating in the activities

The current institutes' participation in the Core Offline activities are listed in Table 8.1 together with their major contribution.

Table 8.1: List of institutes participating in the Core Offline activities and their major contribution.

Institute	Activity area	Main responsibility
CERN	AA1,2,3,4,5,6,7,8,9,10,12	Overall project coordination
		Core software as defined above
CEADEN Cuba	AA2,12	Interface with detector simulation transport programs;
		Maintenance of the Web site
INFN Torino	AA14	Integration of ALICE software with LCG Grid
IN2P3	AA1,3	Overall project coordination,
		GEANT 4 integration
Kosice, Slovakia	AA11	Radiation studies
Warsaw TU	AA6,13	Detector construction DB
Sejong, Korea	AA7	Grid middleware and production support

8.6 Milestones

The major milestones (MS) of the Computing Project are those linked with the execution of the two remaining Physics Data Challenges (PDCs) until the start of data taking in the first semester of 2007.

- **MS1–May 2005**: PDC05 – Start of event production (phase 1)

  PDC05 will use all resources available on the Grid and access them through the LCG middleware and the AliEn services.

- **MS2–June 2005**: AliRoot framework release.

  The framework will include the following items:

  - a prototype for the Condition infrastructure;
  - the FLUKA interface to the Virtual Monte Carlo and FLUKA fully validated to be used as the main tracking package;
  - the ROOT Geometrical Modeller as unique package for the detector geometry description.

- **MS3–June 2005**: Computing TDR (the present document) submitted to the LHCC.

- **MS4–July 2005**: PDC05 – Start of combined test with SC3 (phase 2).

  Phase 2 of PDC05 (see Chapter 3) is started together with the throughput test of the LCG Service Challenge 3 (SC3). In case SC3 is delayed, the PDC05 phase 2 schedule will not be modified.

- **MS5–September 2005**: PDC05 – Start of distributed analysis (phase 3).

  Phase 3 of PDC05 (see Chapter 3) is combined with the services test of LCG SC3. It includes the AliEn services and gShell, the ALICE user interface to the AliEn services.

- **MS6–September 2005**: Metadata prototype ready.

- **MS7–December 2005**: Condition infrastructure deployed.

- **MS8–December 2005**: Preliminary implementation of algorithms for alignment and calibration ready for all detectors.
- **MS9–January 2006**: Release of AliRoot framework in preparation of the PDC06. Final prototype of alignment and calibration ready to be tested. Alignment and calibration algorithms prepared for all detectors. Global alignment and inter-calibration of the detectors at the prototype stage.
- **MS10–January 2006**: Start of PDC06. Test of the full production chain, including calibration and alignment. Size approximately equal to 20% of the real data of a standard data-taking year. Distributed batch analysis of the data. Evalation of the distributed interactive analysis framework.
- **MS11–June 2006**: End of PDC06. Evaluation of the data challenge results. Planning of most urgent activities for next year.
- **MS12–June 2006**: Final implementation of algorithms for alignment and calibration ready for all detectors. This includes inter-calibration and alignment algorithms.
- **MS13–December 2006**: ALICE computing environment ready for data taking.

References

Chapter 8

[1] LHC Computing Review, CERN/LHCC/2001-004.