

The Software and Computing Committee (SC2)

in the LHC Computing Grid Project

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LHC Computing Grid Project

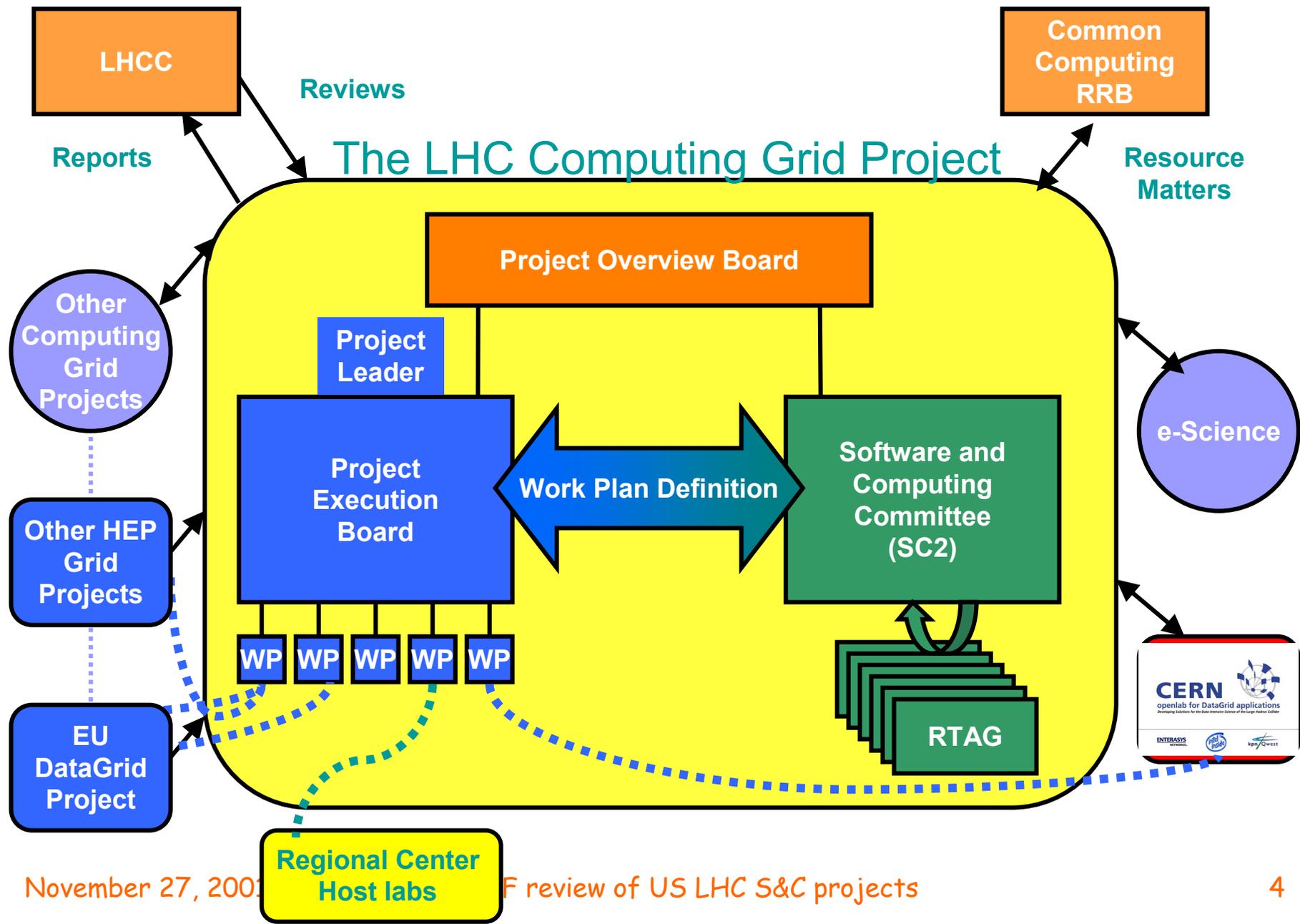
- Following recommendations of the **LHC Computing Review** in 2000 CERN proposes the LHC Computing Grid Project
- It involves a two-phased approach to the problem, covering the years 2001 to 2007:
 - ◆ **Phase 1: Development and prototyping** at CERN and Non Member States from 2001 to 2004, requiring significant manpower and some investment. A prototype at CERN and other sites will be developed for the data analysis. **Member States expert production as a platform**
 - ◆ The experience gained from this phase will allow the elaboration of a **Design Report**, which will serve as a basis for agreeing on the conditions between the distributed Grid nodes and their co-ordinated deployment and exploitation.
 - ◆ **Phase 2: Installation and operation** of the full world-wide initial production Grid system in the years 2005 to 2007, requiring continued manpower efforts and substantial material resources.
- Milestones and activities can be defined precisely for the immediately following years, becoming progressively less certain for the more distant future

**APPROVED by Council,
September 20, 2001**

Formal Project Structure

- A formal project structure will ensure the achievement of the required functionality and performance of the overall system with an efficient use of the allocated resources.
- Participation in the project structure by the LHC experiments and the emerging regional centres will ensure the formulation of a work plan addressing the fundamental needs of the LHC experimental programme.
- The formulation of the work plan as a set of work packages, schedules and milestones will facilitate contributions by collaborating institutes and by pre-existing projects, in particular the EU DataGrid and other Grid projects.
- Appropriate liaisons with these pre-existing projects as well as with industry will be put in place to promote efficient use of resources, avoid duplication of work and preserve possibilities for technology transfer.
- Leadership provided by CERN would have a clear executive role in the CERN developments and in the provision of the application infrastructure, and would provide co-ordination for the prototyping and development of the Regional Centres.

The LHC Computing Grid Project Structure



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Project Overview Board

Chair: CERN Director for Scientific Computing
Secretary: CERN Information Technology Division Leader

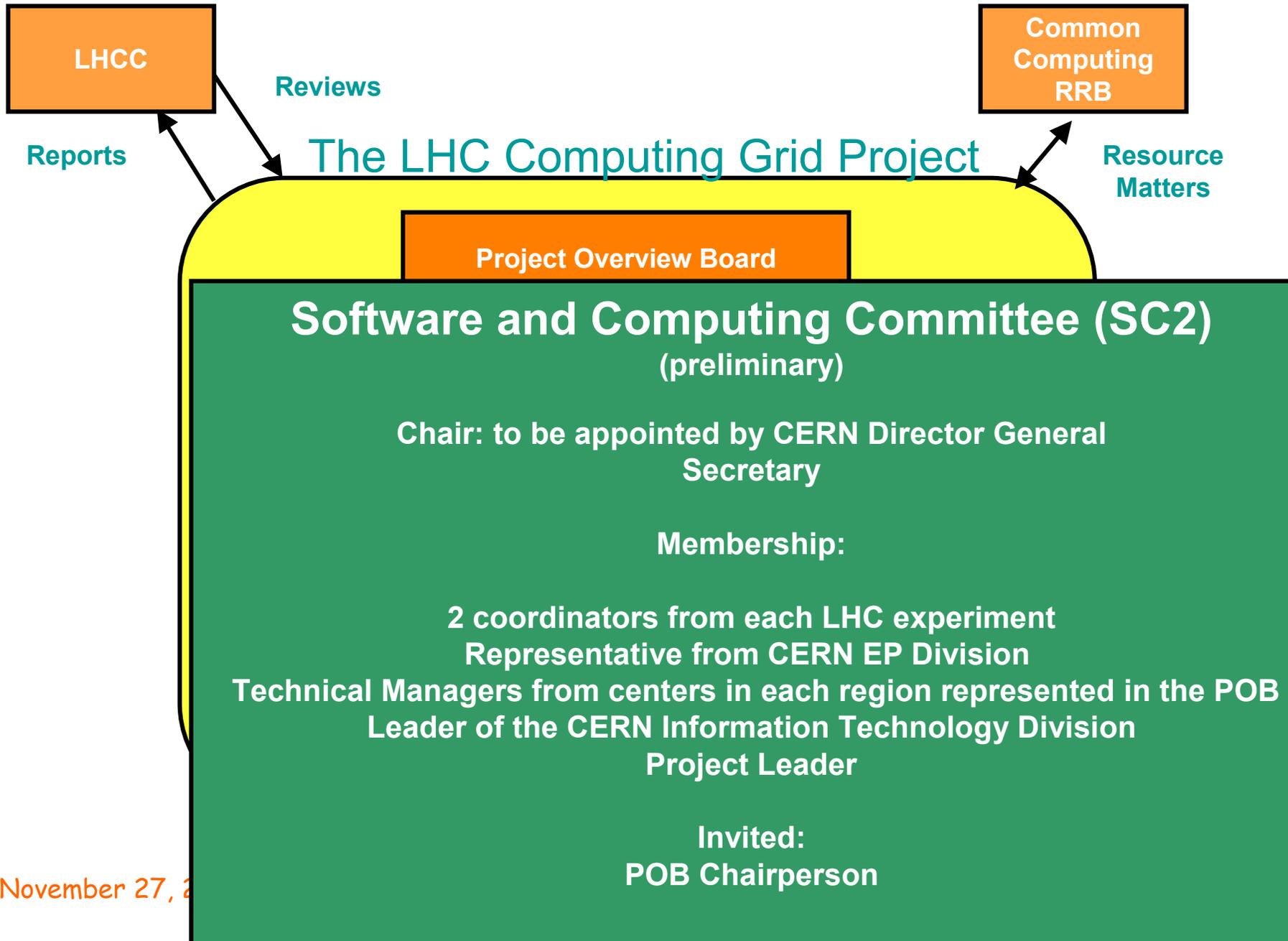
Membership:
Spokespersons of LHC experiments
CERN Director for Colliders

Representatives of countries/regions with Tier-1 center :
France, Germany, Italy, Japan, United Kingdom, United States of America

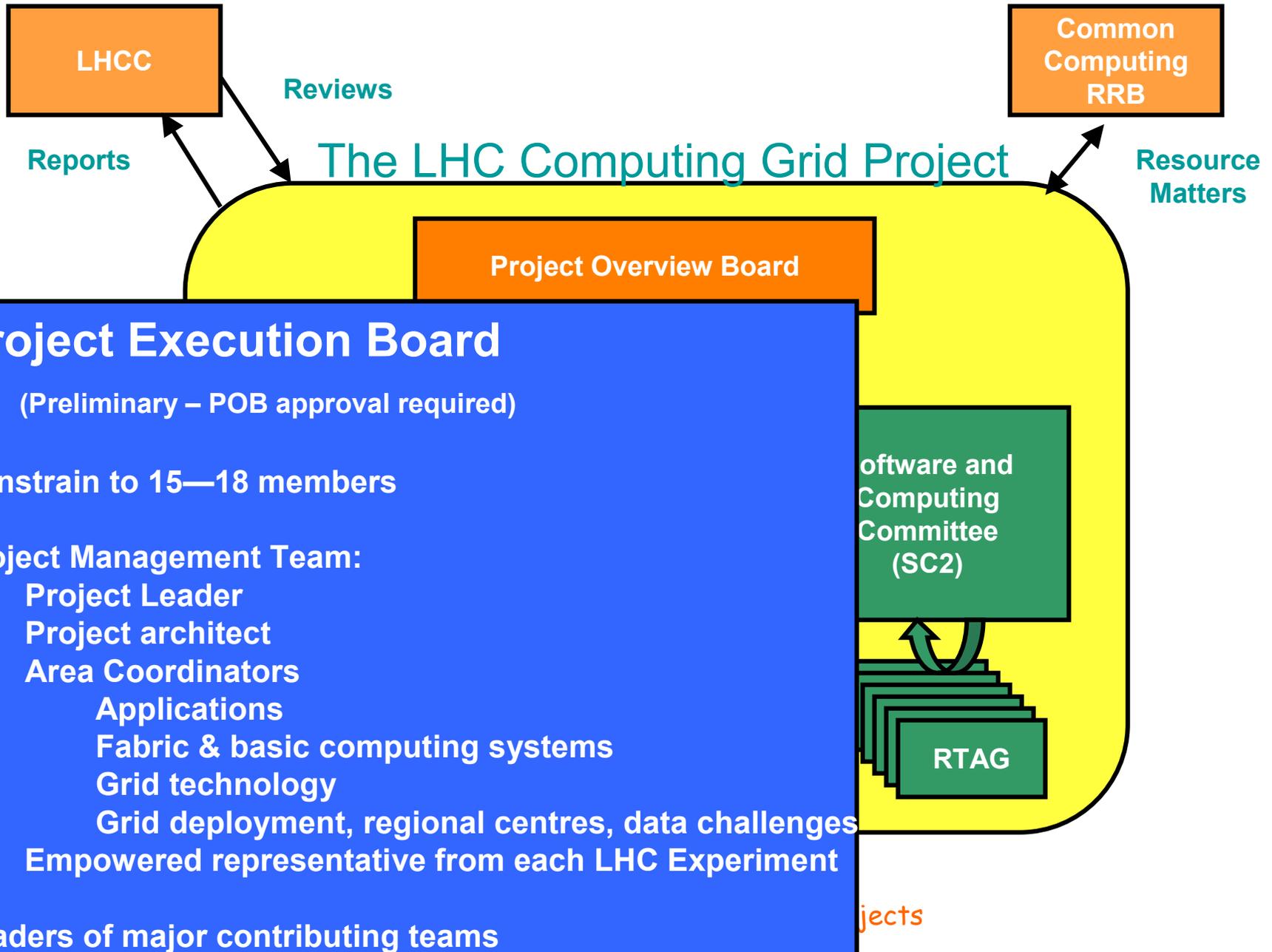
4 Representatives of countries/regions with Tier-2 center
from CERN Member States

In attendance:
Project Leader
SC2 Chairperson

The LHC Computing Grid Project Structure



The LHC Computing Grid Project Structure



The projects requires Collaboration

- The CERN activity is part of the wider programme of work that must be undertaken as a close collaboration between
 - ◆ CERN
 - ◆ Regional Centres
 - ◆ institutes participating in the experiments
 - ◆ Grid projects
- Scope: to develop, test and build the full LHC Computing Grid.
- Once the project has begun and both CERN and the Regional Centres have completed more detailed plans, it may be appropriate to change the balance of the investment and activities made at CERN and in other centres.
- This balance should be reviewed at regular intervals during the life of the project.

Phase 1: High Level Goals

- Provide a common infrastructure that LHC experimentalists can use to develop and run their applications efficiently on a grid of computing fabrics.
- Execute successfully a series of data challenges satisfying the requirements of the experiments.
- Provide methodologies, technical guidelines and costing models for building the high-throughput data-intensive computing fabrics and grids that will be required for Phase 2 of the project.
- Validate the methodologies, guidelines and models by building a series of prototypes of the Tier 0 and distributed Tier 1 facility of increasing capacity and complexity, demonstrating the operation as an integrated Grid computing system with the required levels of reliability and performance.
- Provide models that can be used by various institutions to build the remaining part of the tiered model (Tier-2 and below).
- Maintain reasonable opportunities for the re-use of the results of the project in other fields, particularly in science.
- Produce a Technical Design Report for the LHC Computing Grid to be built in Phase 2 of the project.

Project Scope: Phase 1 (-2004)

- Build a prototype of the LHC Computing Grid, with capacity and performance satisfying the needs of the forthcoming data challenges of the LHC experiments:
 - ◆ Develop the system software, middleware and expertise required to manage very large-scale computing fabrics to be located at various locations.
 - ◆ Develop the grid middleware to organise the interaction between such computing fabrics installed at geographically remote locations, creating a single coherent computing environment.
 - ◆ Acquire experience with high-speed wide-area network and data management technologies, developing appropriate tools to achieve required levels of performance and reliability for migration, replication and caching of large data collections between computing fabrics.

Project Scope: Phase 1 (-2004)

- ◆ Develop a detailed model for distributed data analysis for LHC, refining previous work by the MONARC collaboration and the LHC Computing Review, providing detailed estimates of data access patterns to enable realistic modelling and prototyping of the complex grid environment.
- ◆ Adapt LHC applications to exploit the fabric and grid environment.
- ◆ Progressively deploy at CERN and in a number of future Tier 1 and Tier 2 centres a half-scale (for a single LHC experiment) prototype of the LHC Computing Grid, demonstrating the required functionality, usability, performance and production-quality reliability.
- ◆ Define the characteristics of the initial full production facility, including the CERN Tier 0 centre, the Tier 1 environment distributed across CERN and the Regional Centres, and the integration with the Tier 2 installations

Project Scope: Phase 1 (-2004)

- Complete the development of the first versions of the **physics application software** and enable these for the distributed computing grid model:
 - ◆ Develop and support common libraries, tools and frameworks to support the development of the application software, particularly in the areas of simulation and analysis.
 - ◆ In parallel with this, the LHC collaborations must develop and deploy the first versions of their core software.

Project Scope: Phase 1 (-2004)

- This work will be carried out in a close collaboration between CERN, Tier 1 and Tier 2 centers, and the LHC Collaborations and their participating institutes.
- It is assumed that for Phase 1 the national funding agencies in the Member States and non-Member States will ensure the construction of the prototype Tier 1 and Tier 2 centers and their share of the distributed computing infrastructure.
- It is further assumed that the experimental collaborations will ensure the software requirements

Project Scope: Phase 2 (2005-7)

- Construct the initial full production version of the LHC Computing Grid (2005-2007) according to the experience gained in the years of prototyping.
 - ◆ The resources required are still not known to a sufficient degree of precision but will be defined as part of the Phase 1 activity.
 - ◆ A specific proposal for Phase 2 will be prepared during 2003, in line with the Computing Technical Design Reports of the LHC experiments.
- Regular later updates (after 2007) of the LHC Computing Grid should be foreseen according to the accumulation of data and the evolving needs of the experiments.

SC2: Roles

- The SC2 sets the REQUIREMENTS for the project
- The project team, in consultation with the SC2, takes the requirements and CREATES a Work Plan, identifying the high-level activities with associated goals and milestones.
- The SC2 APPROVES the high-level Work Plan
- The SC2 MONITORS the project:
 - ◆ It received regular status reports
 - ◆ It organizes 'peer reviews'

SC2: Members

- Chair: to be appointed by D.G.
- Secretary
- Representatives from regional centers
- CERN EP Representative
- CERN IT Leader
- Project Leader
- Proposed:
 - ◆ Grid projects representation
- Invited: POB Chairperson
- Nominated by experiments:
 - ◆ ALICE:
 - ◆ Federico Carminati
 - ◆ Wisla Carena
 - ◆ ATLAS:
 - ◆ Norman McCubbin
 - ◆ Gilbert Poulard
 - ◆ CMS:
 - ◆ Paolo Capiluppi
 - ◆ David Stickland
 - ◆ LHCb:
 - ◆ Nick Brook
 - ◆ John Harvey

SC2: Next Steps

- Finalize membership:
 - ◆ Need to get regional centres representation
 - ✦ should have solid technical background relevant for regional center implementation, operation and Grid software deployment
 - ✦ Representatives of countries/regions with Tier-1 centers (France, Germany, Italy, Japan, UK, US)
 - I believe it would be beneficial to get 2 US representatives
 - ✦ 4 representatives of countries with Tier-2 centers from 'CERN member states'
 - ◆ Propose: get representation covering major Grid projects
- First pre-SC2 meeting scheduled for December 7
 - ◆ Start organizing the work, Rtag's
- Early next year: Launching Workshop for all those doing the work (later ~one "LHC Computing Grid" week/year?)