



# LHC Computing Grid Project – LCG

*Review November 2003*

*Future Challenges*

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# Where we are

- We have seen that progress is being made, but slowly
  - Many complex problems remain in the grid technology area
    - Not much experience of the reliability of "grid systems".
    - Scalability is still an issue.
    - Manageability is still an issue.
  - In our problem domain many issues still exist
    - Configuration management.
    - Security and VO management.
    - Data management.
  - Much experience yet to be gained
    - Job throughput and splitting.
    - Efficient scheduling and matching.
    - Chaotic workloads.

Many others too ... seems clear we are at the very beginning of a very long process of technology development and evolution.



# Networking

- Effective use of underlying network infrastructures still need much further work.
  - New EU proposals address some issues of middleware interaction (GRANDE).
  - New projects (\*light) aim to create high speed (10Gbit) network infrastructures.
  - New protocol stack implementations required to exploit WAN of high latency.
    - Moving us towards an underlying circuit switched special purpose network in addition to a general purpose packet switch network.



# Medium term opportunities

## ■ 2003

- Until now we have envisaged complex schemes and functionality.
- Existing middleware is generally overly complex and under developed.
- Politics and Marketing is both providing and consuming tremendous effort.

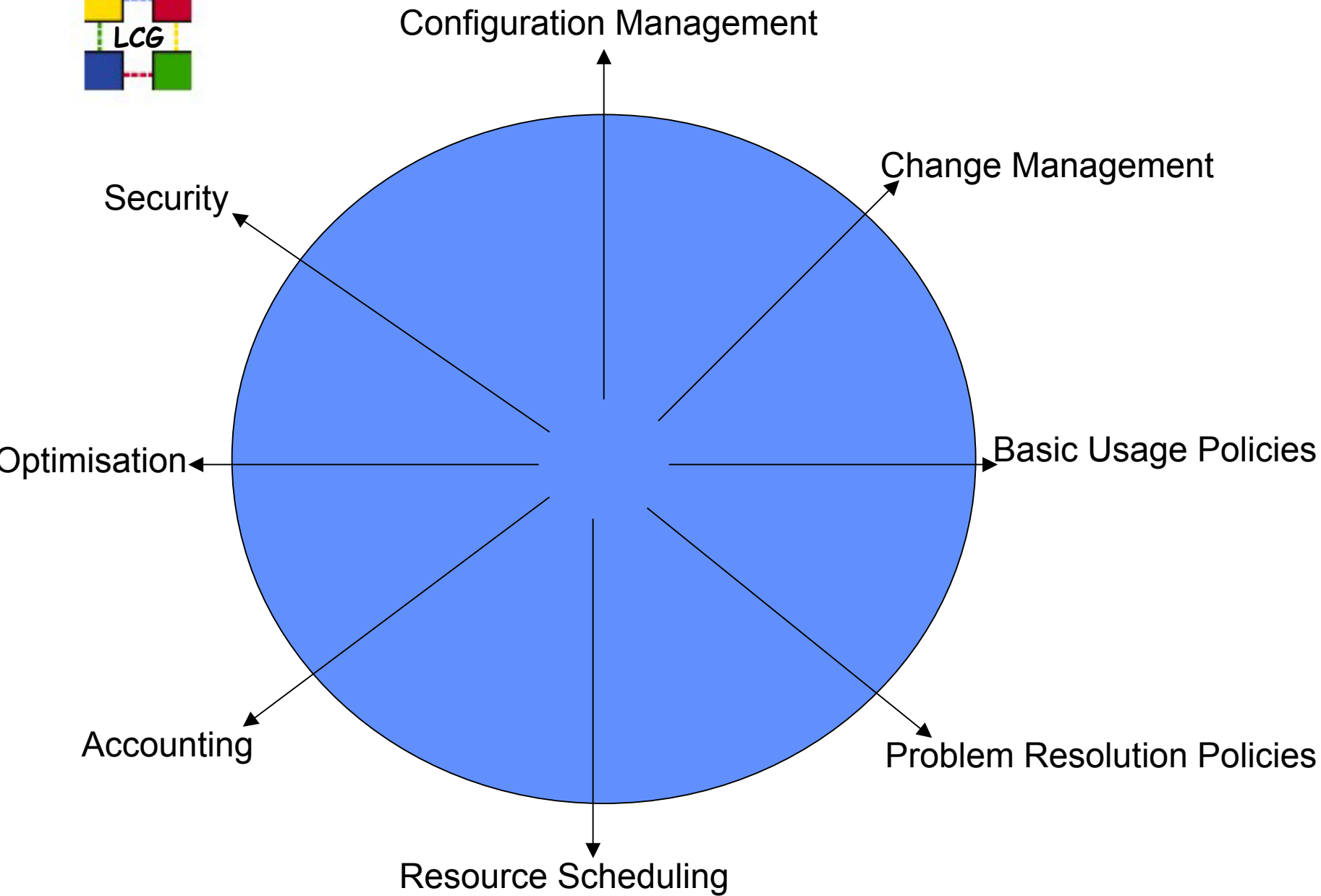
## ■ 2004

- LCG-1 and LCG-2 will continue to be developed and reach a level of operational stability.
- A service based approach (ARDA) will be developed and will need to be proven as a strategic direction.
  - **Milestones in March, June and October?**
- Industry activity likely to grow slowly
- Relationship of LCG/EGEE to US HEP activities critical to overall success
  - **The role of Globus will depend on how effectively they can deal with the known problems.**
- Should be able to start pilot projects on high speed WAN connectivity between a number of large centers for bulk data transfer.

## ■ 2005

- We need to be cleaning up the details of the LHC computing solution.

# The Big .... Vision?





# Conclusions

- Existing plans and planning assume a deterministic path to success but grid technologies are far from this at present...
- Main middleware risks are lack of delivery of an effective middleware package due to:
  - Over ambition, complexity and too short timescales
  - "Mythical Man Month" problems.
  - Complex dependencies between projects.
- **Managing complexity is the major challenge**
  - Need an incremental plan
    - MSS to MSS copy across the wide area.
    - Local data access from worker nodes.
    - Simple job submission and control.
    - Excellent configuration management and deployment tools
- We look forward to EGEE using its resources to move to the next phase in the LHC grid system (Analysis) but we have not yet mastered the existing phase (Production) fully.
  - It is a very hard problem and aggressive simplification is needed.
  - Rapid development cycles and deployment of software.

