Massive Ray Tracing in Fusion Plasmas on EGEE

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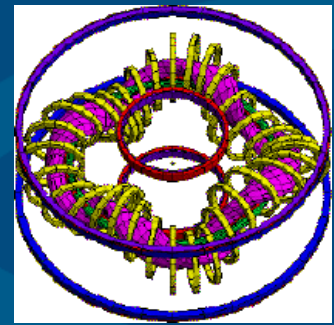**(1) Universidad Complutense de Madrid (Spain)**
(2) Centro de Astrobiología (Spain)

What are we going to see?

MA-RA-TRA: a computational view

Using the LCG-2 Infrastructure

What if... GridWay?

Comparison

Conclusions

Our two cents

MA-RA-TRA: a computational view

MA-RA-TRA: "Massive Ray Tracing" in Fusion Plasmas

Application profile:

- Sizes

  Executable (Truba) – 1.8 MB

  Input files – 70 KB

  Output files – about 459 KB

- Execution Time – about 26 minutes

  Pentium 4 (3.2 GHz)

- 1 execution = 1 ray traced

lcg2.1.9 User Interface C++ API

1 job = 1 ray

Procedure:

- Launcher script

  Generates JDL files
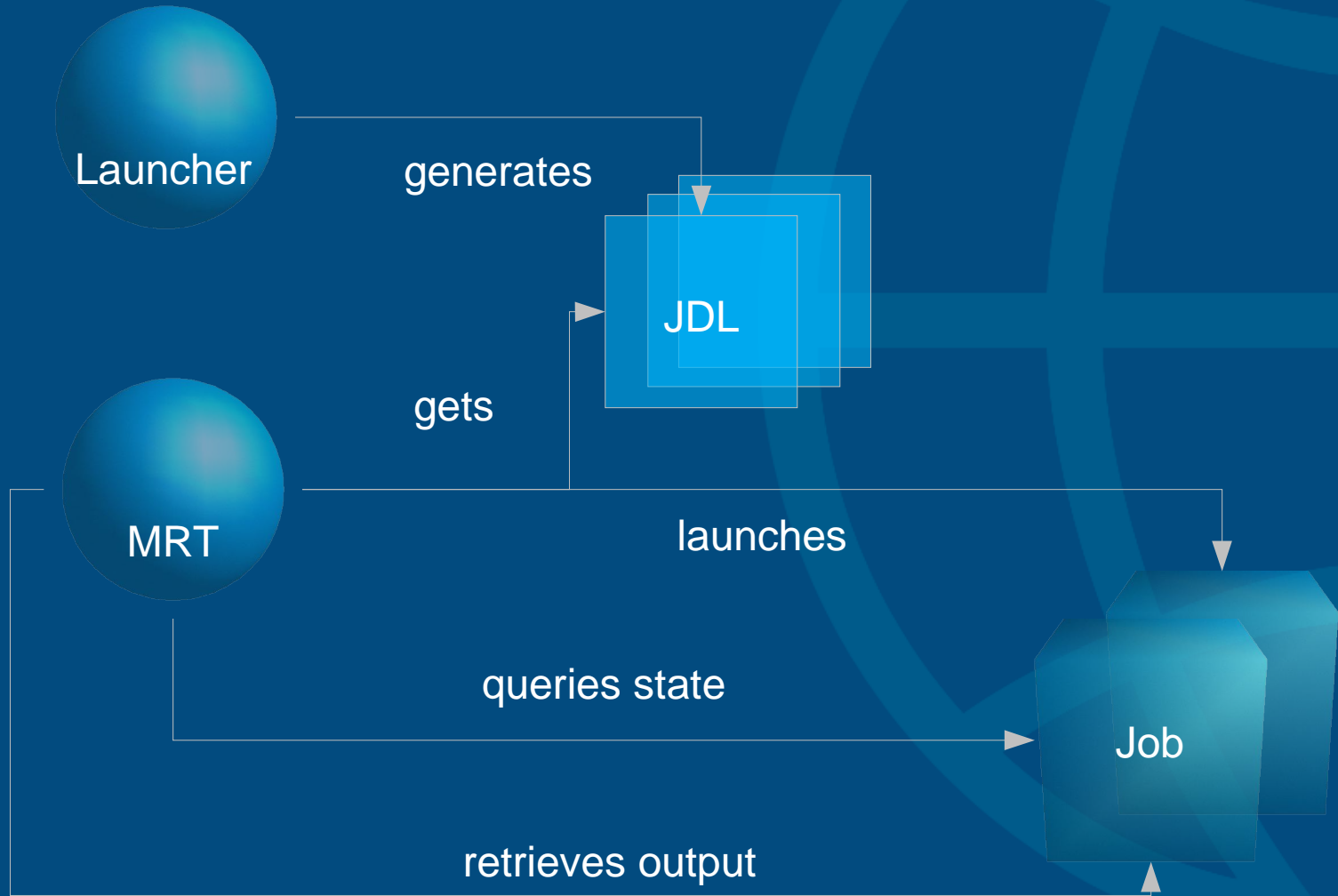
- MRT framework

  Launches them simultaneously

  Queries each job's state periodically

  Retrieves each job's output (Sandbox)

Using the LCG-2 Infrastructure (2)

Launcher

generates

JDL

gets

MRT

launches

queries state

Job

retrieves output

Using the LCG-2 Infrastructure (3)

SWETEST VO

Sites involved in the experiments:

- CESGA (46 x Intel Pentium III 1133 MHz)
- IFIC (127 x AMD Athlon 1.2 GHz)
- PIC (172 x Intel Pentium 4 2.8 GHz)
- IFAE (11 x Intel Pentium 4 2.8 GHz)
- LIP (25 x Intel Xeon 2.8 Ghz)

Spanish sites conected by RedIRIS

- 622 Mbps to 2.5 Gbps

Using the LCG-2 Infrastructure (4)

Total Time: 220 minutes (3.67 hours)

Execution Time:

- Average: 30.33 minutes
- Std. Deviation: 11.38 minutes

Transfer Time:

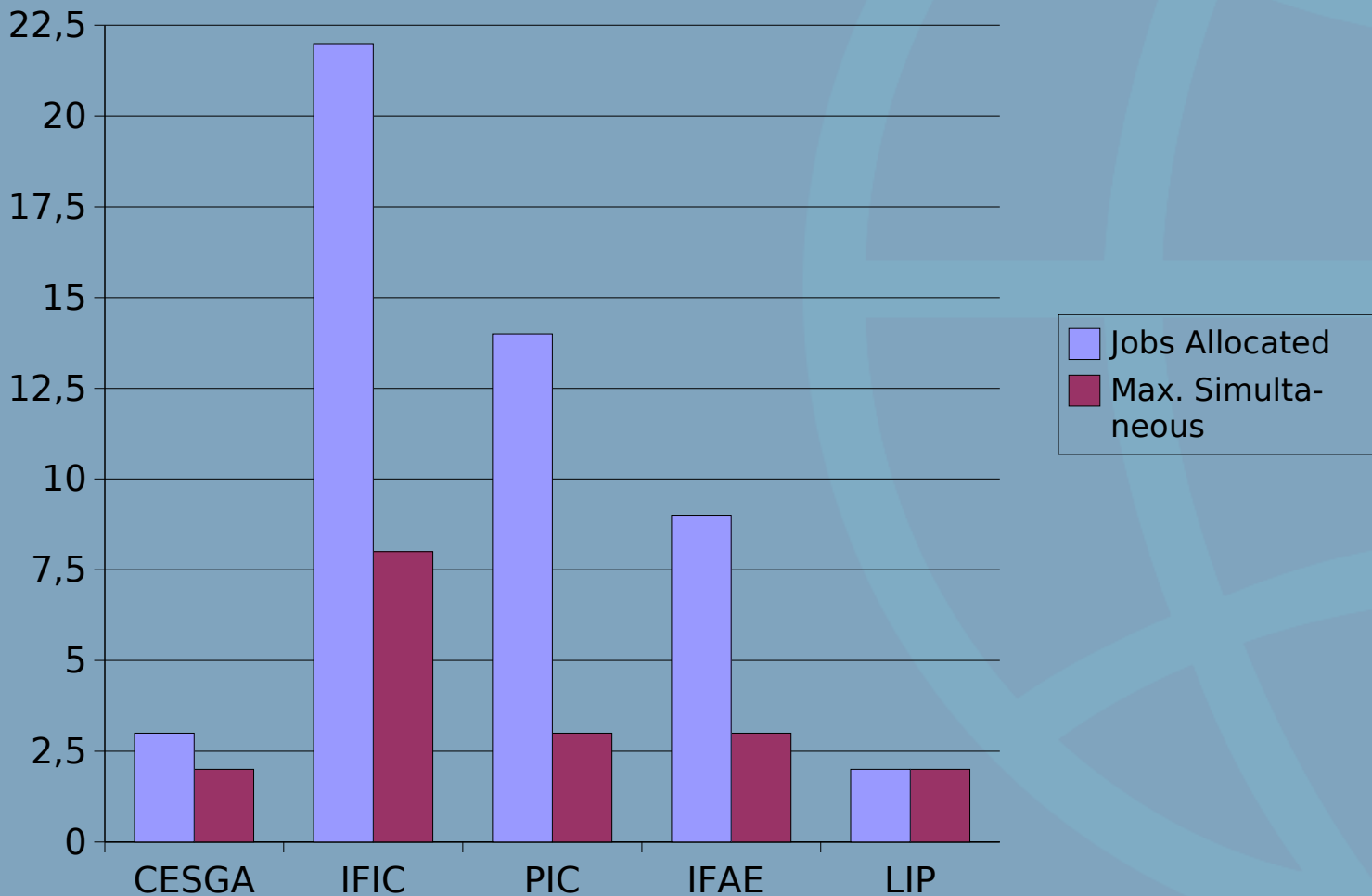- Average: 0.42 minutes
- Std. Deviation: 0.06 minutes

Avg. Productivity: 13.36 Jobs/hour

Avg. Overhead: 90.99 minutes/job

Jobs Allocated (LCG-2)

As in the real world, some jobs failed

– Jobs affected: 31

– Max resubmissions/job: 1

Problems encountered:

– LCG-2 Infrastructure:

    Lack of opportunistic migration

    Lack of fault tolerance mechanisms

– The API itself:

    Submitting more than 80 jobs in a Collection

What if... GridWay? (1)

www.gridway.org

Light-weight framework

Works on top of Globus services

Performs:

– Job execution management

– Resource brokering

Allows unattended, reliable and efficient execution of:

– single jobs, array jobs, complex jobs

– on heterogeneous, dynamic and loosely-coupled grids

What if... GridWay? (2)

www.gridway.org

Works transparently to the end user

Adapts job execution to changing Grid conditions

- Fault recovery

- Dynamic scheduling

- Migration on-request

Scheduling using Information System (GLUE schema) from LCG-2

Stands on the client side

Execution as seen by GridWay:

- Prolog: prepares remote system

    Creates directory

    Transfers input files and executable

- Wrapper: executes job and gets exit code

- Epilog: finalizes remote system

    Transfers output files

    Cleans up directory

www.gridway.org
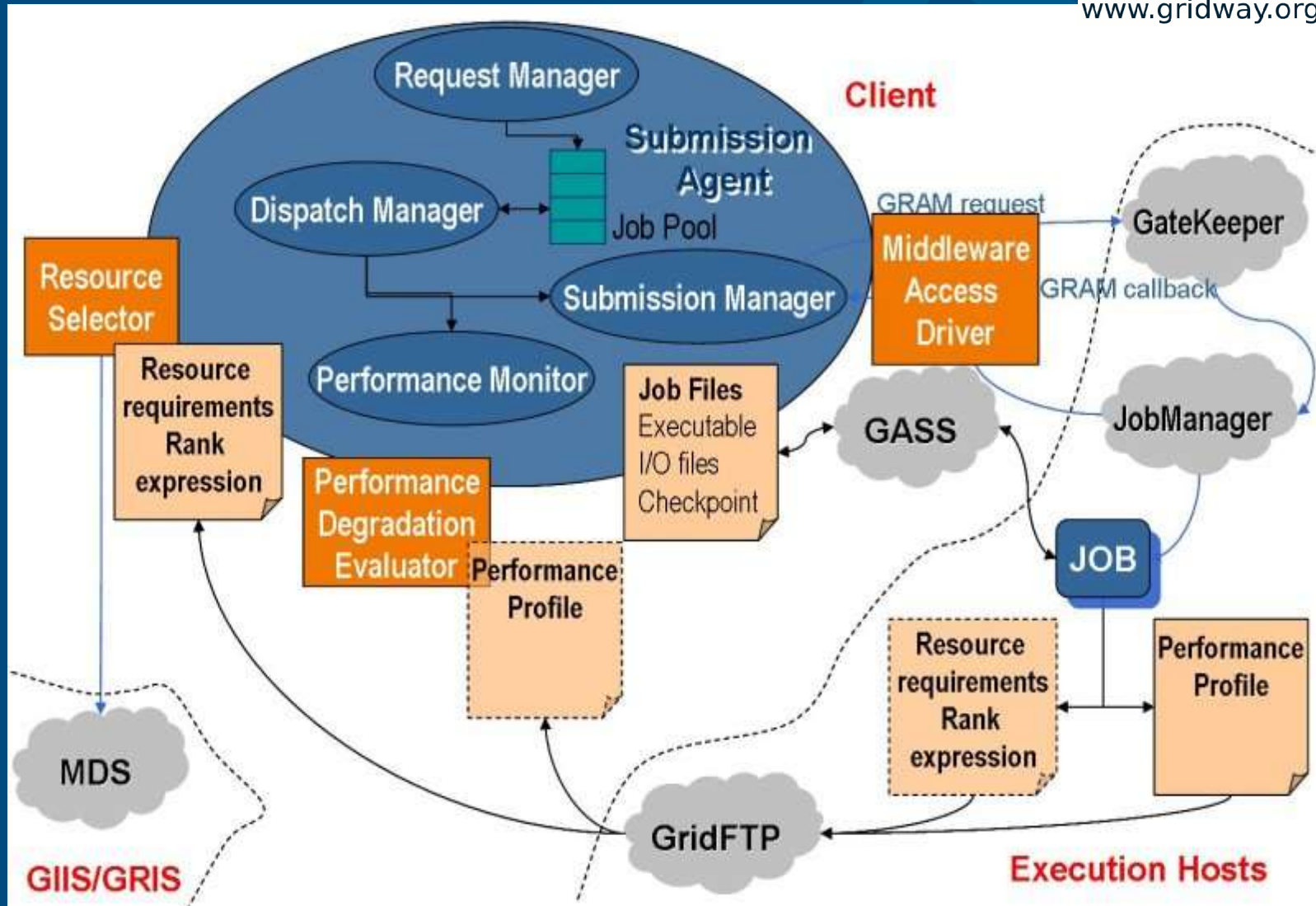
www.gridway.org

SWETEST VO

Sites involved in the experiments:

– CESGA (46 x Intel Pentium III 1133 MHz)

– IFIC (127 x AMD Athlon 1.2 GHz)

– INTA-CAB (4 x Intel Pentium 4 2.8 GHz)

– IFAE (11 x Intel Pentium 4 2.8 Ghz)

– USC (100 x Intel Pentium III 1133 Mhz)

Spanish sites conected by RedIRIS

– 622 Mbps to 2.5 Gbps

www.gridway.org

Total Time: 123.43 minutes (2.06 hours)

Execution Time:

– Average: 36.8 minutes

– Std. Deviation: 16.23 minutes

Transfer Time:

– Average: 0.87 minutes

– Std. Deviation: 0.51 minutes

Avg. Productivity: 23.82 Jobs/hour

Avg. Overhead: 25.99 minutes/job

What if... GridWay? (7)

www.gridway.org
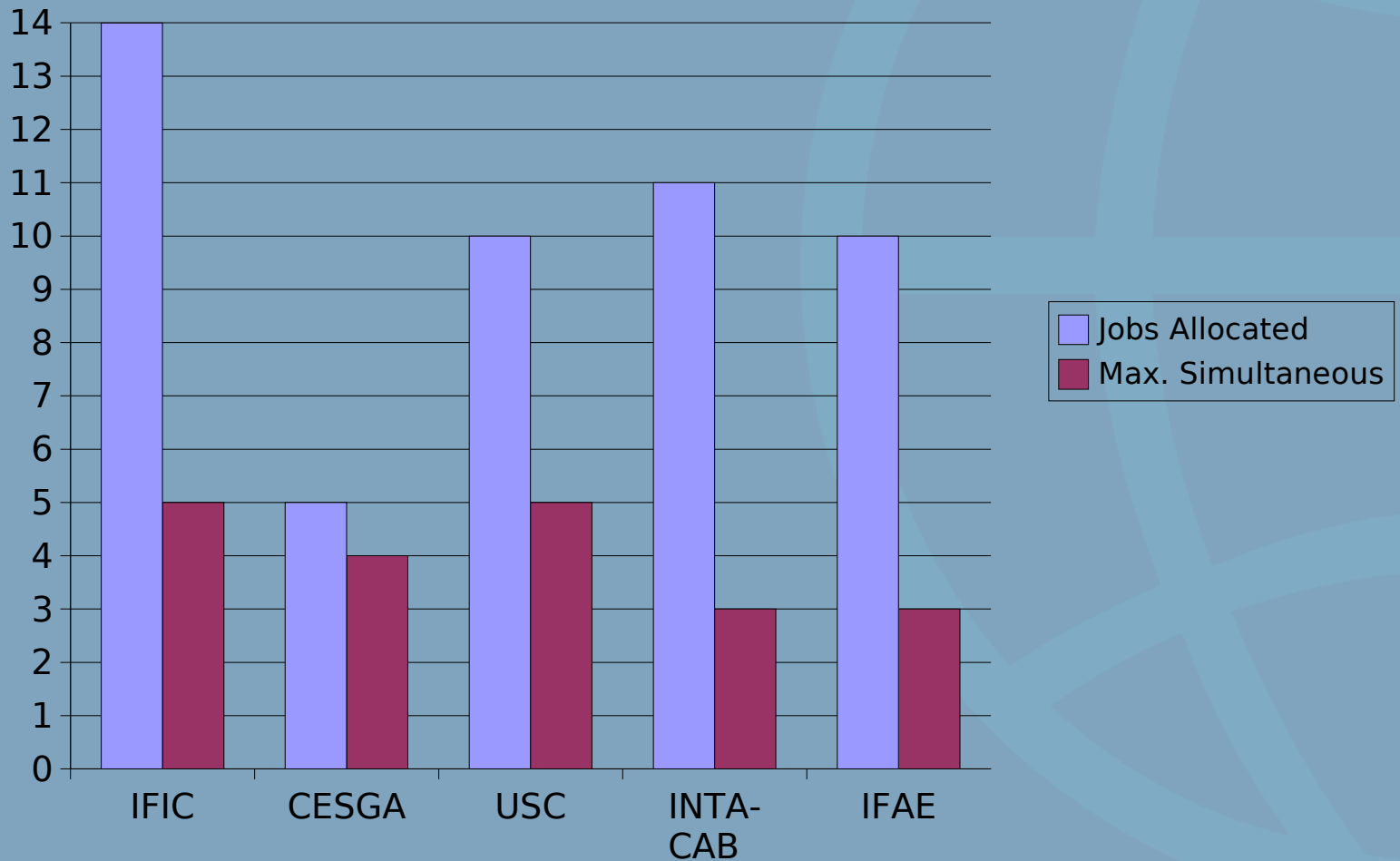
Also with GridWay, some jobs failed

– Jobs affected: 9

– Total reschedules: 22
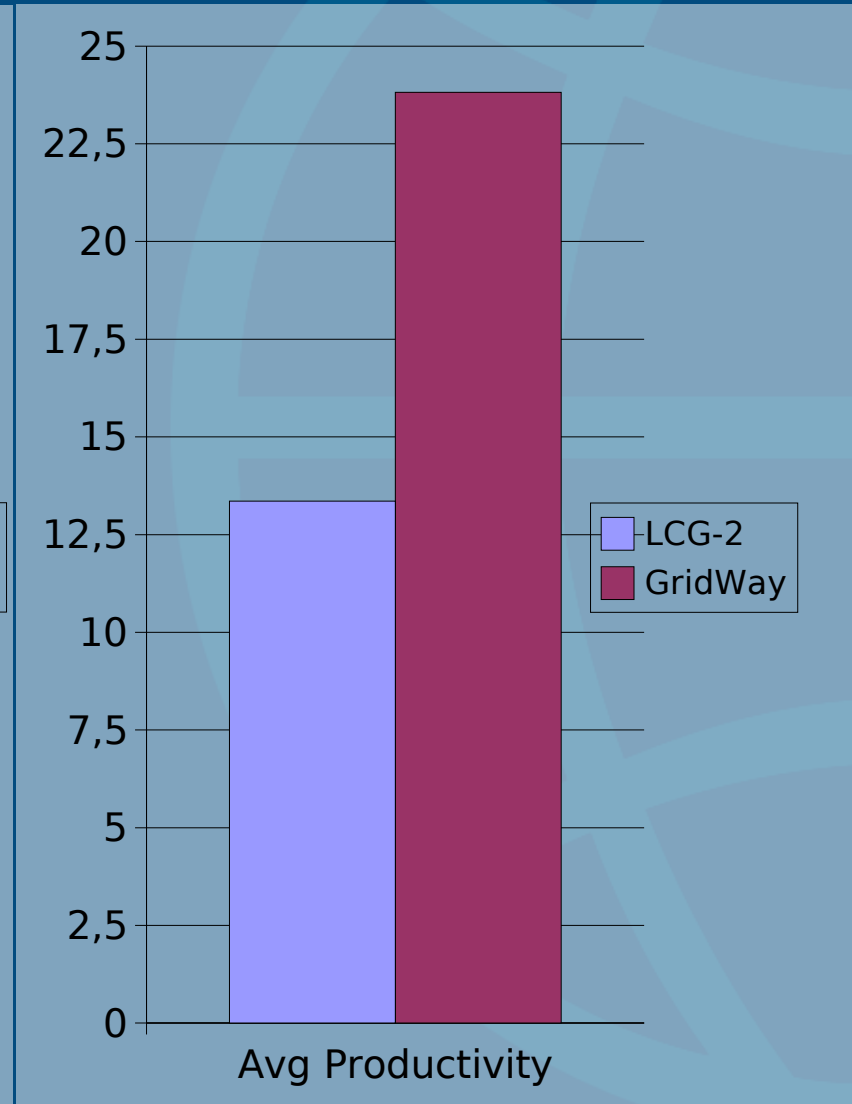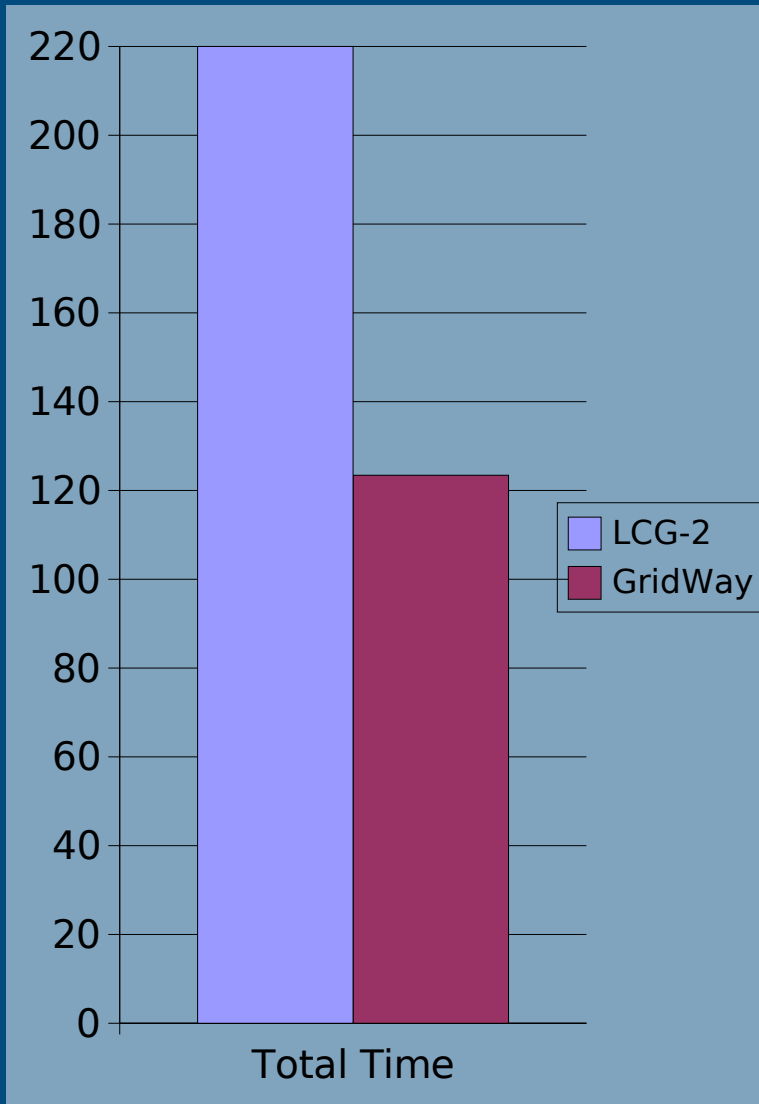
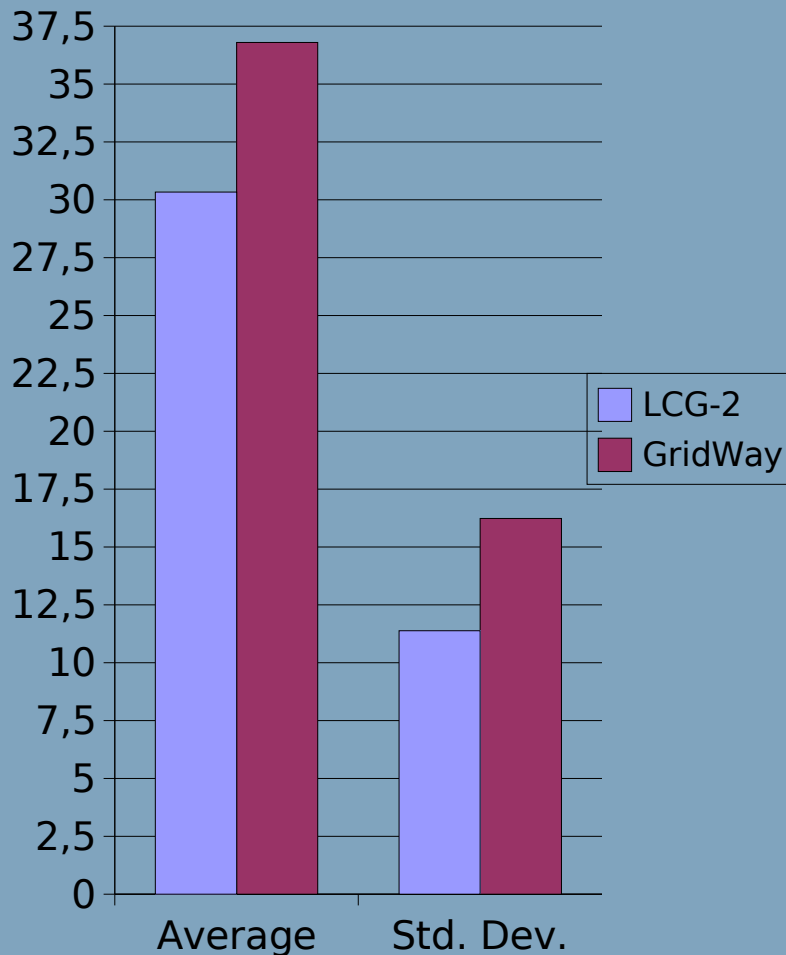– Max. reschedules/job: 4

GridWay Resched Reasons

Exec (CAB-INTA)
Suspension (IFAE)
Migration
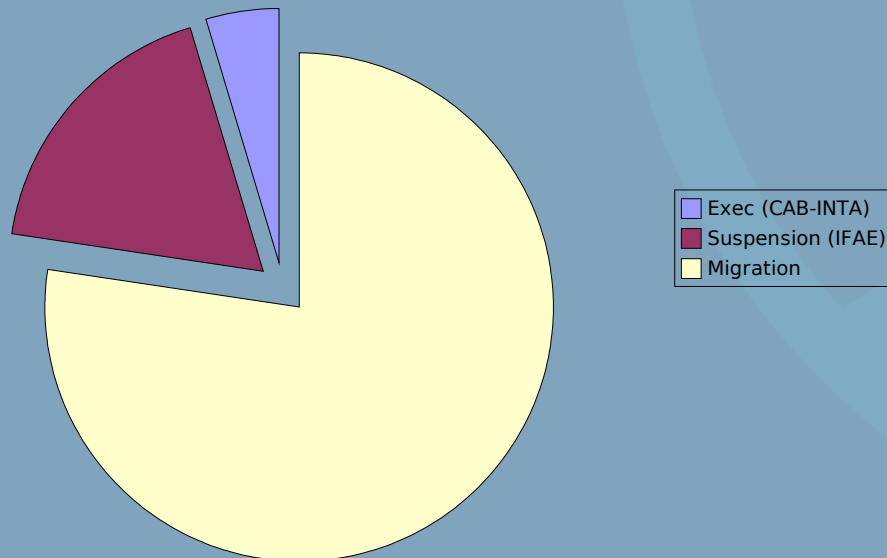
Comparison

Comparison

Execution Time and Transfer Time bar charts comparing LCG-2 and GridWay.
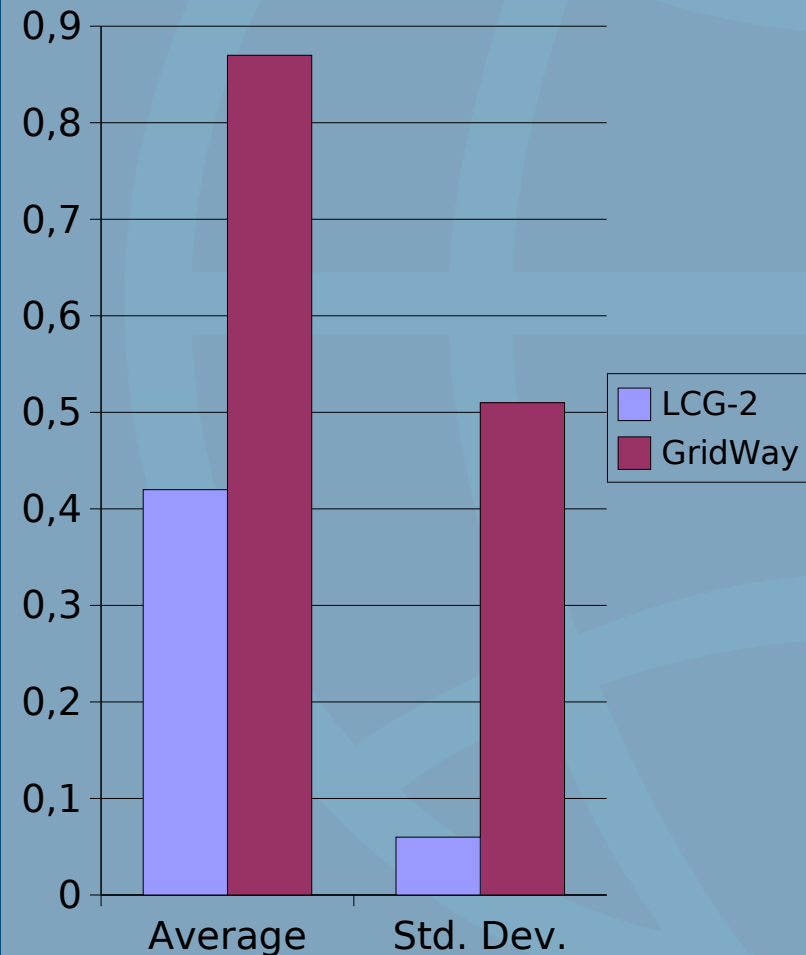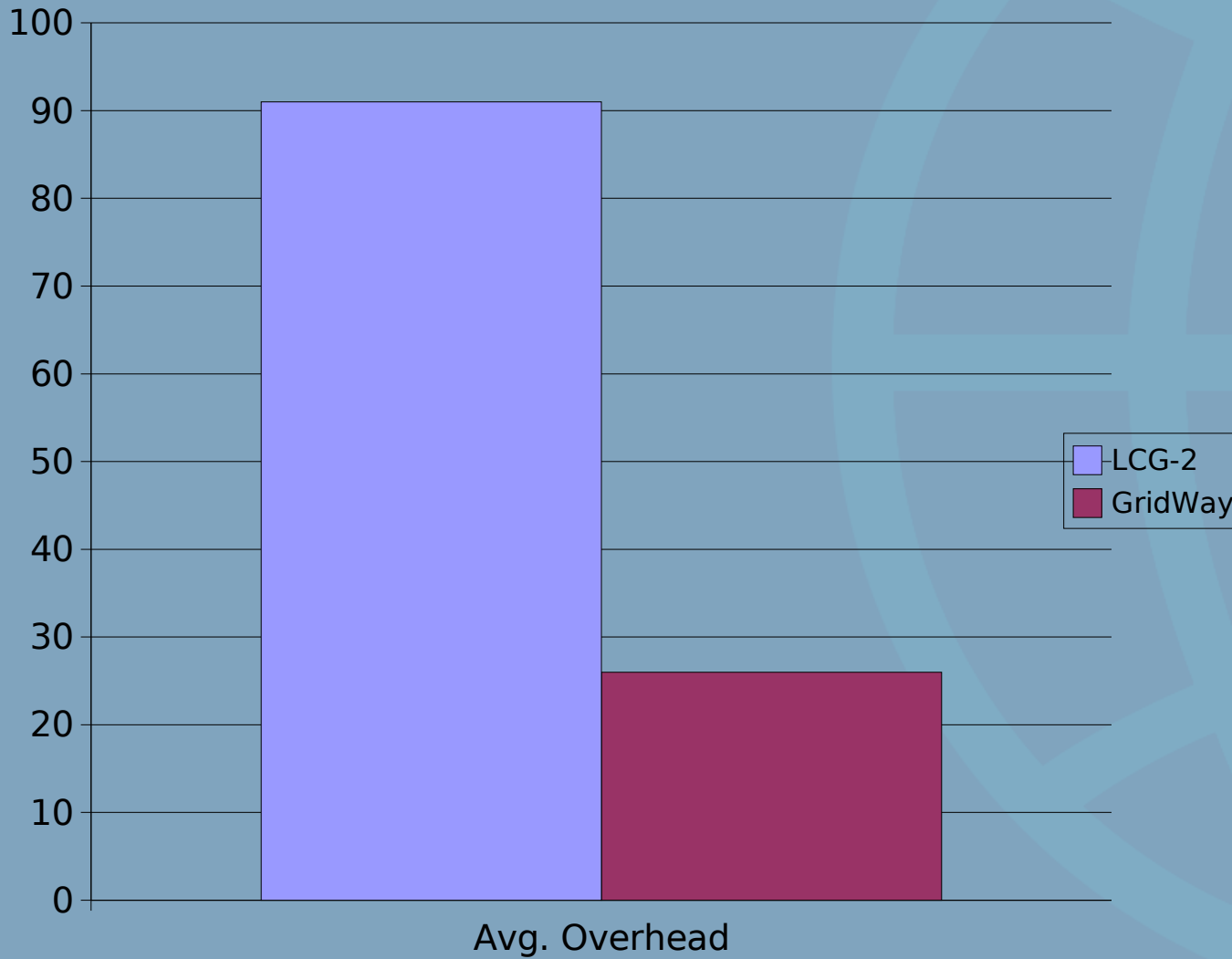
Comparison

Comparison

Resubmissions/Reschedules
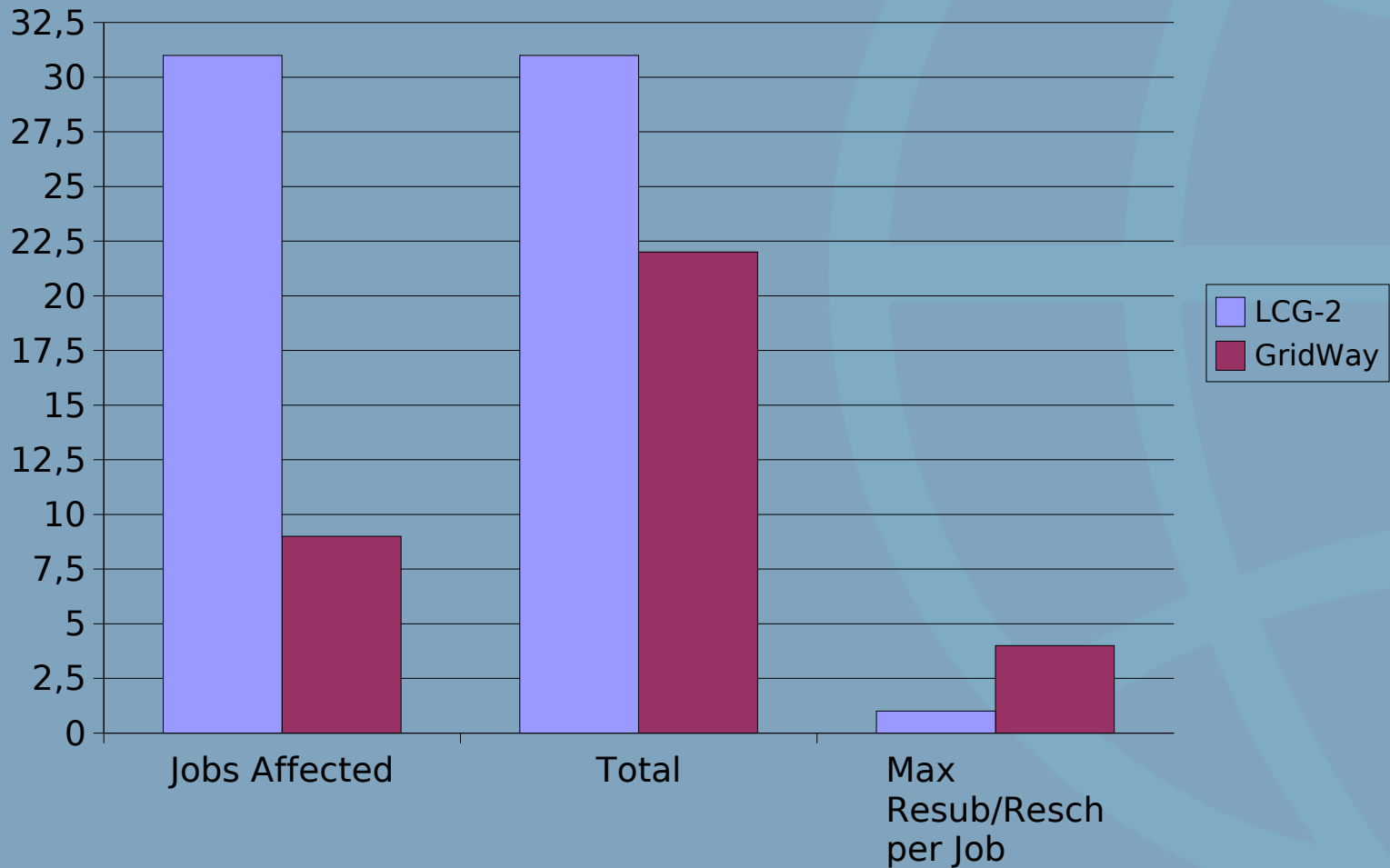
Comparison

Jobs Allocated (Every 15')
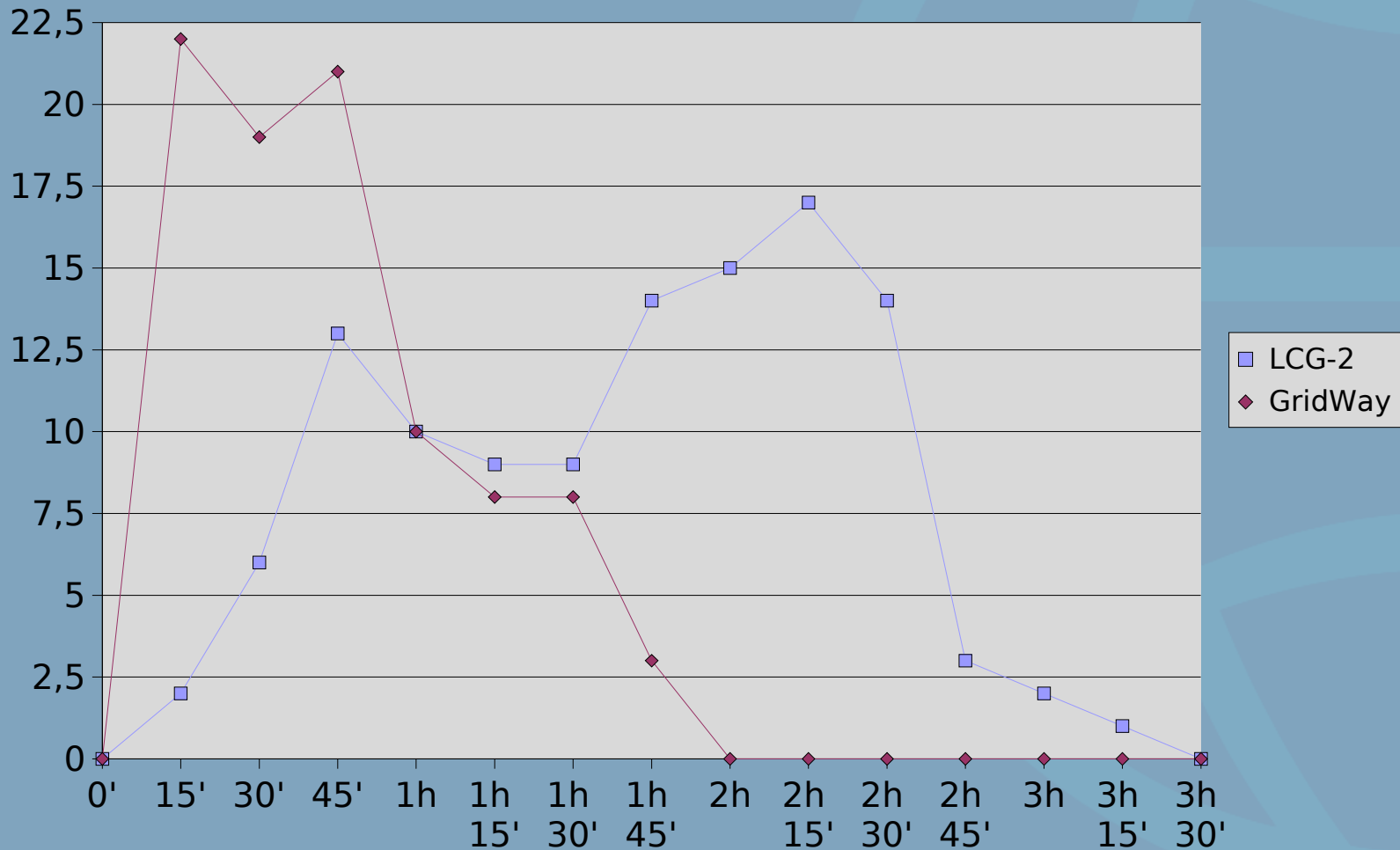
Productivity (Every 15')
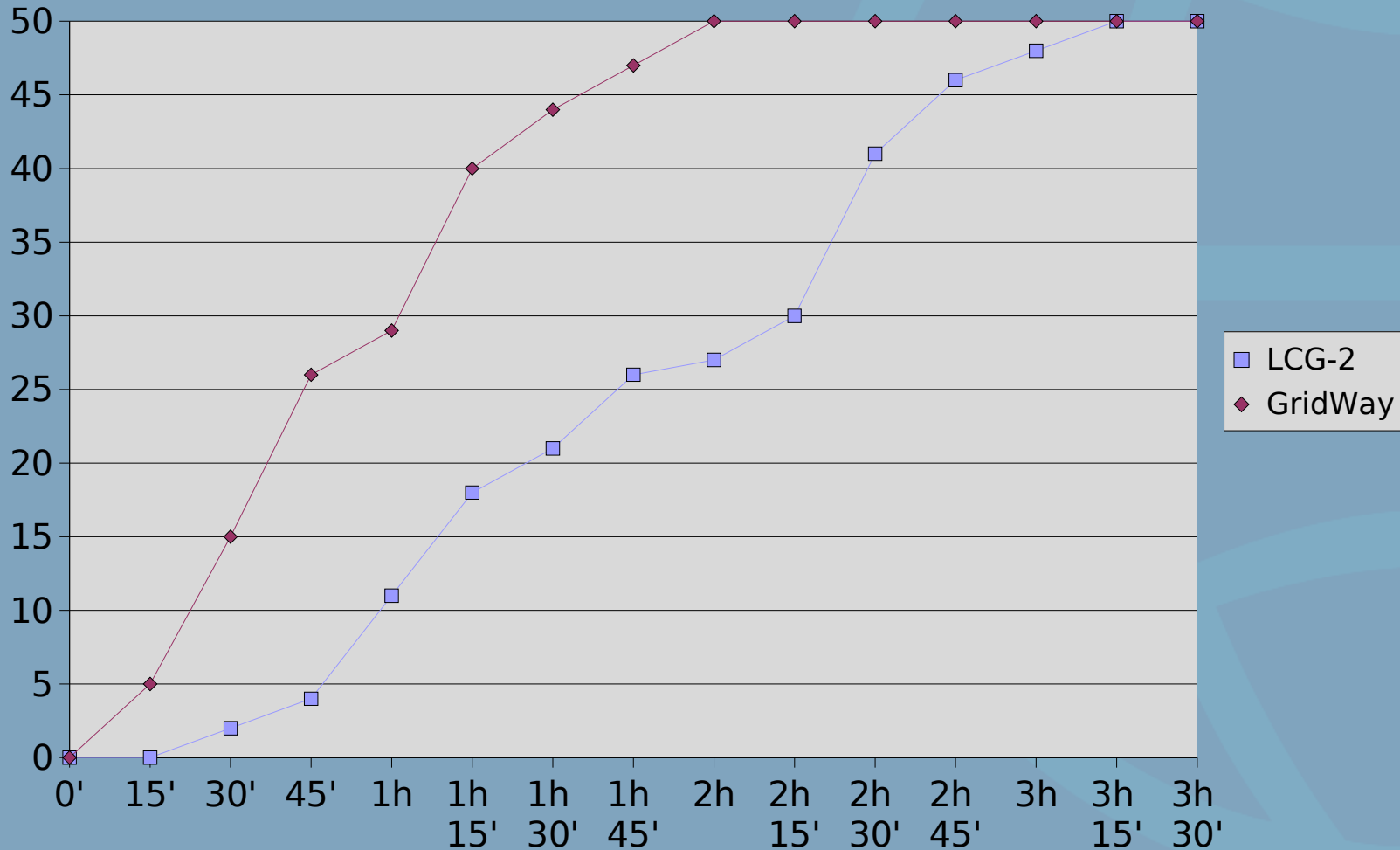
GridWay obtains higher productivity
- Reduces number of nodes and stages
- Mechanisms

    Opportunistic migration

    Fault tolerance

API's
- LCG-2: Relays on specific middleware
- DRMAA implementation: doesn't

    GGF standard

    Job sync, termination and suspension

Our two cents

Data from Information System should:
- be updated more frequently
- represent the real situation

Thank you for your attention