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Max-Planck-Institute  
for Gravitational Physics



# Searching for Gravitational Waves

Catching Gravitational Waves with the Grid

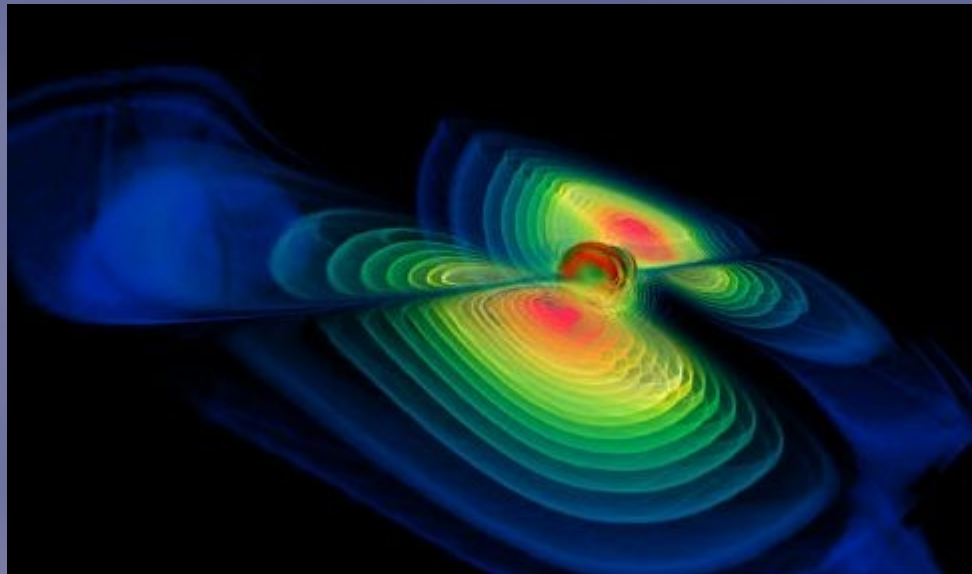
Astrogrid Workshop  
Garching, Nov. 14<sup>th</sup> 2006

# Gravitational Waves for Pedestrians

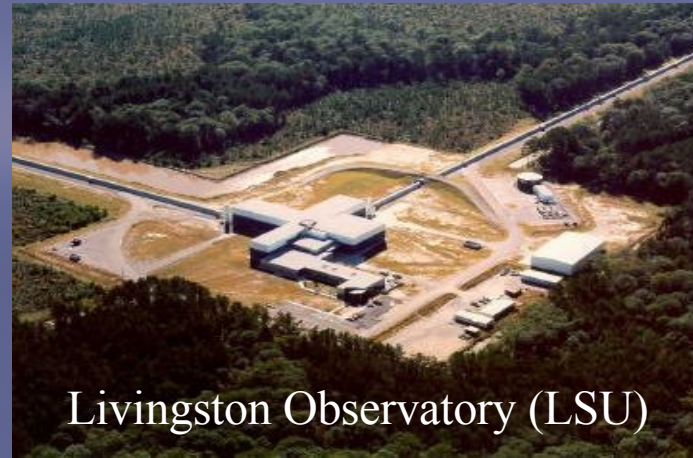
We are concerned with inspiring **binary black hole systems**.

These are numerically studied using the **Cactus Computational Toolkit**.

Large scale simulations predict emission of **gravitational waves**.



# Laser Interferometer Gravitational-Wave Observatory



# AEI Grid Scenarios

	Cactus	Einstein
source code needed	YES	NO
Tools needed	Perl, Make	Perl
Compilers needed	Intel F90, C, C++	NO
Libraries needed	multiple dependencies	NO
Binaries available	NO	YES
staging files in	YES	NO
Job type	Parallel	Serial
Checkpoint & recovery	YES (slow)	YES (fast)
Staging files out	YES (large)	NO
Network access needed	NO	YES

# Status of Astrogrid

	Type	Globus	GSISSH	GSISCP	GRAM
gavo2.aip.de	Server	Yes	Yes	Yes	Yes
gavo3.aip.de	Server	Yes	Yes	Yes	Yes
astar.aip.de	Workstation	Yes	Yes	Yes	Yes
photon.aip.de	Workstation	Yes	Yes	Yes	Yes
dublin.aip.de	Workstation	Yes	No	No	No
supergrid.aei.mpg.de	Server	Yes	Yes	Yes	Yes
altix.lrz-muenchen.de	SMP	Yes	Yes	Yes	Yes
lxsrv1.lrz-muenchen.de	Frontend	Yes	Yes	Yes	Yes
gavo1.aip.de	Workstation	Yes	No	No	No
mintaka.aip.de	Server	Yes	No	No	No
cashmere.aip.de	Server	Yes	Yes	Yes	Yes

Only simple scenarios currently well supported!

- > A grid should evolve more in a continuous way than being build at once.

introducing a fast cycle between designing, building and testing the grid

taking incremental steps in every cycle

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**scenario** start with simple scenarios that increase their complexity along with the capability of the grid

**testing** continuously test file transfers using Globus  
continuously test job submission using Globus  
test possibility of automated software deployment

**monitoring** determine useful monitoring metrics (MDS)

**metadata** determine good ways to archive job metadata (RDF)

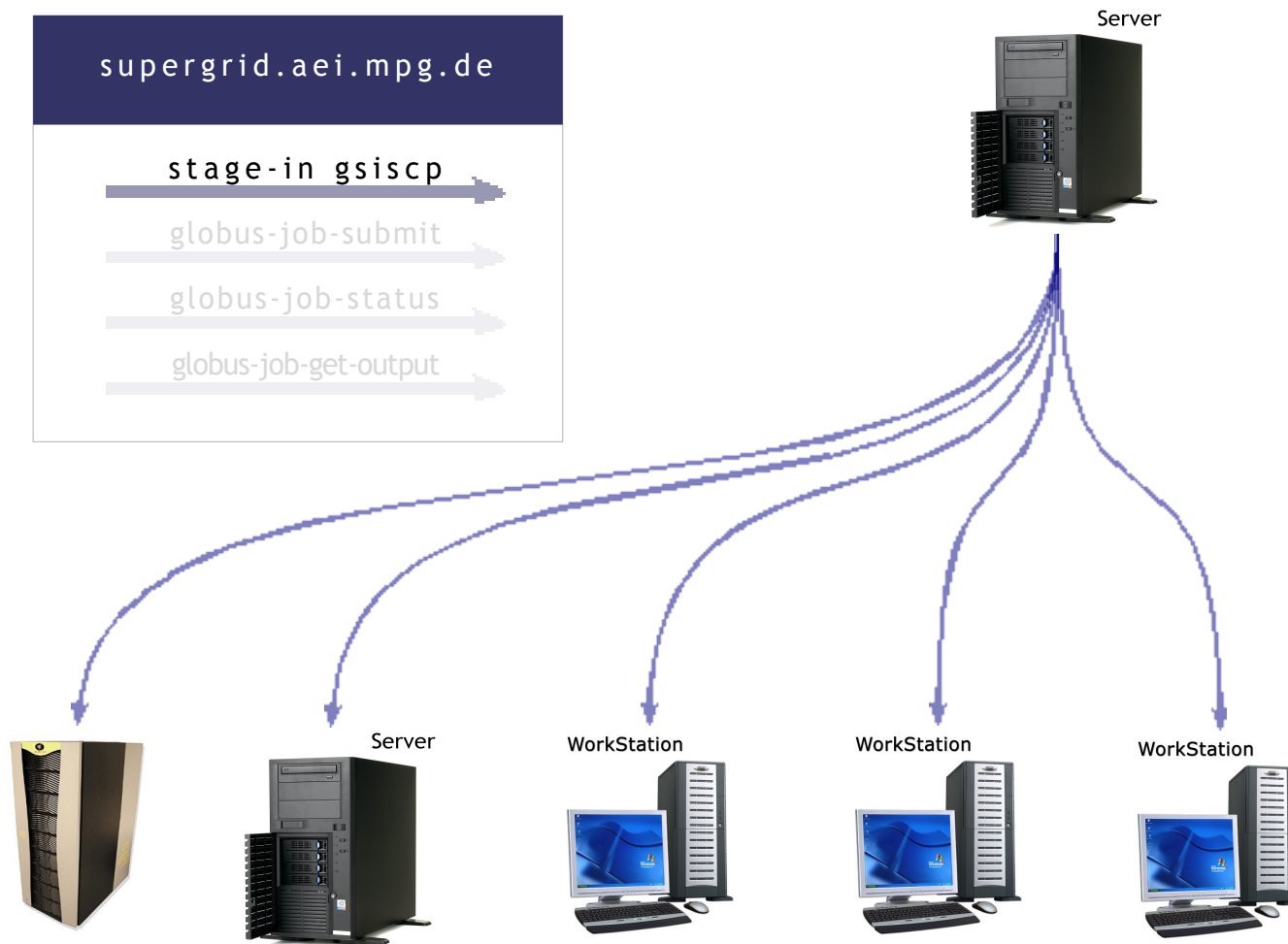
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- > Einstein @ Home

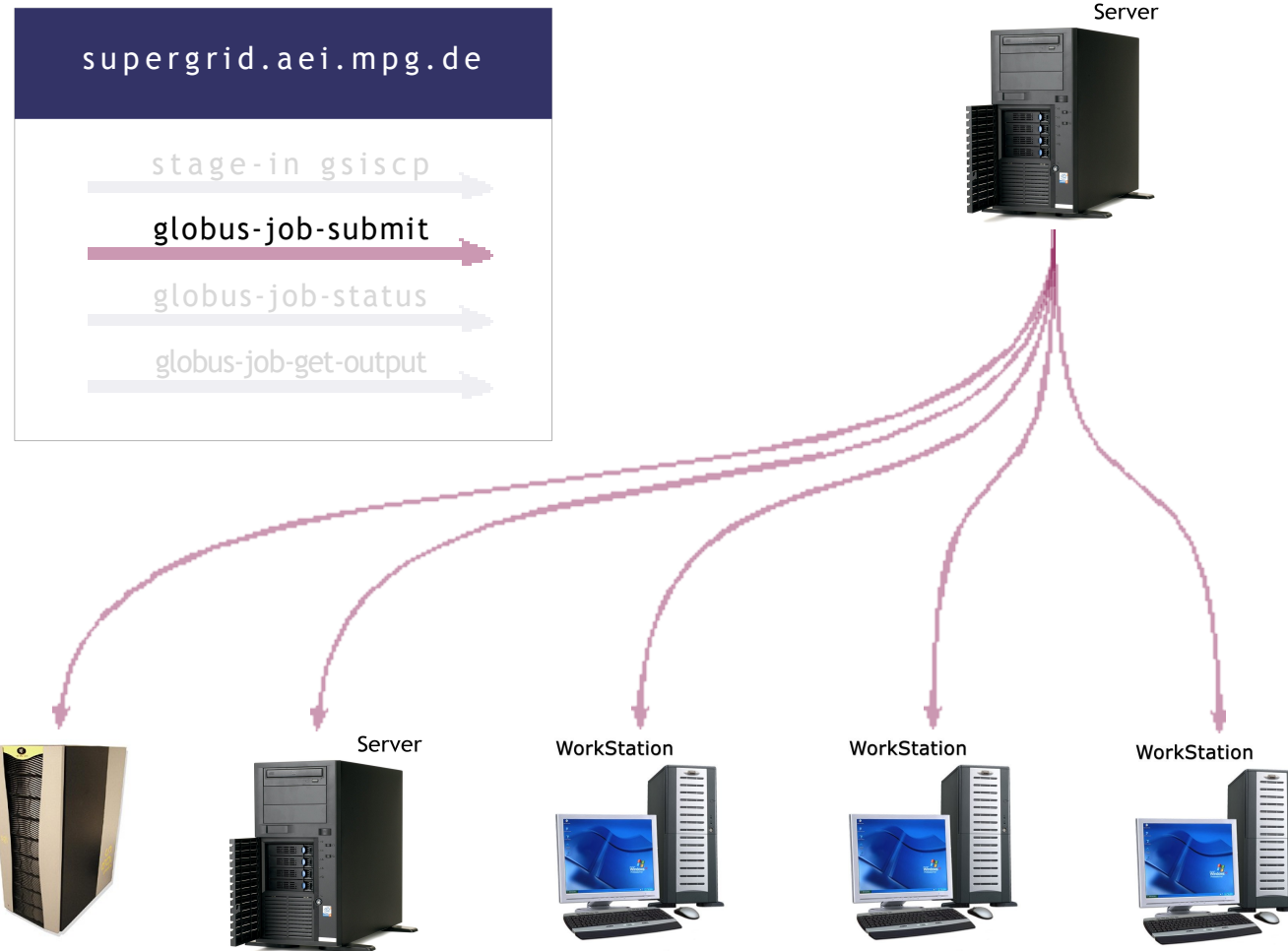
# Einstein @ Home Scenario

supergrid.aei.mpg.de

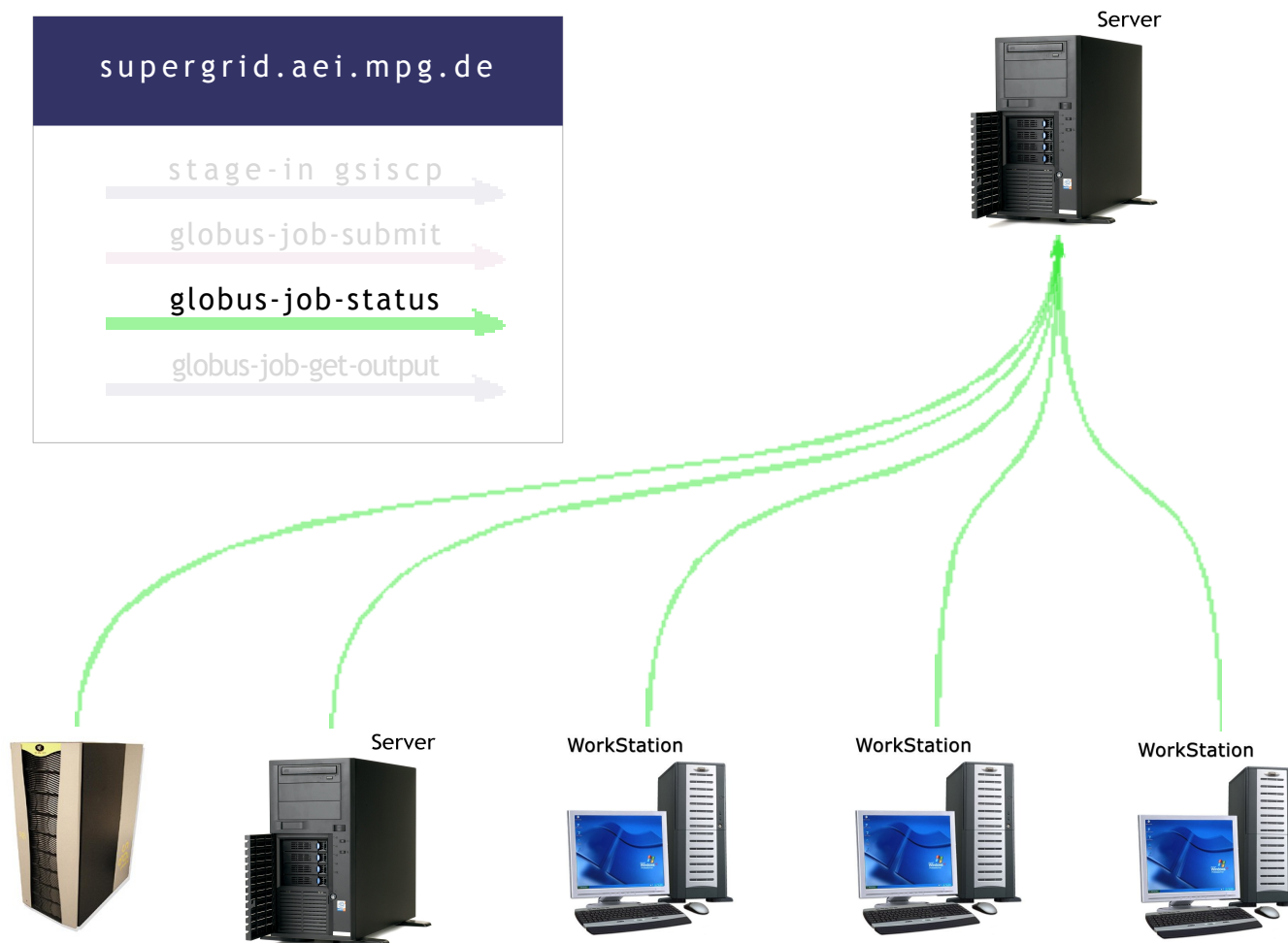
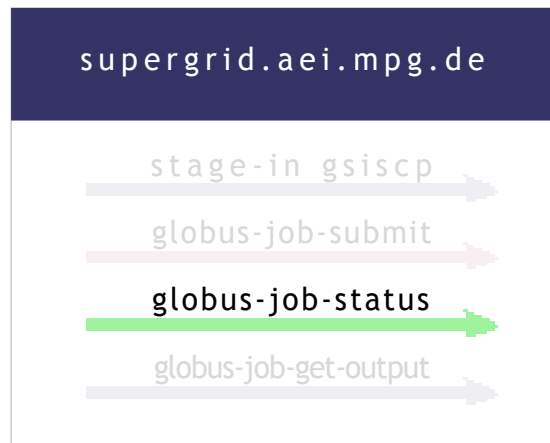
- stage-in gispcp
- globus-job-submit
- globus-job-status
- globus-job-get-output



# Einstein @ Home Scenario



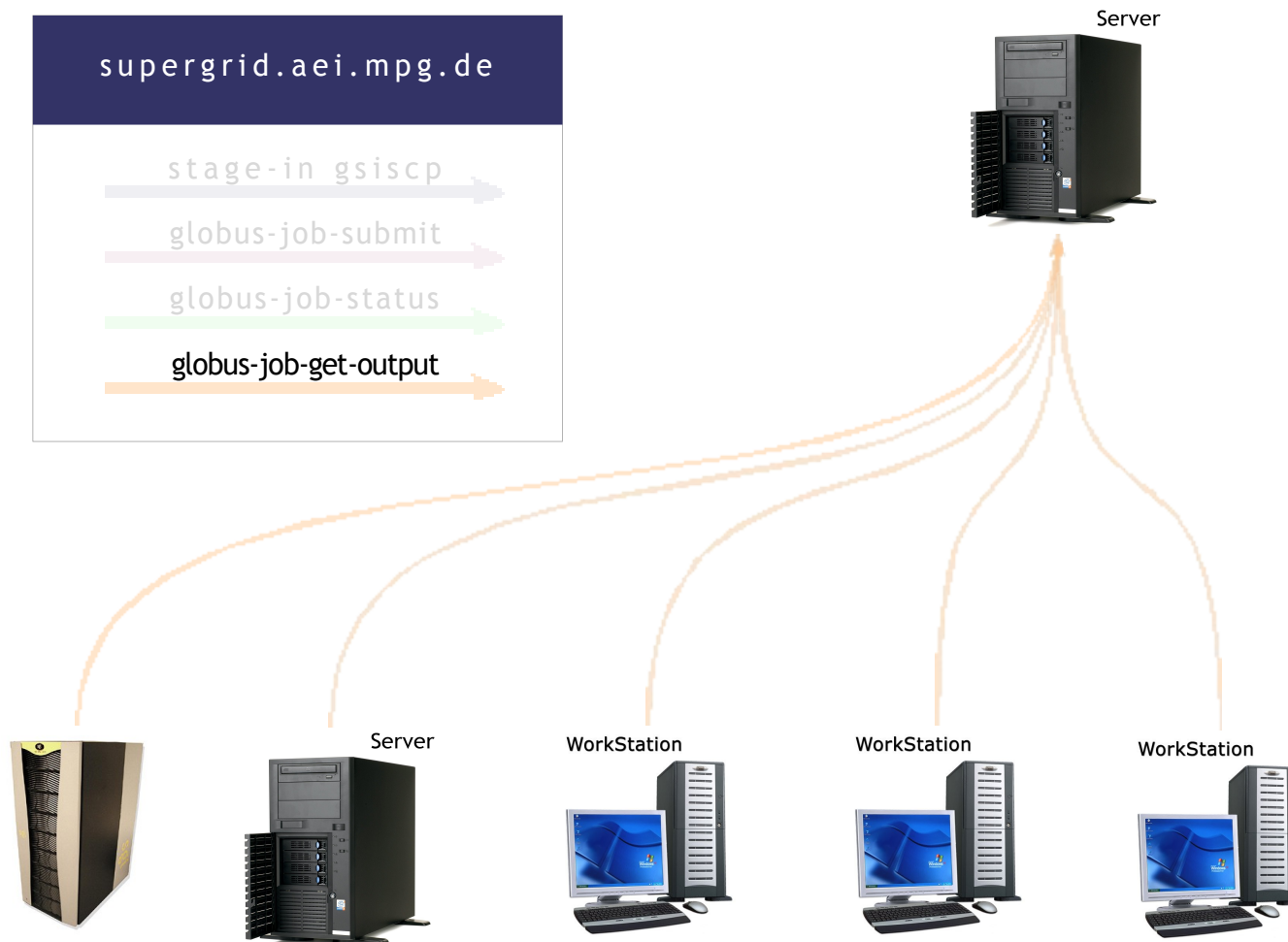
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# Einstein @ Home Scenario

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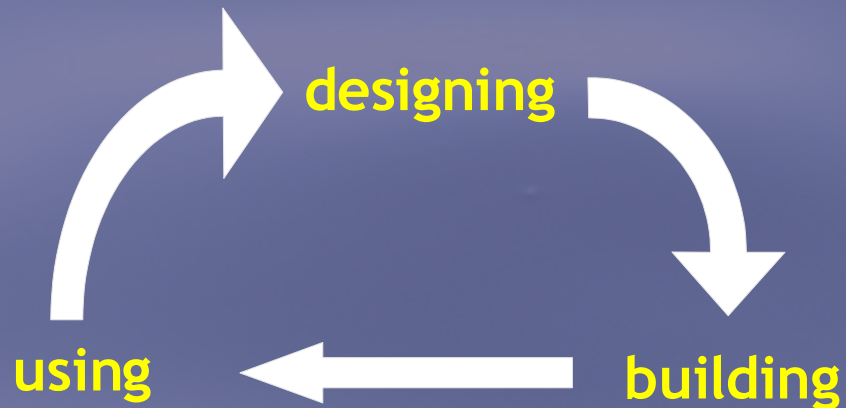
# Scientific Results

Project Home Page	<a href="http://einstein.phys.uwm.edu/">http://einstein.phys.uwm.edu/</a>
Astrogrid Team (engro@aei.mpg.de:Pinguin)	<a href="http://einstein.phys.uwm.edu/team_display.php">http://einstein.phys.uwm.edu/team_display.php</a>
Credit System	<a href="http://einstein.phys.uwm.edu/top_users.php">http://einstein.phys.uwm.edu/top_users.php</a>
Machine Monitoring	<a href="http://einstein.phys.uwm.edu/hosts_user.php">http://einstein.phys.uwm.edu/hosts_user.php</a>

grid-state	limited set of machines available only one machine that supports queuing services not stable
grid-access	limited to some extent
grid-machines	mix of reliable & unreliable resources
MDS	information provided is insufficient
policies	differ to an extent that software must be extended to cope with these policies
grid-scheduler	reliability of machines & usage policies must be taken into account

*details: talk by Thomas tomorrow*

## Evolution of the Grid



Every cycle detects new problems to *real grid problems*.

Every cycle *incremental solutions will be integrated*.

Every cycle *improves the usability & capability of our grid*.

**Don't wait for the grid to be *done!***