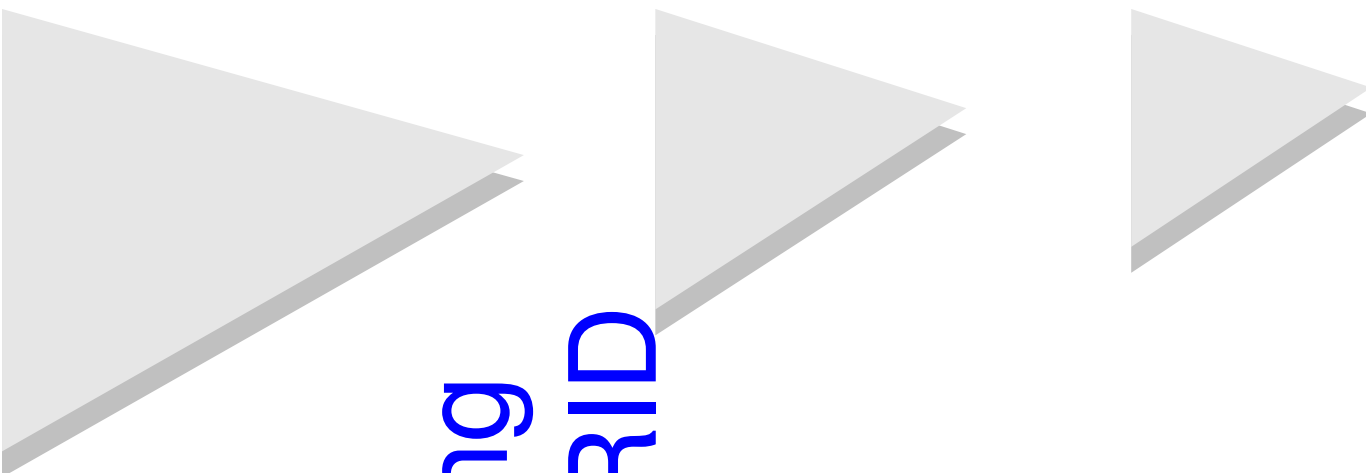




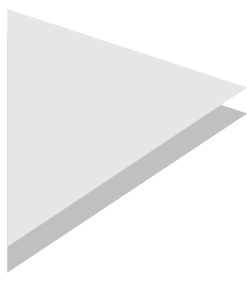
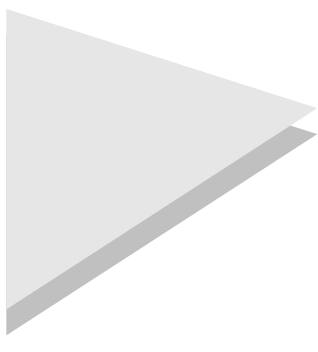
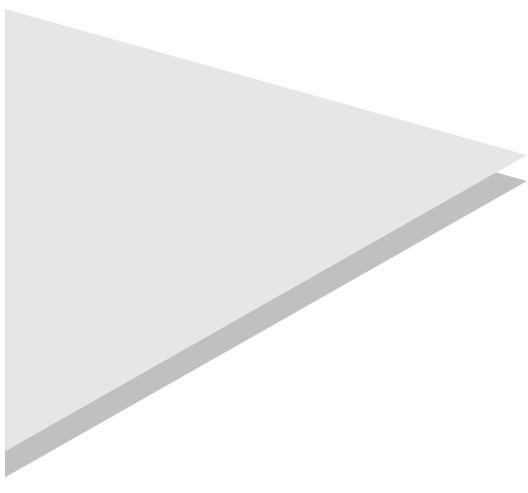
AMANDA – first running experiment using the GRID

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CHEP 2003
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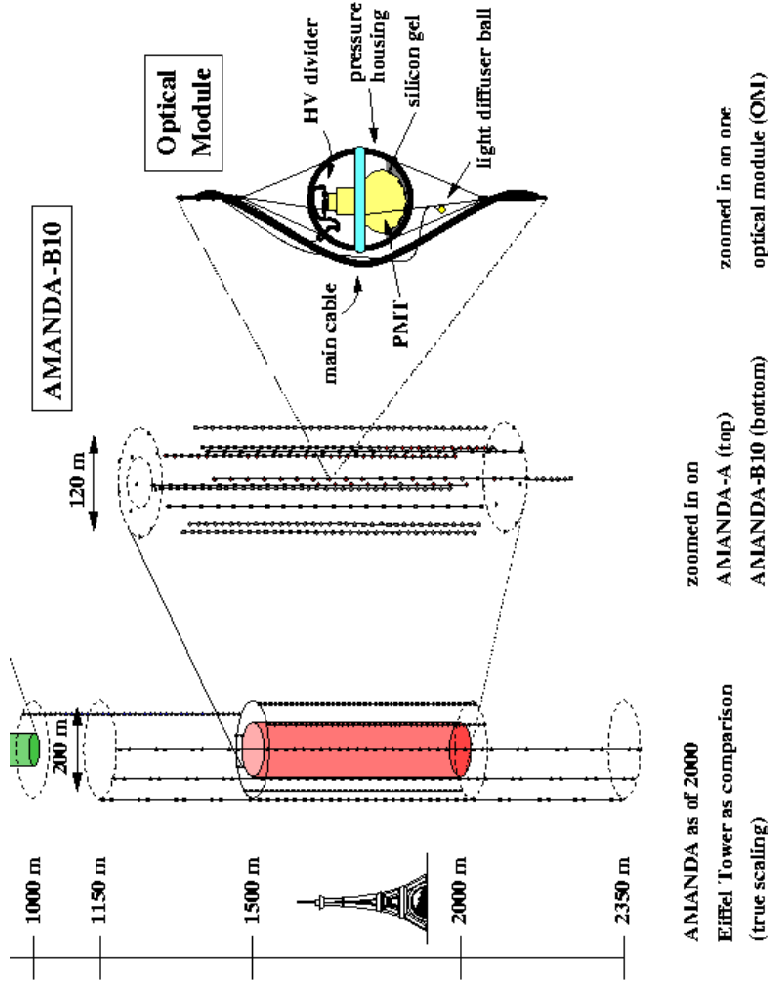
Structure

- Introduction to AMANDA
- GRID in Wuppertal
 - Why?
 - Installation procedure
 - Introducing: „Grid Navigator“
- GRID @ AMANDA
- Summary / Outlook





Neutrino Telescope in Ice



1997:

AMANDA-B10

302 OMs at 10 Strings

2000:

AMANDA-B19

680 OMs at 19 Strings

The AMANDA collaboration

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2. DESY-Zeuthen, D-15735, Zeuthen, Germany
3. Dept. of Physics, Stockholm University, S-11385, Stockholm, Sweden
4. Dept. of Physics, UC Berkeley, Berkeley, CA, 94720 USA
5. Dept. of Physics, UC Irvine, Irvine, CA, 92697 USA
6. Dept. of Physics, Pennsylvania State University, University Park, PA, 16802, USA
7. Dept. of Physics, University of Wisconsin, Madison, WI, 53706, USA
8. Dept. of Physics, University of Wuppertal, Wuppertal, Germany
9. Dept. of Technology, University of Kalmar, Kalmar, Sweden
10. Lawrence Berkeley Laboratory, Berkeley, CA, 94720 USA
11. Inst. of Physics, University of Mainz, Staudinger Weg 7, D-55099, Mainz, Germany
12. South Pole Station, Antarctica
13. ULB - IIHE - CP230, Boulevard du Triomphe, B-1050 Bruxelles, Belgium
14. Dept. of Physics, University of Kansas, Lawrence, KS, USA
15. Div. of High Energy Physics, Uppsala University, S-75121, Uppsala, Sweden
16. University of Alabama, Tuscaloosa, AL, USA
17. Univ. Simon Bolivar, Caracas, Venezuela
18. Vrije Universiteit Brussel, Dienst ELEM, B-1050, Brussels, Belgium
19. Univ. of Mons-Hainaut, Mons, Belgium
20. Dept. of Physics, University of Wisconsin, River Falls, WI, 54022 USA

Why GRID in Wuppertal?

- Wuppertal participates in these experiments, where GRID structures are going to build up:

- DØ @ Tevatron / Fermilab (near Chicago)
- ATLAS @ LHC / CERN (near Geneva)
- AMANDA/IceCube @ the south pole

- Above all, the MC production for these experiments needs huge amount of CPU.

- A **uniform** computing pool would be desirable.

- **But:** Collaboration software is not „Grid ready“ yet and each experiment requires „own Linux“.

Why GRID in Wuppertal? (2)

- Desktop PCs
 - ~1GHz CPUs
 - often only used during working hours
 - could run batch jobs during the night.
- Goal: use **existing** Grid toolkits and **existing** collaboration software to get the most of our **existing** hardware **now**.
- The experience gained from this can be useful for further development within the collaborations.

The AMANDA Software chain

AMANDA offline software consists of 3 main parts:

- **dCORSIKA**: air shower generator written in FORTRAN (Karlsruhe/Wuppertal)
- **MMC**: Muon propagation code written in JAVA (Wuppertal/Berkeley)
- **AMASIM**: Detector simulation written in C and Fortran (Stockholm)

All three parts has been bundled and are stored on a central software server.

Our installation @ Wuppertal

- Software was bundled to run without special Linux.
- Grid/Condor is running on ~20 Desktop PCs with
 - different Linux versions
 - different Memory/CPU equipment
- Tests to enlarge our system to the technical university of Aachen were successful.
- Our system can be extended to other insitutes!
- Extentions to DESY Zeuthen and Stockholm are under way!
- Our new Cluster with 1024 CPUs will be equipped, too!

Achievements (1)

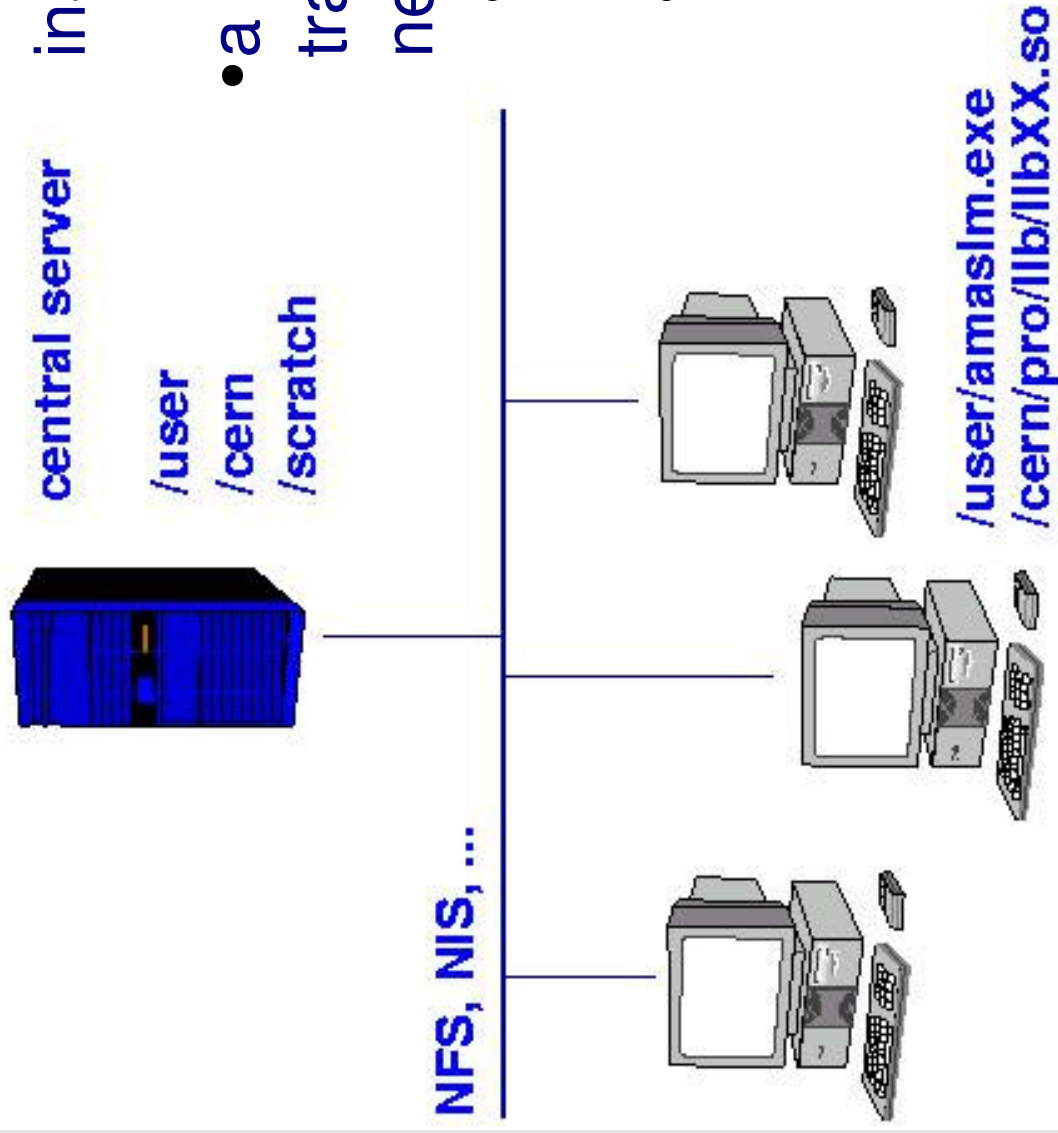
- A Globus/Condor pool is running: we **have** a running Grid why others are still talking
- Pool was capable of producing 200 million CORSIKA events (@11 CPUs) per week
- **before:**
 - ~15 million events in a week (one alpha server and several Sun workstations)
 - production had to be started on each machine separately (telnet to all machines, accounts needed, no automatic start, ...)
- D0: Random Grid Search for tt X-section measurement (ROOT based)

Achievements (2)



- **Problem 1:** Most experiment specific software needs a special „environment“ (libs, etc.)
- **Problem 2:** All collaboration software is not GRID-enabled:
 - Idea: Create „Sandboxes“ to let D0/AMANDA-Software run on PCs, where no specific environment is installed.
 - Run everything in temporary file space and transfer files using GRID protocols:
 - ⇒ Done for all main AMANDA software and D0 Simulation ✓

conventional approach



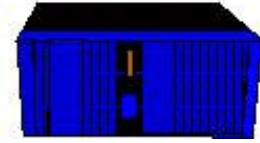
- hard to extend to other institutes

- a lot of data is transferred over the network

- no problem in LANs
- bad in WANs

our approach

central software server
bundles of software
AMASIM, MMC, CORSIKA, ...

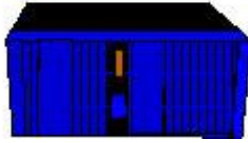


CORSIKA
bundle



User data

central data server



possible Institute boundaries

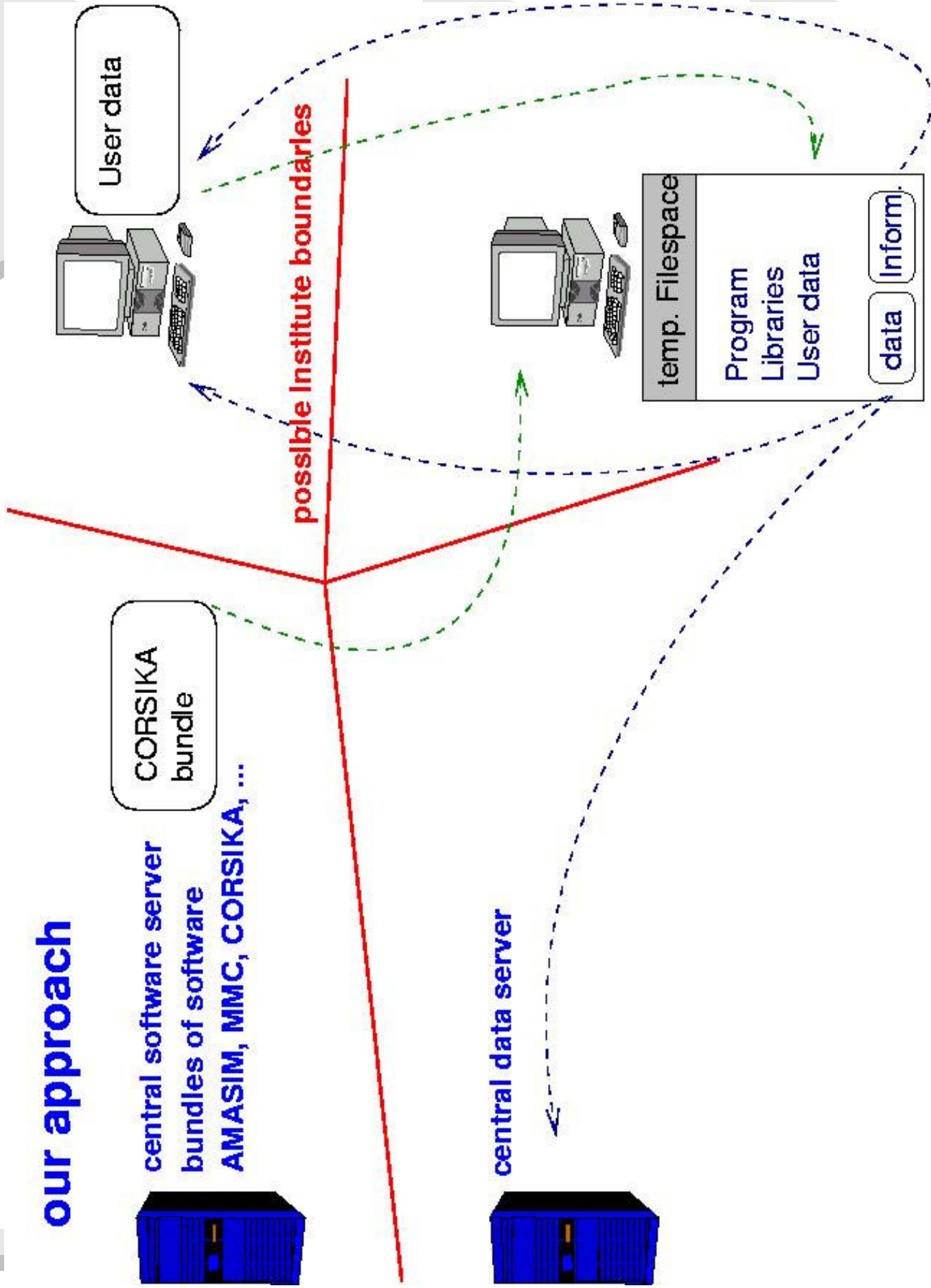


temp. Filespace

Program
Libraries
User data

data

Inform.



Achievements (3)

Problem 3: Operation of a GRID environment is still complicated – most people don't want to care about it
Idea: write a „steering software“ for that

⇒ first version of the „**Grid Navigator**“ ready ✓

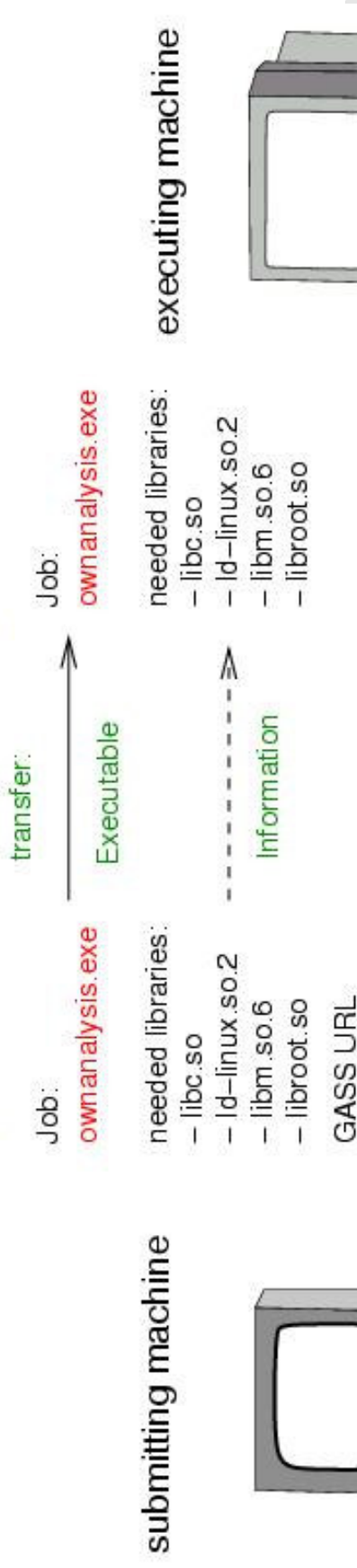
Problem 4: With own (not bundled code) one has to care about in- and output and about needed libraries
Solution: software („sandbox“) inside „Grid Navigator“
(see following slides)

Introducing: Grid Navigator

- The Grid Navigator makes it easy to use the Grid/Condor-environment w/o knowledge of underlying structure
- Has a GUI to access Grid ✓
- already „knows“ standard AMANDA/D0 software ✓
- can also be used for own code ✓
- **Library dependencies are resolved** – very important in an environment with many experiments.

Whole job process

2.) transfer executable and library information



3.) check for needed libraries on remote machine



1.) GASS server started to access local Filesystem the binary



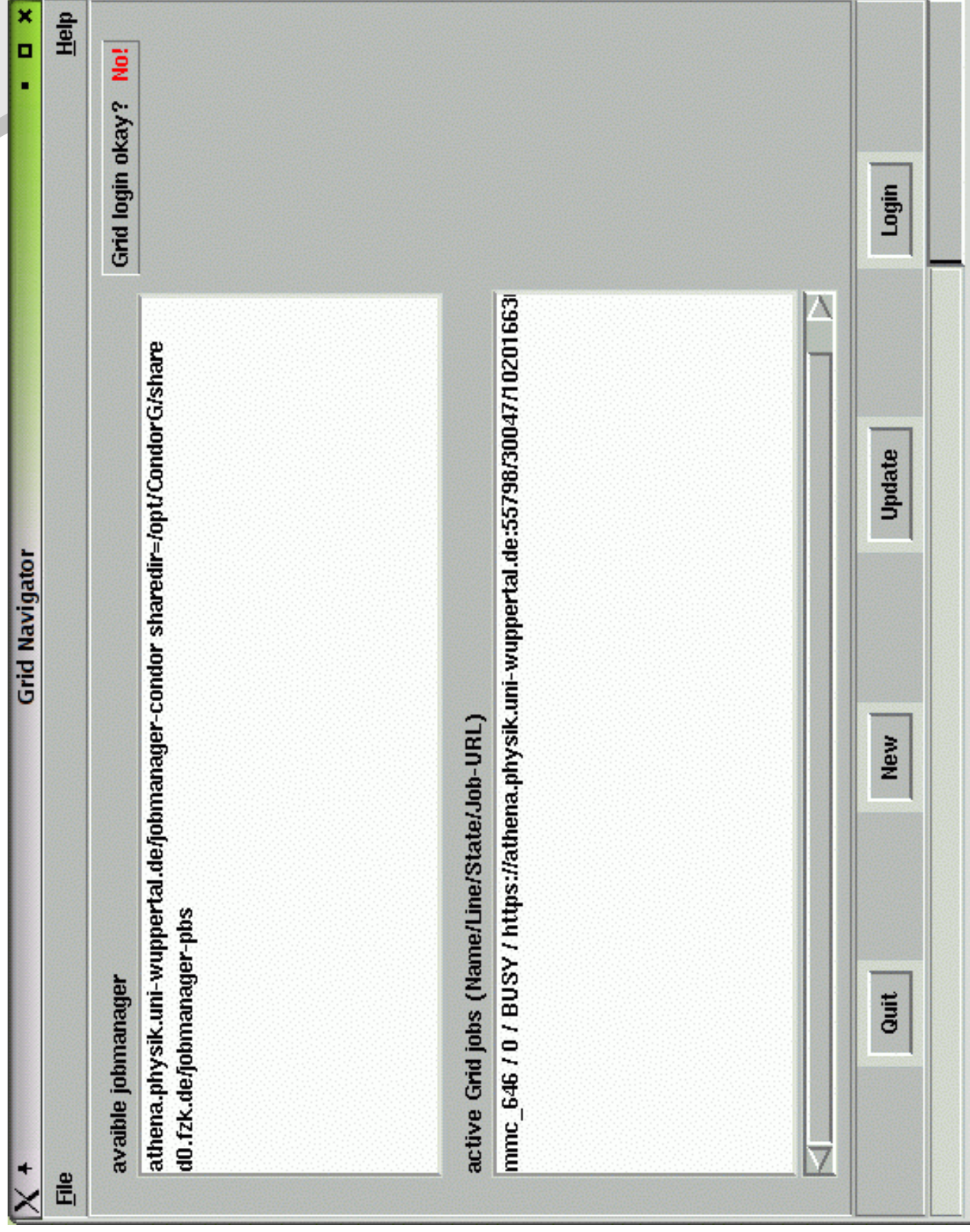
5.) transfer output files back

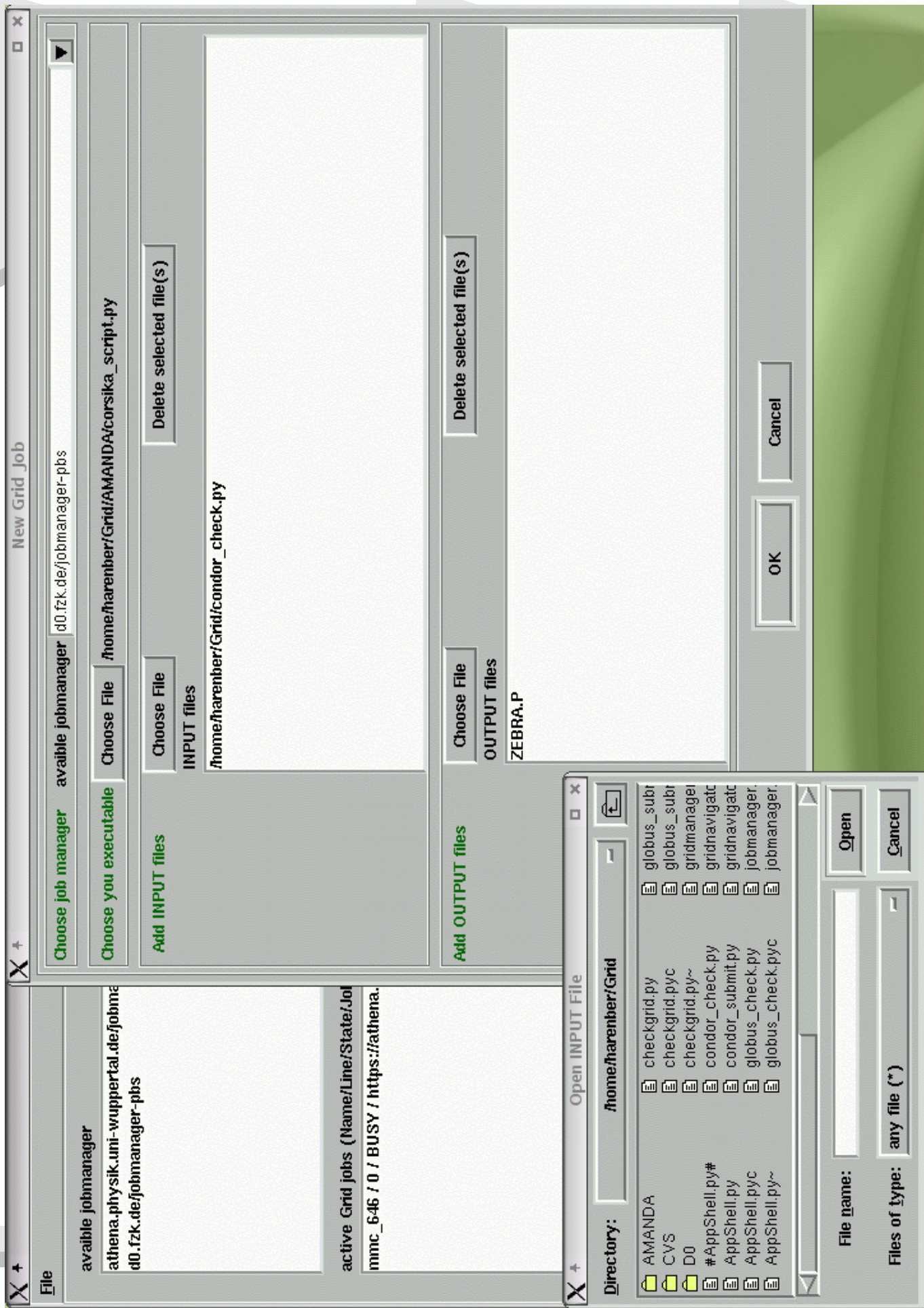


6.) stop GASS server



Grid Navigator





Grid @ AMANDA: distributed computing within the collaboration

STOCKHOLM

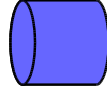
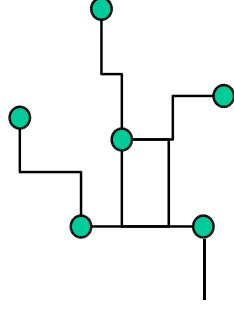


(coming soon)

PCs group
Rhode



PCs group
Becks/Mättig



software
catalogue

DESY Zeuthen



(coming soon)

central data
server



WUPPERTAL

Summary

- Introduction to AMANDA
- Reasons for GRID in AMANDA and in Wuppertal
- We built up a GRID in Wuppertal which is running very stable
- First success with existing software (CORSIKA, MMC and AMASIM for AMANDA and D0pythia).
- The „Grid Navigator“ software is taking care of most steps when running jobs and keeps track of these jobs
- The dynamic library resolution is very important for the first years of GRID (esp. for own code).

Outlook

- Software is in active Development:
 - more AMANDA and DØ Software to support
 - make it more fault tolerant
 - maybe more GUI options
 - BUT: System is ready to run.
People can start mass production with a simple mouse click.
- We'll benefit from further Globus Toolkit development
- System should be used within the german DØ groups
- Within AMANDA we're going to extend further ...