LATFOR Initiative, Grid, Computers

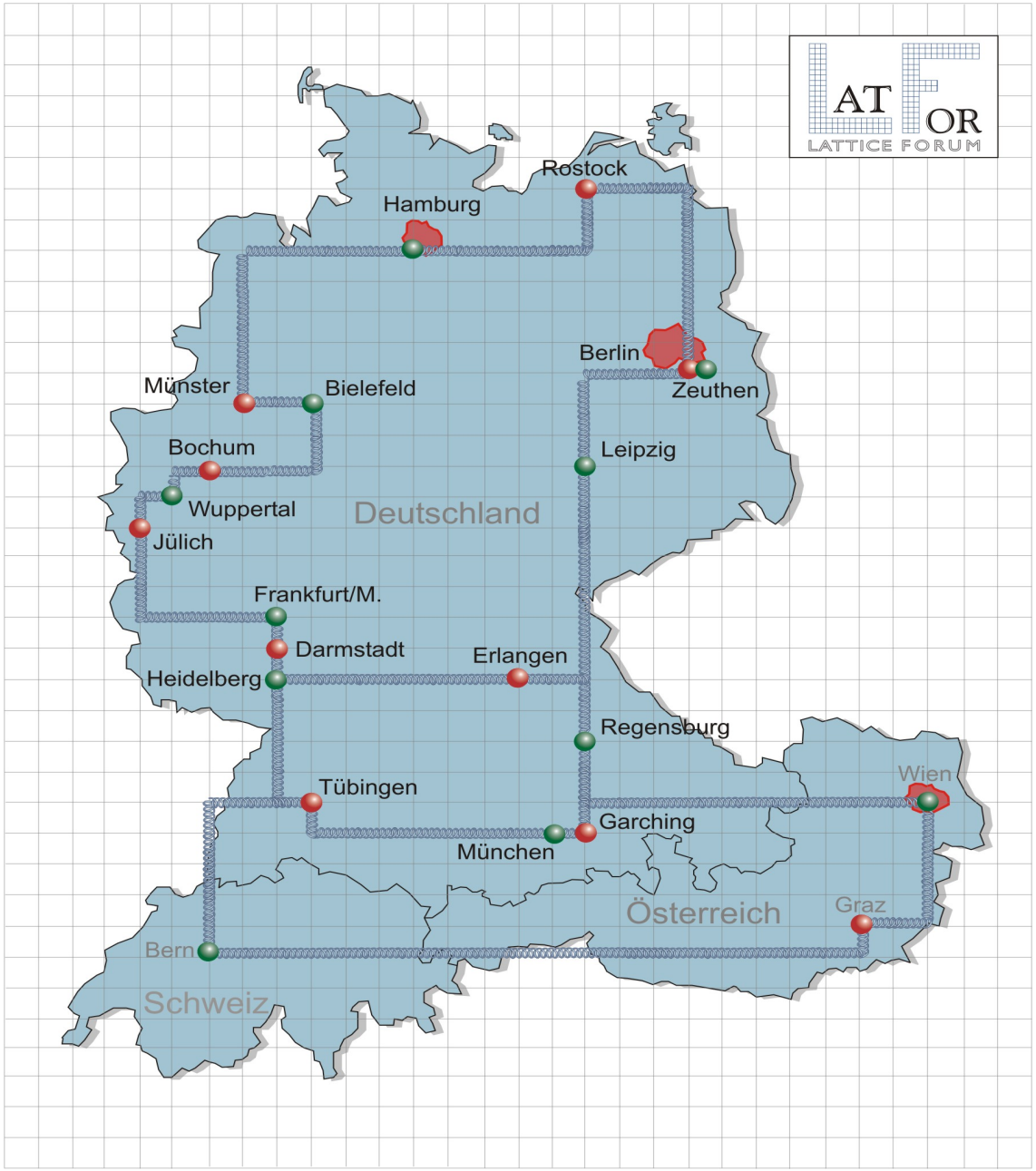
Karl Jansen

- **Organisation: Lattice Forum (LATFOR)**

  - Initiative of German Lattice Physicists
    with associated countries Austria and Switzerland
  - Coordination of physics programme
  - Common uasge of Software and raw data $\rightarrow$ Datagrid
  - Requirement of Supercomputer resouces

http://www-zeuthen.desy.de/latfor

coordination at NIC/DESY Zeuthen



Major reasearch areas within LATFOR

- ab initio calculations of QCD with *dynamical quarks*
  - Hadron spectrum and structure functions
  - fundamental parameters of QCD
  - B-physics
- matter under extreme conditions
  - QCD thermodynamics
  - QCD at non-vanishing baryon density
- Non-QCD physics
  - Electroweak standard model
  - Supersymmetry
- Conceptual developments
  - exact chiral symmetry on the lattice
  - Twisted mass lattice fermions
  - algorithm development

- LATFOR council

Z. Fodor, K. Jansen (Speaker), F. Karsch, G. Münster,
A. Schäfer, J. Wambach, U. Wolff

- LATFOR Supercomputer Resources?
  → DESY 3 TFlops
  → National Supercomputer Centers:
  FZ Jülich 10TFlops, IBM Regatta
  HLRN (Berlin, Hannover) 7TFlops IBM Regatta
  HLRS (Stuttgart) 1.4TFlops NEC/CRAY
  LRZ (München) 2TFlops Hitachi
  - fold with efficiency 15%
  - fold with ET contingent 20% ⇒ 1 TFlops

  → University of Wuppertal: cluster with 1024 Opteron processors,
  50% for LGT, 1GFlops sustained
  → University of Bielefeld: Proposal for 5 TFlops
  → Smaller clusters at HU, Münster, DESY → small QCDOC at Regensburg
- Definition of benchmarks for actions and algorithms
- Participation in International Lattice Data Grid (ILDG)

Requirements for realizing the LATFOR physics program

Typical user profile

lattice size	$32^3 \cdot 64$
memory	40 Gbyte
I/O request	0.1 Mbyte/sec/Gflops
minimal machine size	32 nodes
total runtime	>5 Teraflops-years

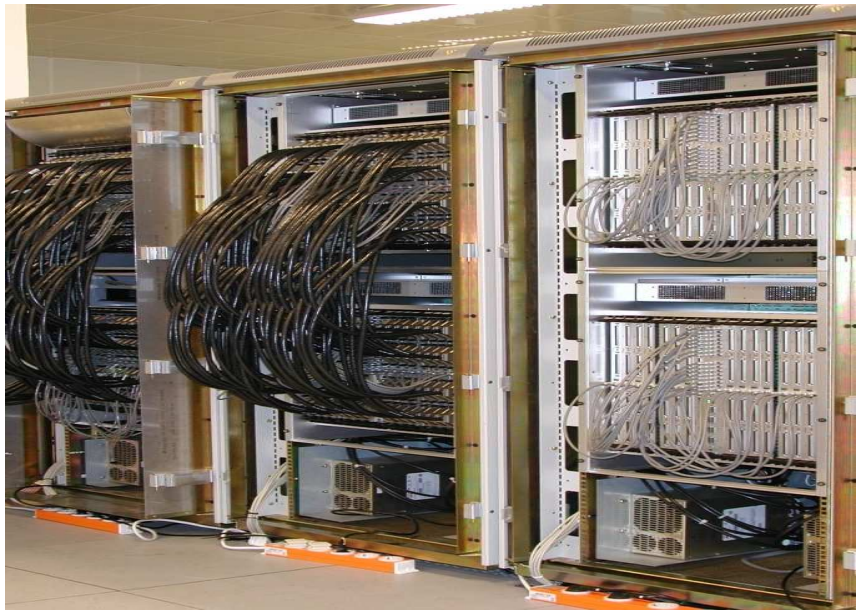
$\Rightarrow$ need of 12.5 **Teraflops sustained** (1-2 Teraflops sustained per project)

in accordance with other evaluations

- ECFA Report
  Requirements for high performance computing for lattice QCD: report of the ECFA working panel
  F. Jegerlehner et.al., CERN 2000-002, ECFA/00/200
- NuPECC Report
  The NuPECC Working Group Computational Nuclear Physics
  M. Baldo et.al., June 2000

$\Rightarrow$ massively parallel computers with a very fast communication network

Array Processor Experiment → APE



APEmille installation in Zeuthen
550 Gflops peak speed
32 Gbytes memory
1024 Processing units
machine runs very stable
many physics results

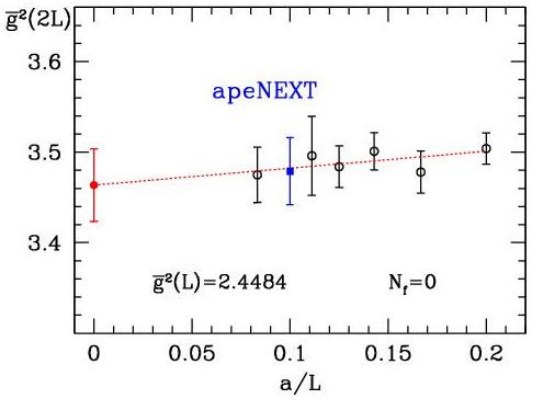
apeNEXT: collaboration of lattice physicists from INFN, DESY and University of Paris Sud

10 Tflops peak speed, 1-4 Tbytes memory
O(6 000) Processing units, 0.5Euro/Mflops peak performance

Developing Future Infrastructure: apeNEXT

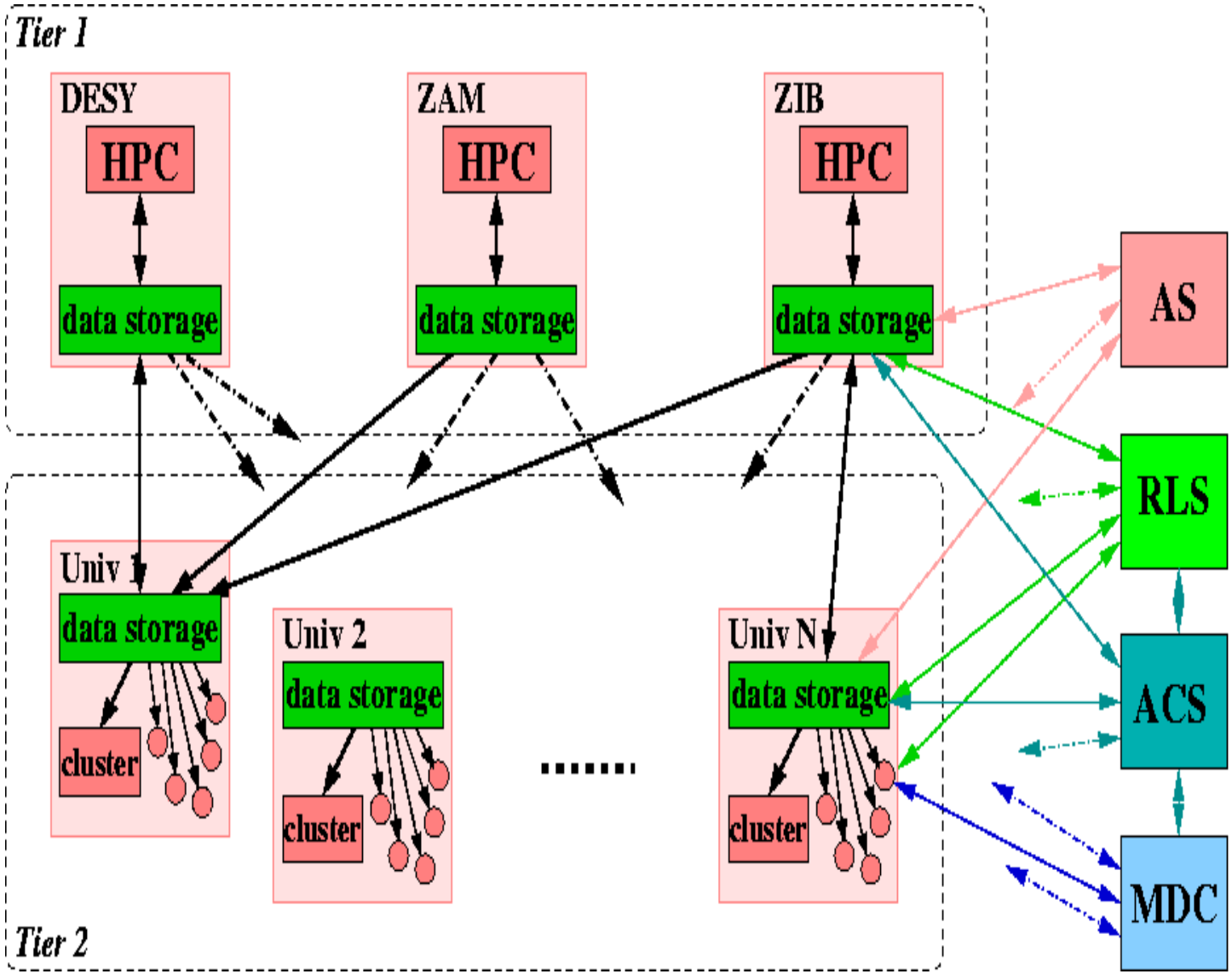
- **Planned**: → 1+1 racks at INFN+DESY = 1.6 Tflops
- **Status (June 2004)**:
  - 10 PBs (160 processors) being assembled
  - First physics codes running as hardware tests
  - 1000 more processors in O(20) weeks
  - Tender for 5 TFlops at INFN
    (option for further 5 TFlops at INFN + other sites)
  - Tender for 3 TFlops at DESY

- **Aims**:
  - Physics production on 1.6 TFlops prototype
    - ☞ Stable hardware
    - ☞ Efficient+stable software



D-Grid, HEP-Grid, Lattice Data Grid

- D-Grid: German Grid of several (5) Communities
- High Enegry Physics, HEP Grid → mainly experimental physics
- call for proposals from German Science Ministry just open
  - budget for community grids and one integration project
  - Lattice Data Grid
    → initial partner labs: NIC, DESY, FZ-Jülich, ZIB
    → participate in Metadata working group
    → announcement of SESAM, χLF configurations soon
    → plan of having a prototyp Grid running at German-Japanese workshop, November 2004
  - Middleware
    → LCG based, d-Cache system, development of DESY/FermiLab
    → works for DESY experiments, adapt to lattice requirements
    → Metadata and Replica catalogues, Storage Resource Manager


Tier 1
DESY
HPC
data storage
ZAM
HPC
data storage
ZIB
HPC
data storage
AS
RLS
ACS
MDC
Univ 1
data storage
cluster
Univ 2
data storage
cluster
Univ N
data storage
cluster
Tier 2