

Zukunft des High Performance Computing

Dieter Kranzlmüller

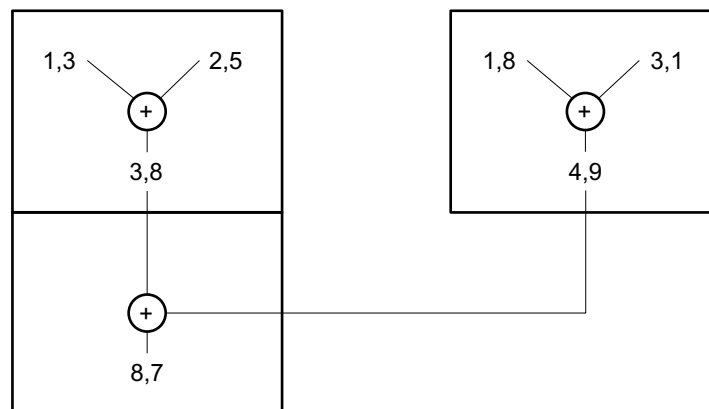
Munich Network Management Team
Ludwig-Maximilians-Universität München (LMU) &
Leibniz Supercomputing Centre (LRZ)
of the Bavarian Academy of Sciences and Humanities



Paralleles Rechnen

$$1 + 2 = 3$$

$$1,3 + 2,5 = 3,8$$



LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN **Hochparalleles Rechnen** lrz

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LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN **Der Supercomputer SuperMUC Phase 1 + 2** lrz

Phase 1
3.2 PFLOP/s

SuperMUC Phase 2
3.2 PFLOP/s

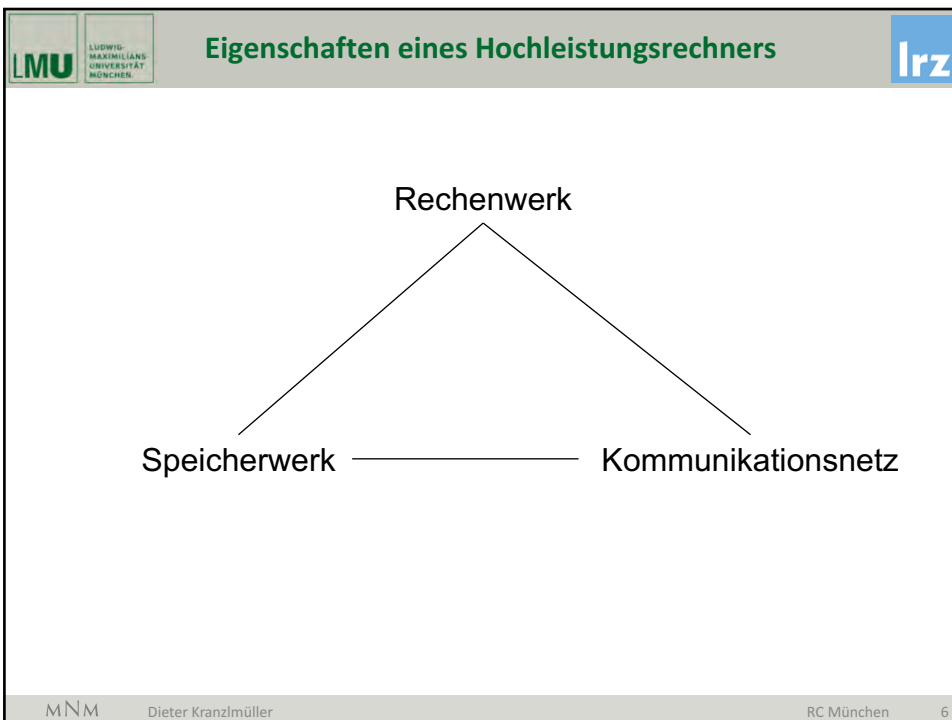
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LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN **Top 500 Supercomputer List (June 2012)** lrz

Rank	Site	Computer/Year Vendor	Cores	R_{max}	R_{peak}	Power
1	DOE/NNSA/LLNL United States	Sequoia - BlueGene/Q, Power BQC 16C 1.60 GHz, Custom / 2011 IBM	1572864	16324.75	20132.66	7890.0
2	RIKEN Advanced Institute for Computational Science (AICS) Japan	K computer , SPARC64 VIIIix 2.0GHz, Tofu interconnect / 2011 Fujitsu	705024	10510.00	11280.38	12659.9
3	DOE/SC/Argonne National Laboratory United States	Mira - BlueGene/Q, Power BQC 16C 1.60GHz, Custom / 2012 IBM	786432	8162.38	10066.33	3945.0
4	Leibniz Rechenzentrum Germany	SuperMUC - iDataPlex DX360M4, Xeon E5-2680 8C 2.70GHz, Infiniband FDR / 2012 IBM	147456	2897.00	3185.05	3422.7
5	National Supercomputing Center in Tianjin China	Tianhe-1A - NUDT YH MPP, Xeon X5670 6C 2.93 GHz, NVIDIA 2050 / 2010 NUDT	186368	2566.00	4701.00	4040.0
6	DOE/SC/Oak Ridge National Laboratory United States	Jaguar - Cray XK6, Opteron 6274 16C 2.200GHz, Cray Gemini interconnect, NVIDIA 2090 / 2009 Cray Inc.	298592	1941.00	2627.61	5142.0
7	CINECA Italy	Fermi - BlueGene/Q, Power BQC 16C 1.60GHz, Custom / 2012 IBM	163840	1725.49	2097.15	821.9
8	Forschungszentrum Juelich (FZJ) Germany	JuQUEEN - BlueGene/Q, Power BQC 16C 1.60GHz, Custom / 2012 IBM	131072	1380.39	1677.72	657.5
9	CEA/GCC-GENCI France	Curie thin nodes - Bullx B510, Xeon E5- 2680 8C 2.700GHz, Infiniband QDR / 2012 Bull	77184	1359.00	1667.17	2251.0
10	National Supercomputing Centre in Shenzhen (NSCS) China	Nebulae - Dawning TC3600 Blade System, Xeon X5650 6C 2.66GHz, Infiniband QDR, NVIDIA 2050 / 2010 Dawning	120640	1271.00	2984.30	2580.0

www.top500.org

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LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN **Phylogenetic Tree Computation** lrz

ACGT
ACC
ACGG
AAGC

ACGT
ACC-
ACGG
AAGC

Sequencing → Alignment → Phylogenetic Tree

Alexandros Stamatakis, H-ITS

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LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN **# of possible trees for 150 species** lrz

- 4226517247809112252219618802377042809718932383449
8822942857479880831434032178759024536798491951168
3076494692867414802738570221298292428457687814873
4552121861861600804474608426626044448936698500560
2468116186441264227425440726676614927906540649360
2976397461917469326750931190889241406694054603576
66015625
- $\approx 4.22 \times 10^{301}$

1KITE Dataflow

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Wissenschaftliche Publikationen

lrz

Does DNA act as a telephone line? p. 1214

Mutations enhancing leukemia development p. 1222 & 1223

A stable gold support gives sharper resolution p. 1277

Science 310 12 DECEMBER 2014 sciencemag.org AAAS

SPECIAL ISSUE

Avian genomes

Sequencing across the bird species tree p. 1305

All aTwitter over an Internet study p. 1332

The extragalactic background's uneven glow p. 1333 & 1334

A cellular target for human norovirus p. 1335 & 1336

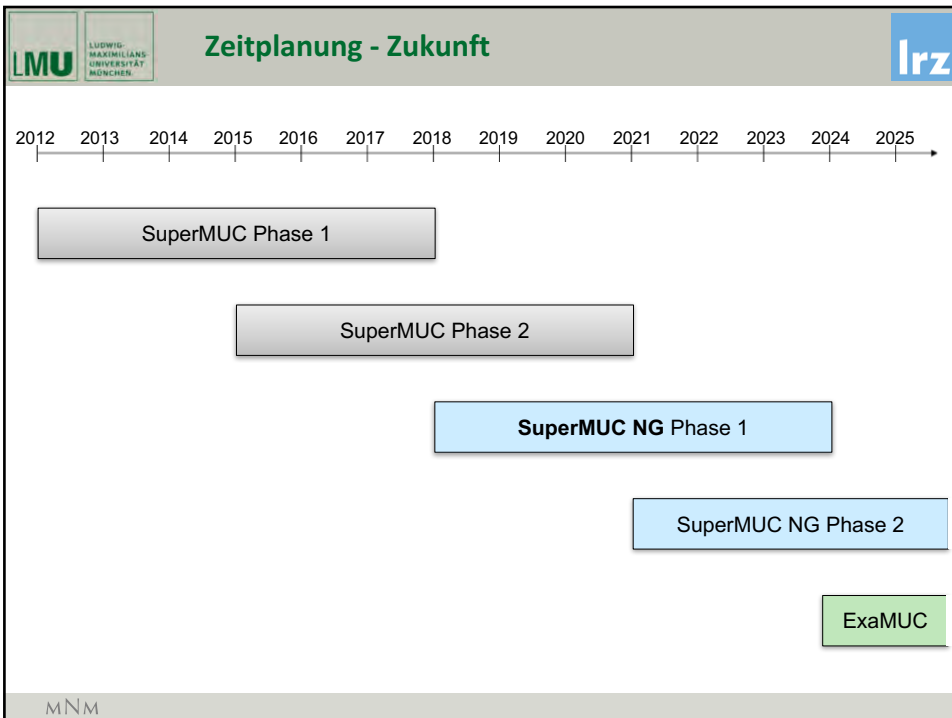
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Insect phylogeny resolved

Molecular insights into insect origins and evolution p. 1000

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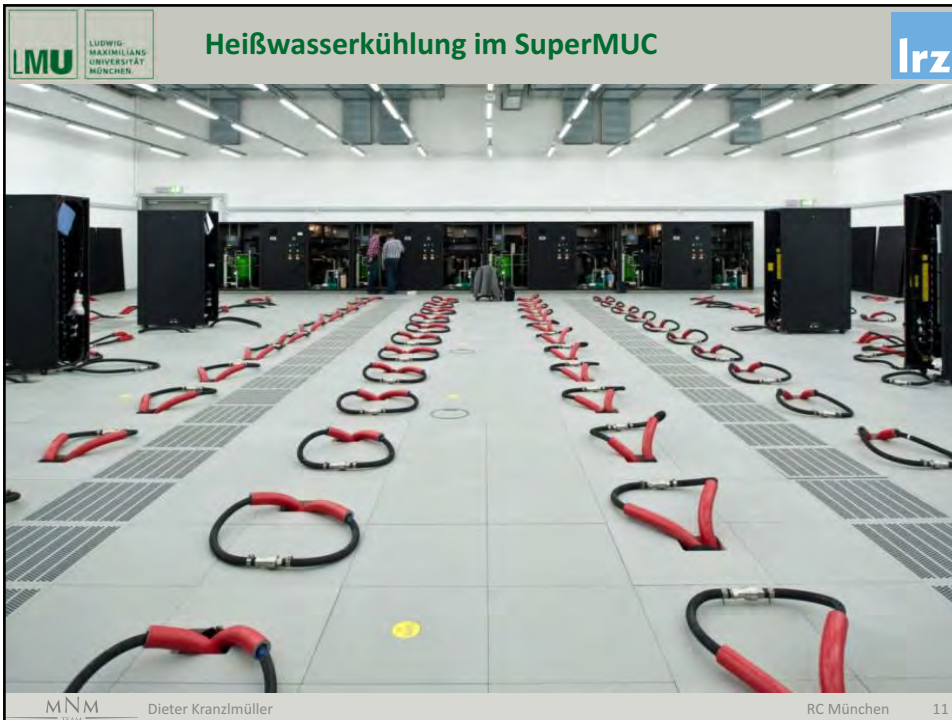
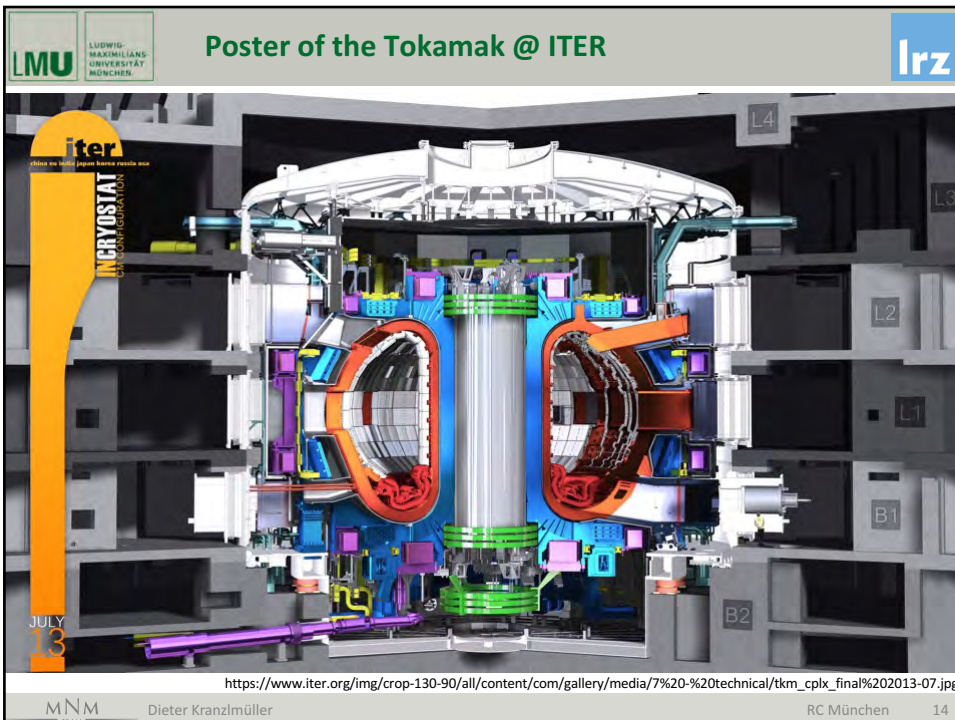


Photo: ITER Organization/EJF Riche, August 2017



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