

High Performance Computing in CAS

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Supercomputing Center, CNIC, CAS



Outline

- Computing Environment and Resources
- Key Applications
- Computing Grid in CAS

Computing Environment and Resources

History of SCCAS

- In 1978, Computing Center of Chinese Academy of Sciences was founded.
- In 1996, Department of supercomputing, CNIC was established.
- In 2001, Supercomputing Center of Chinese Academy of Sciences



Computing Resource Upgrade in SCCAS

- In 1996, SGI Power Challenge XL

- 6.4Gflops
- 16 CPUs



- In 1998: Hitachi SRR201

- 9.6GFlops
- 32CPUs



Computing Resources Upgrade in SCCAS

- In 2000, Dawning 2000II manufactured in China
 - 111.7Gflops
 - 164 CPUs



Computing Resources Upgrade in SCCAS

● In 2003, Lenovo DeepComp6800

- 5Tflops, 1024 CPUs
- TOP500: No.14; China TOP100: No.1
- FIRST supercomputer rank in top 20 on the TOP500 list and manufactured by China's Vendor



Current Supercomputer

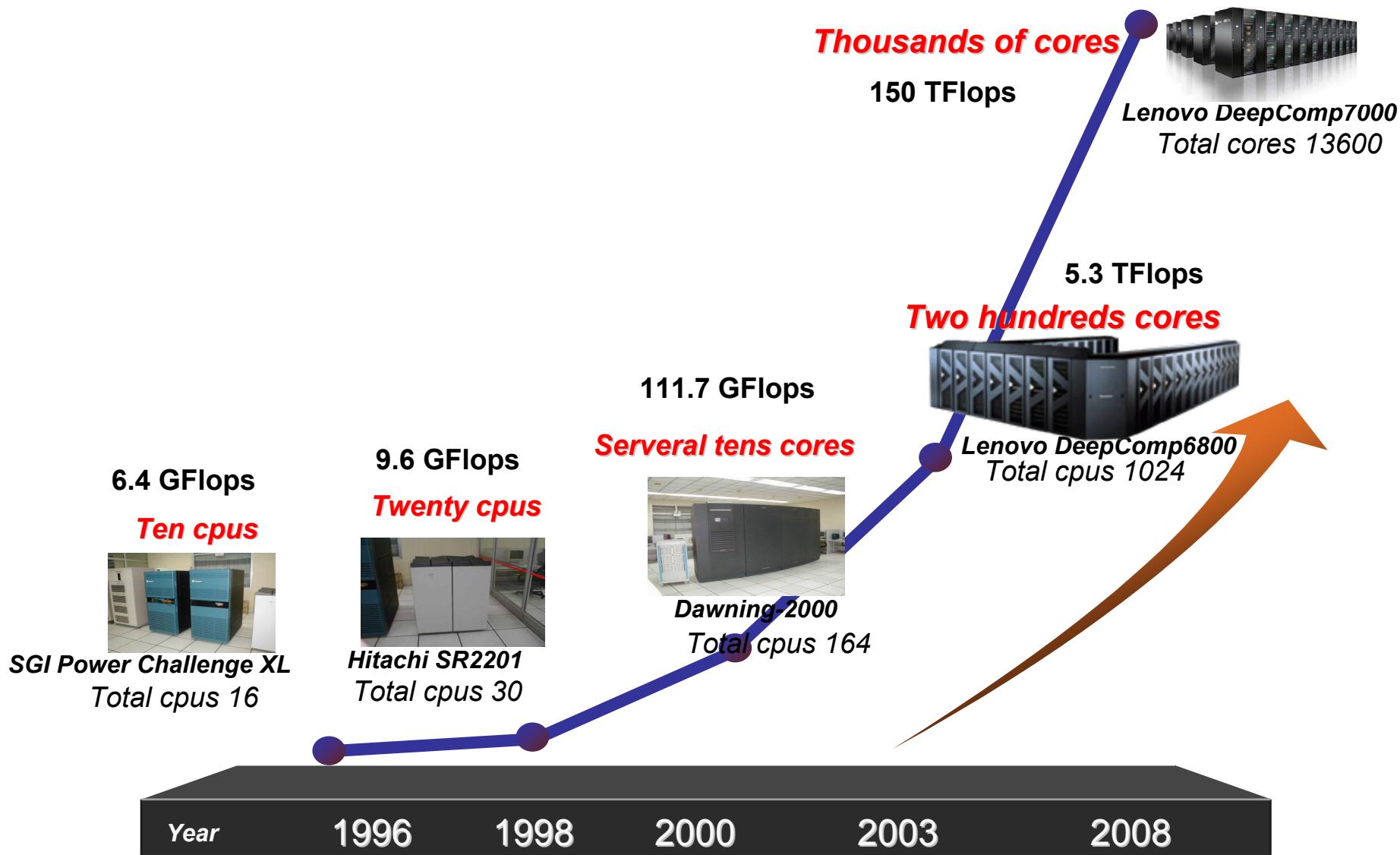


- TOP 500, Rank 31
(June, 2009)
- Came online in April,
2009

- Lenovo DeepComp 7000
 - Mixed architecture (Xeon + Itanium2)
 - More than 12,000 cores
 - Peak performance: 146TFlops
 - More than 40TB memory
 - 350TB on-line storage, 1PB off-line storage
 - 4X DDR Infiniband Interconnected
 - Lustre, SNFS, IBM GPFS, SGI CXFS file system
 - Linux OS

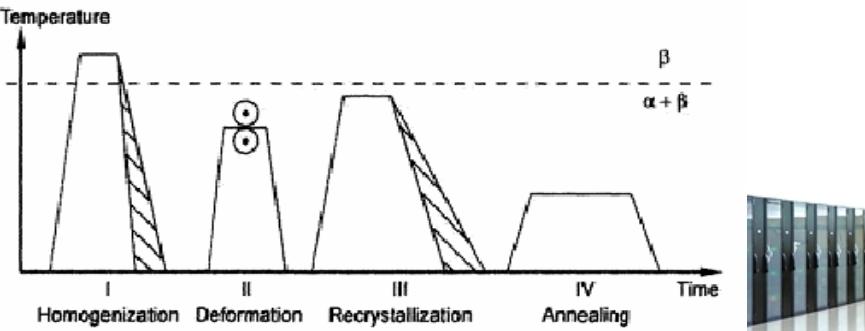
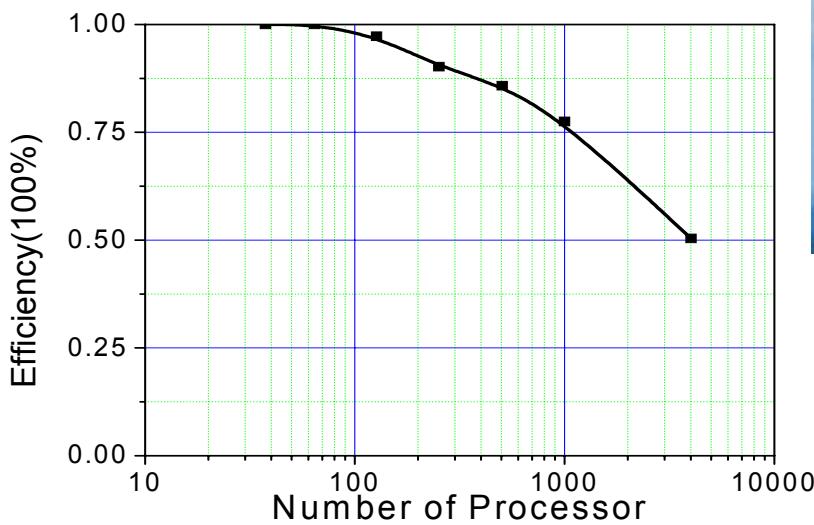
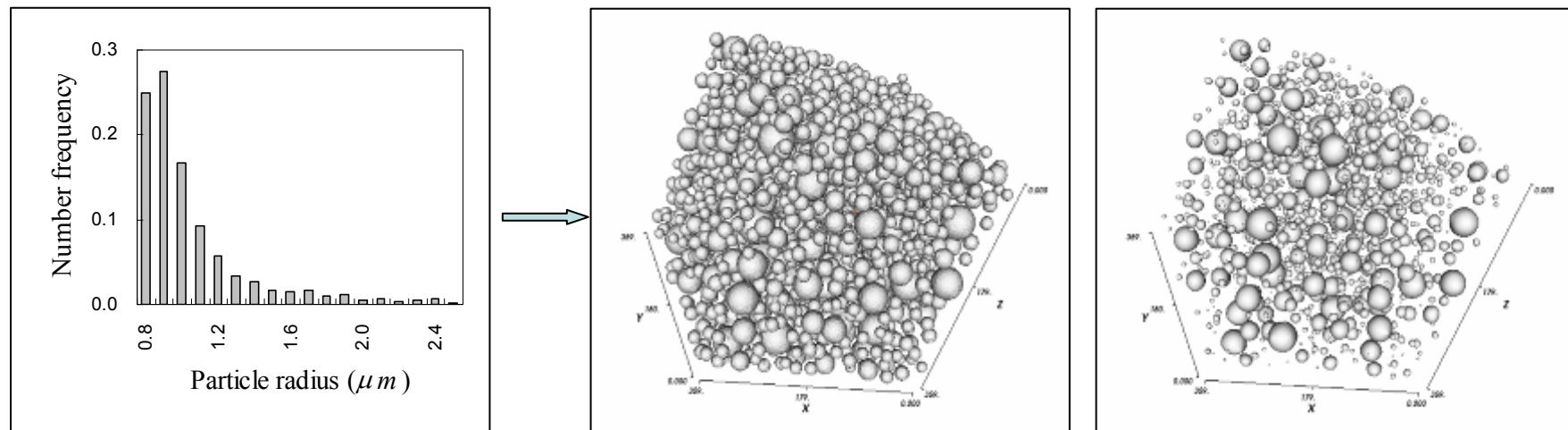


Growing Computing Scale



Key Applications

The Large-Scale Parallel Simulation for Deformation of Titanium Alloys Microstructure Evolution under High Temperature



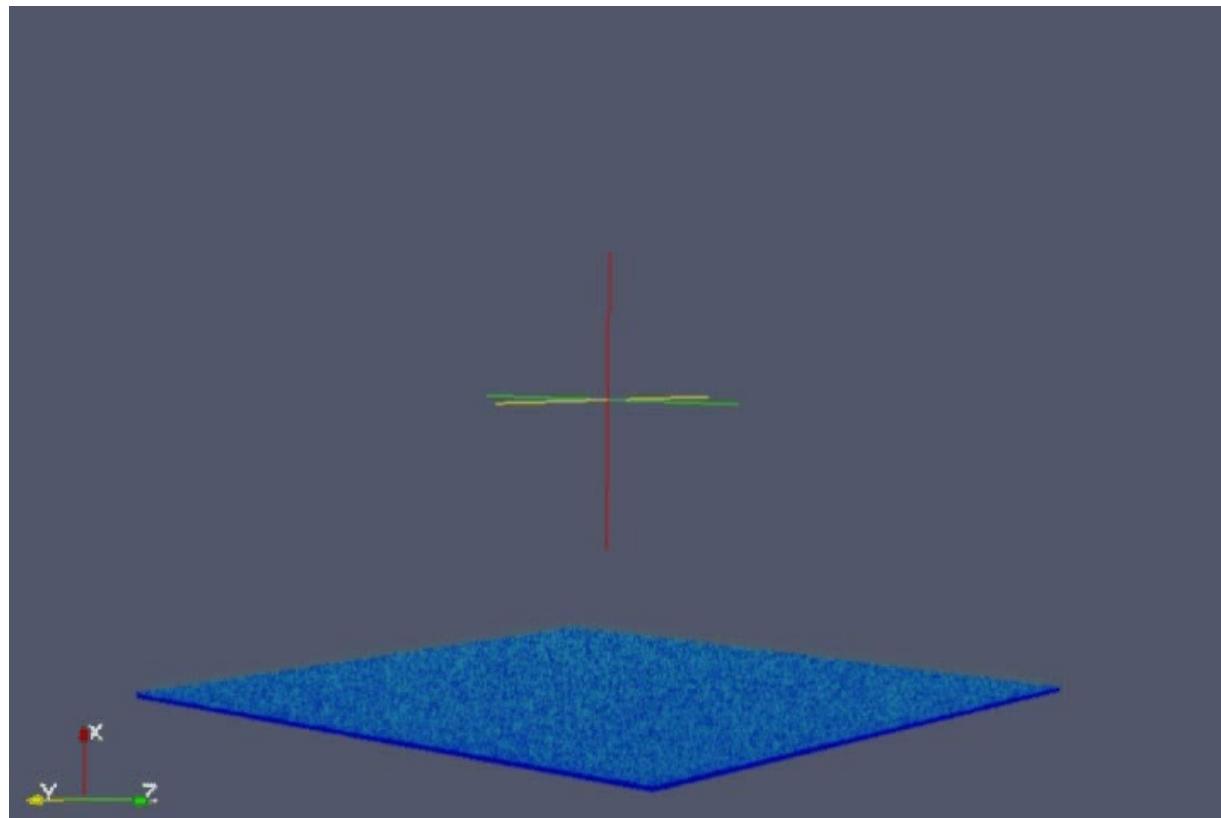
Processing route for fully equiaxed microstructures of $\alpha + \beta$ titanium alloys slowly cooled from the bi-modal recrystallization annealing temperature (schematically)



Titanium phase field computing

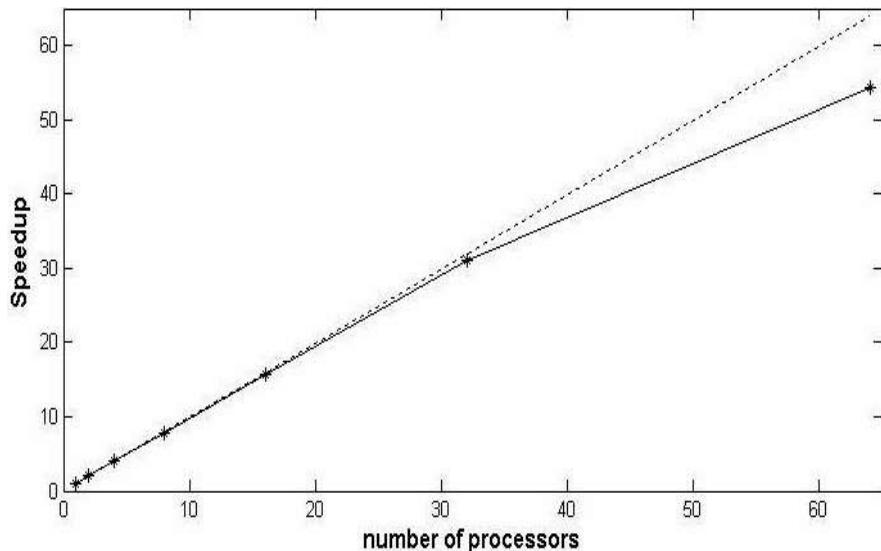
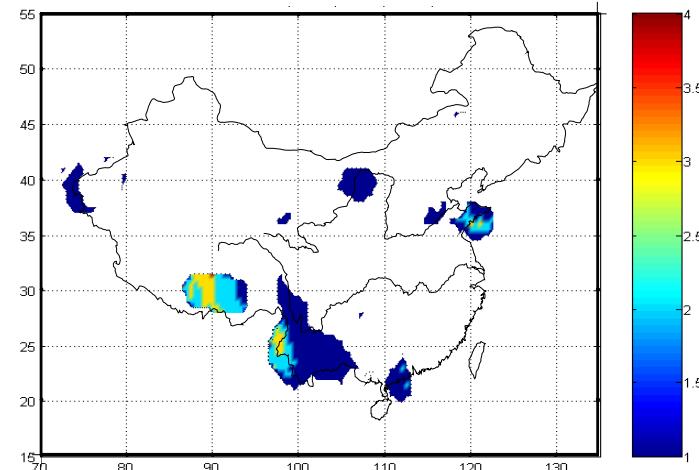
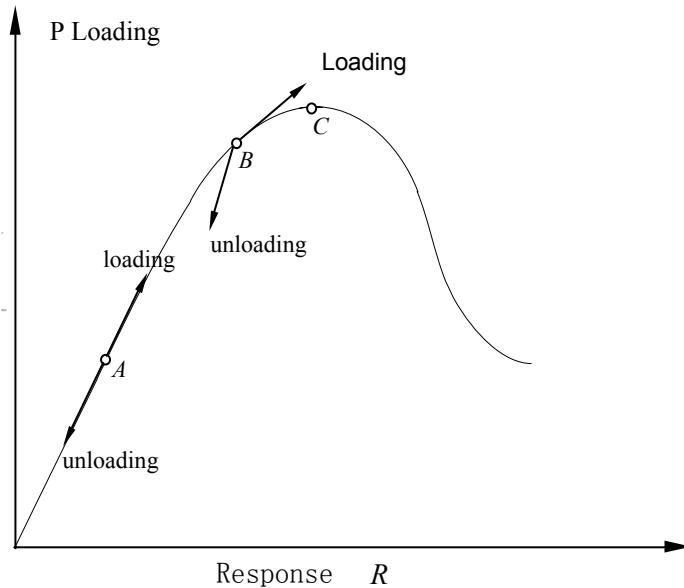
1024^3

core	64	128	256	512	1024	2048
time	1261s	634s	304s	152s	77s	39s
eff	100%	99.5%	104%	104%	102%	100%





Earthquake Prediction and LURR (Load/Unload Response Ratio)



(三) 您的“加载响应比”方法方向对头，已经过实践验证。但正如您说的，还需要进一步完善。怎样进一步完善？我建议参考前人及同代的地震学工作，把他们的工作纳入您的思路，切莫排他人于门外！如翁文波院士的工作，如美国已故 G. Housner 的工作；还祝您为祖国的地震预报作出新贡献！
此致
敬礼！

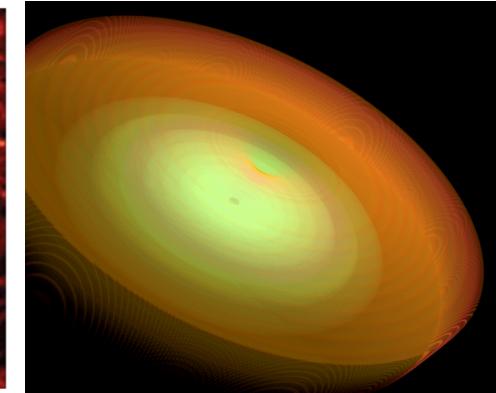
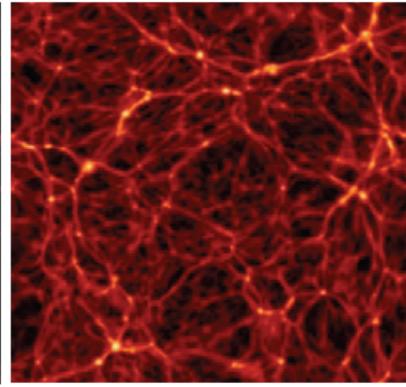
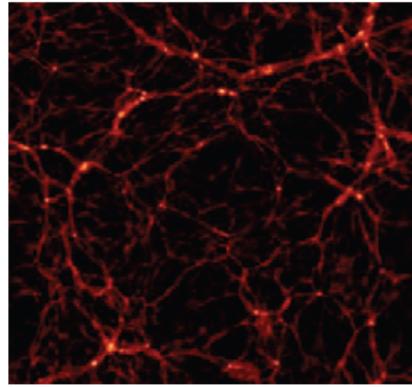
钱学森
1995.3.15



Simulation on WenChuan earthquake

Cores	100	200	1000
Time (hrs)	1.9955	1.1916	0.2525
Eff	100%	83.73%	79.03%



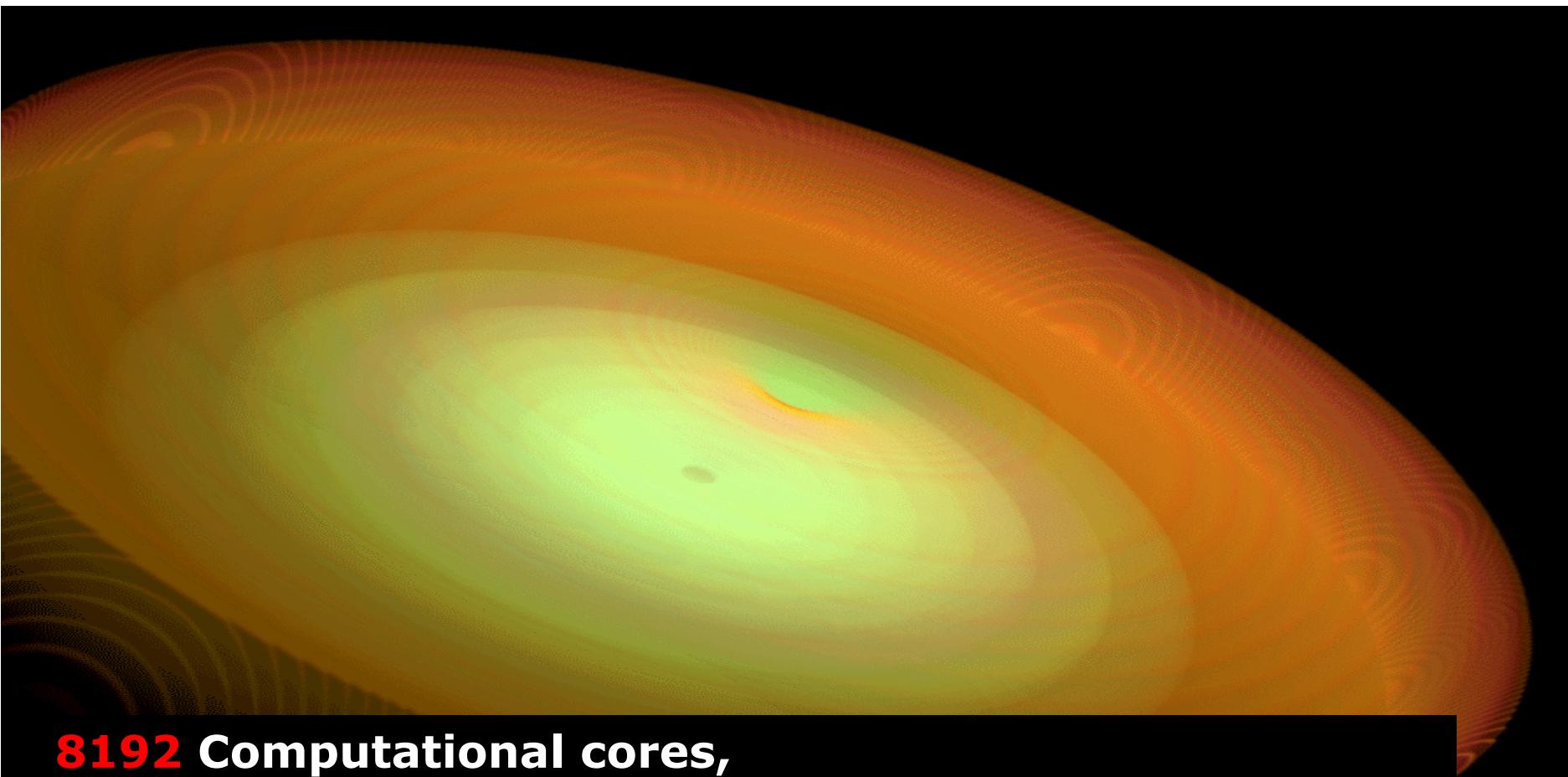


- **Hydro Solver: 5th / 9th WENO Scheme**
- **Gravity Solver: Particle-Mesh Method**
- **Time Discretization: 3th Low Storage Runge-Kutta Method / 3th TVD Rung-Kutta Method**
- **Chemistry + Cooling + Heating +UV Background**
- **Feedback: Star Formation + Supernova Explosion (Kinetic and Chemical Feedback)**
- **Boundary Condition: Periodic or Isolated**
- **Adaptive Mesh Refinement (AMR) for WIDGEON (Ongoing project with Shu Chiwang, Qiu Jinmei, & Wang Long)**
- **Radiative Transfer (Ongoing Project with Shu Chiwang & Fang Lizhi)**
- **Visualization (Ongoing Project with Shan Guihua & Wang Long)**



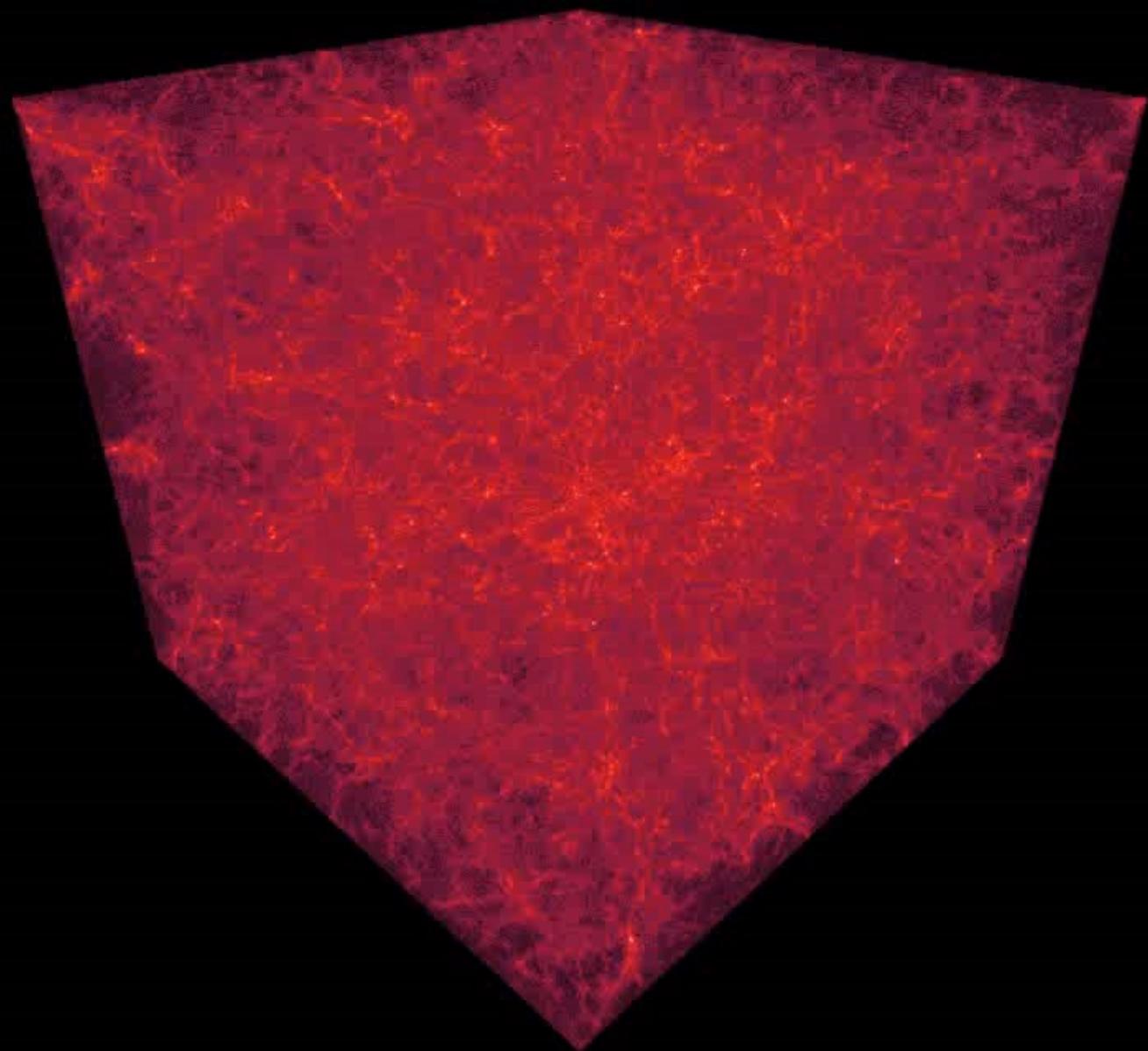
中国科学院
计算机网络信息中心
Computer Network Information Center
Chinese Academy of Sciences

Galactic Wind Simulation



8192 Computational cores,

**Internationally advanced both in computational scale
and speed**

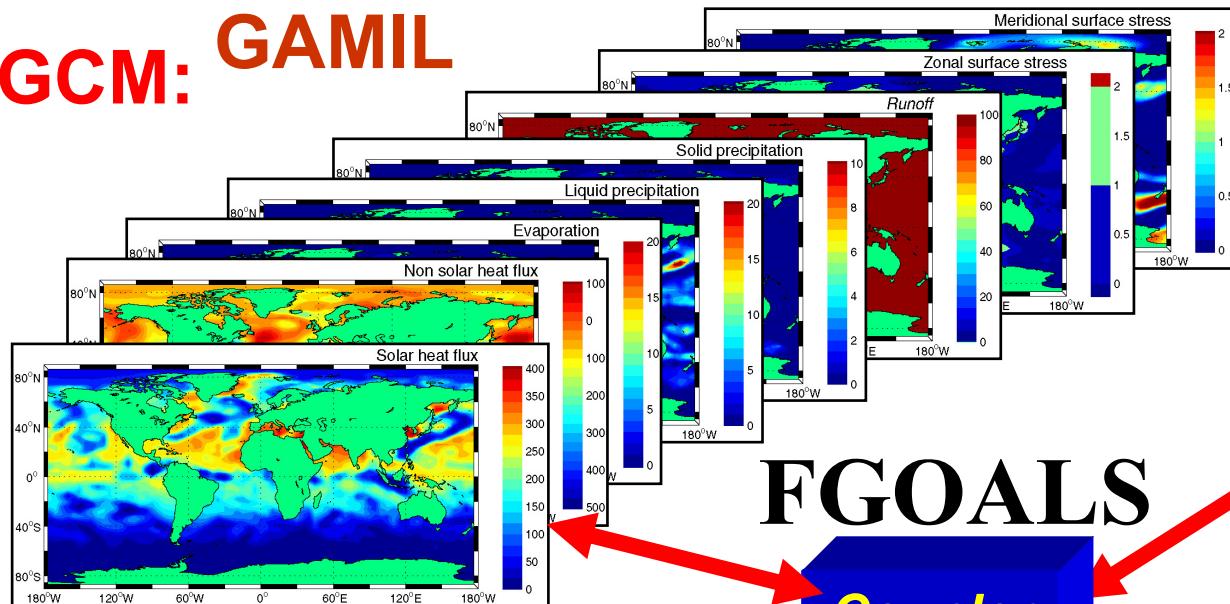




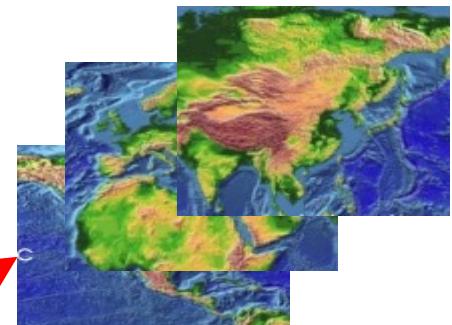
中国科学院
计算机网络信息中心
Computer Network Information Centers
Chinese Academy of Sciences

LASG Climate Model (FGOALS)

AGCM: GAMIL

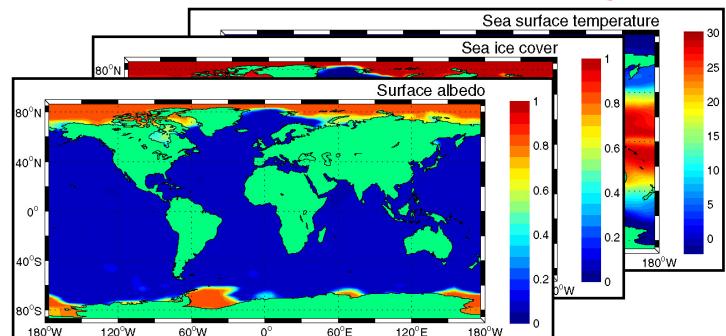


land:CLM

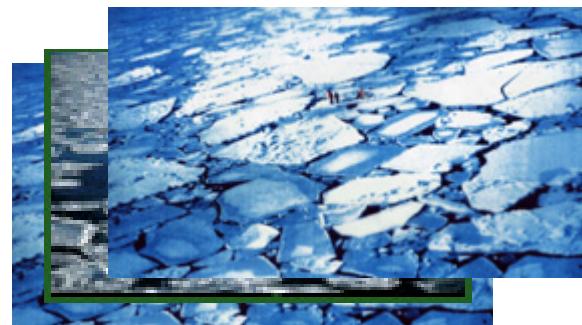


FGOALS

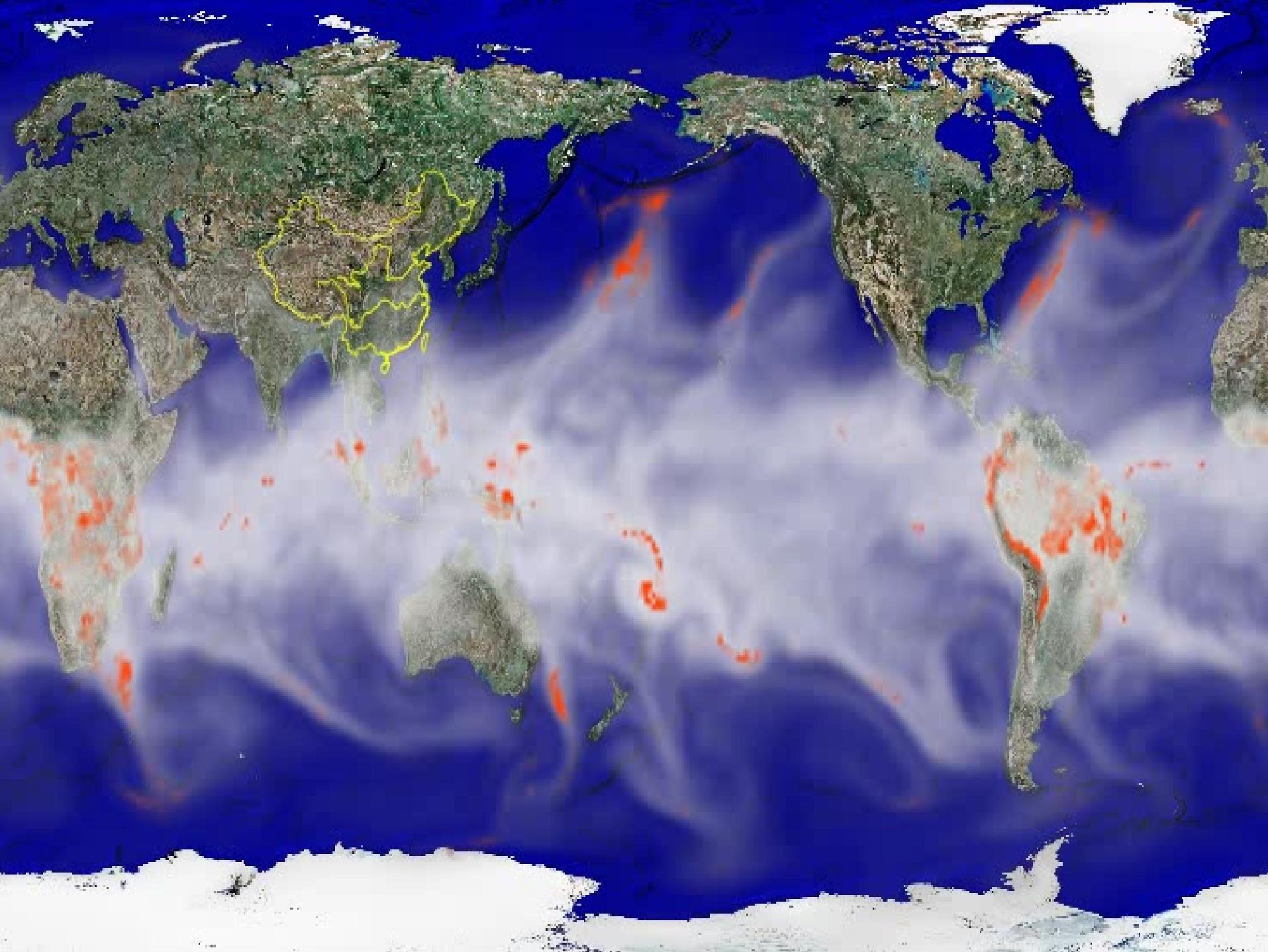
Coupler
(*cpl5*)



OGCM:LICOM



ICE:CICE



Scanning Electron Microscopy (SEM) image

5 nm

FDC: High-Energy Physics Code

Input for a physical process: process, physical model,
Many options, histograms, scatter plots.

Generate Feynman Diagram

Manipulate amplitudes for each diagram and generate FORTRAN source for calculation of amplitudes square

Find and properly treat all the resonance, t-channel singularities, ... and generate FORTRAN source for phase space integral and fitting

Control flag and parameters files generated by FDC which can be changed later by users:
flag.inp, amptable.inp, fpara.inp, reson.inp

Users should prepare two files:
pdata1.dat – experiment events data file
pdata1.mc – phase space monte carlo event file

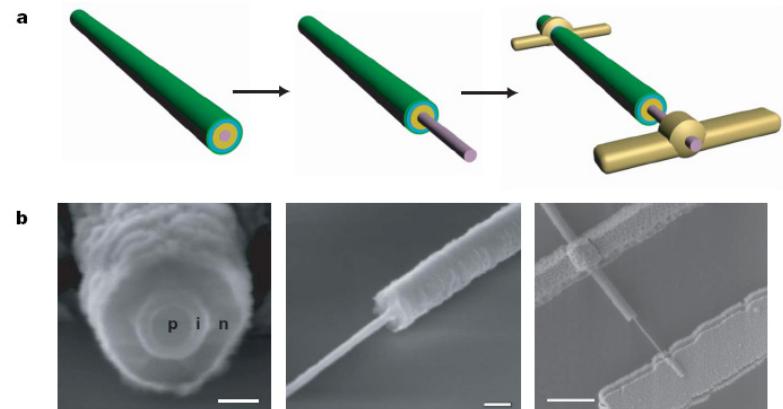
Compile FORTRAN programs and run 'fit' for likelihood fitting

Output: mplot.info, pep.res, mplot.hbook, dplot.hbook

III-V Semiconductor Nanowires

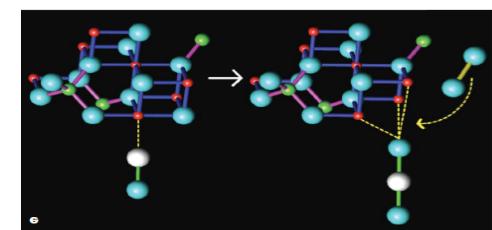
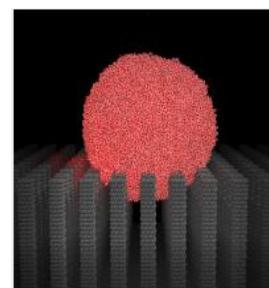
- Supercomputing for large-diameter III-V wide bandgap semiconductor nanowires (above 1000 CPU cores)

- Structure
- Mechanical properties
- Electrical properties
- Growth conditions

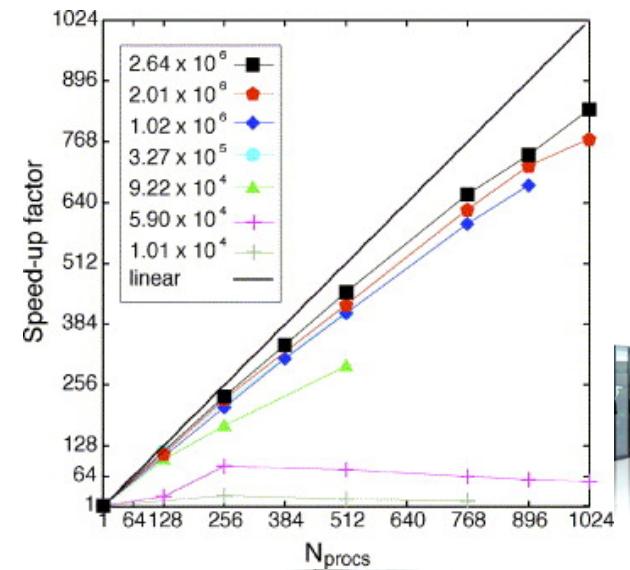
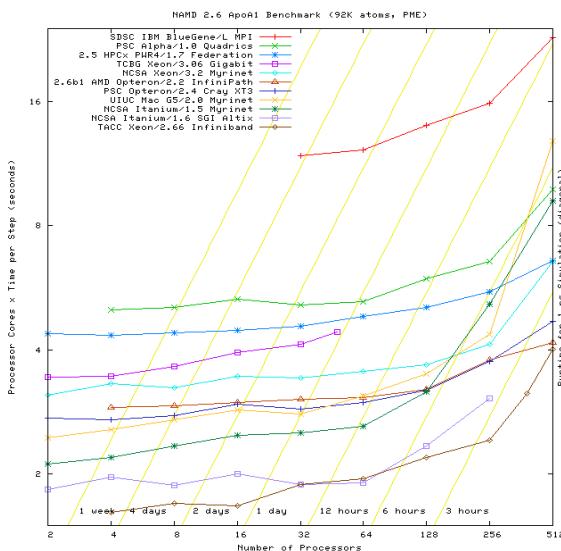
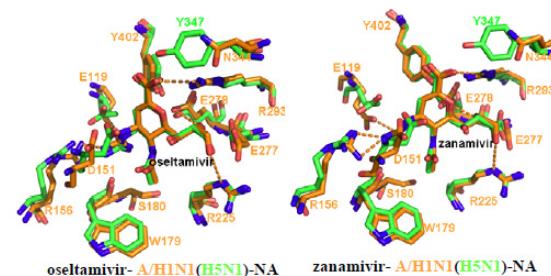
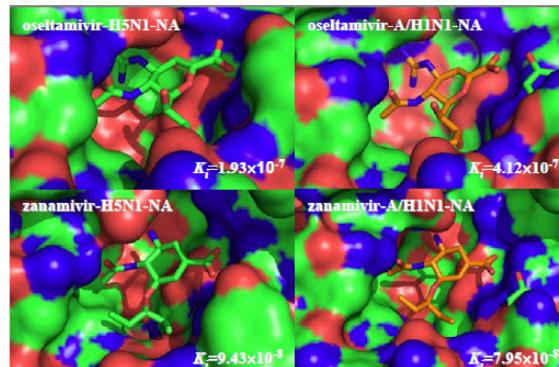
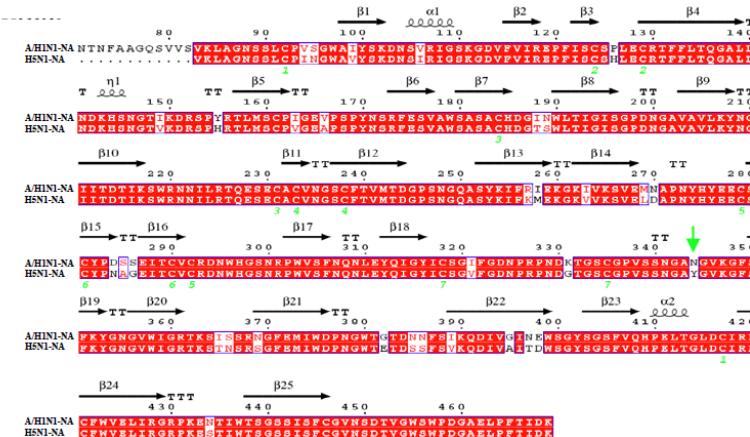
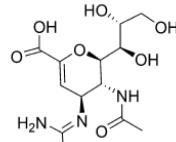
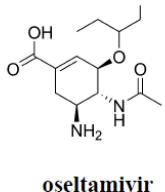


- Application

- Bio-functional interface
- Surface properties of micro-nano structure
- Nano-Heterogeneous Catalysis



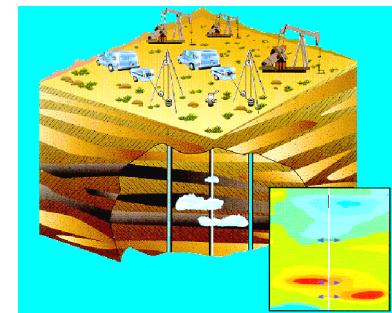
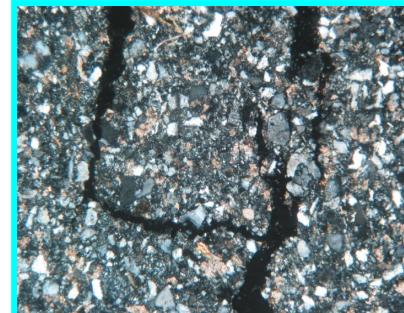
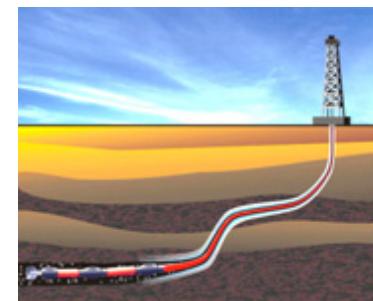
Virtual Drug Screening



Up to 5000 cores

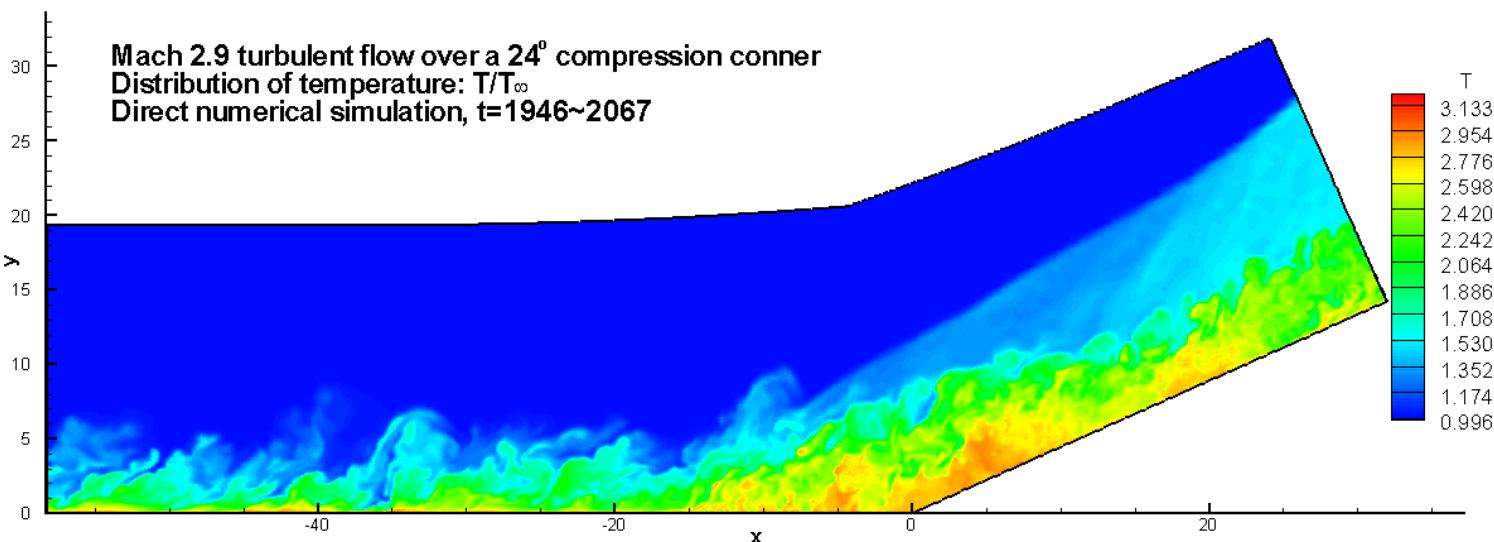
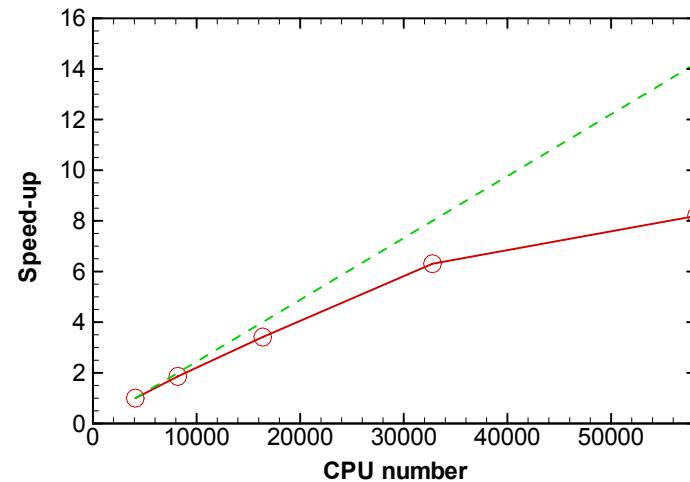
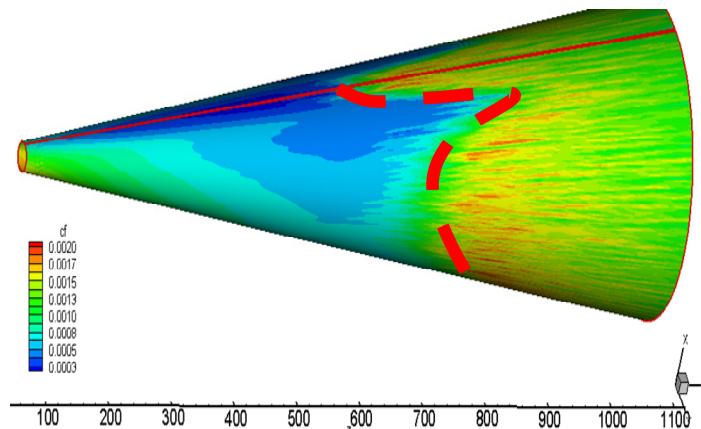
Oil & Gas Exploration

- West China (oil & gas deep in mountain or desert) or deep ocean
- Big number of complex, Inhomogeneous oil & gas Reservoirs existing
- Sound Field (Elastic Wave Field) numerical simulation
- mm-level fracture and km-level model
- Huge computation, Big memory requirement





Computational Fluid Dynamics





中国科学院
计算机网络信息中心
Computer Network Information Center
Chinese Academy of Sciences

Computing Grid in CAS

Chinese Scientific Computing Grid

- Three-level grid computing environment (a.k.a ScGrid) is one of the key projects in the construction of CAS e-Science during the 11th five-year plan.
- Provide support and services for the Knowledge Innovation of CAS
- To be the kernel of infrastructure and organization of China National Grid (CNGrid)

ScGrid Overview

- **Extension of traditional computing grid**
 - multi-tree structure, like a pyramid matrix
- **ScGrid nodes are not functionally equal**
 - root or master node administrate the whole system
 - easy to operate and manage in CAS

ScGrid Overview

● Architecture

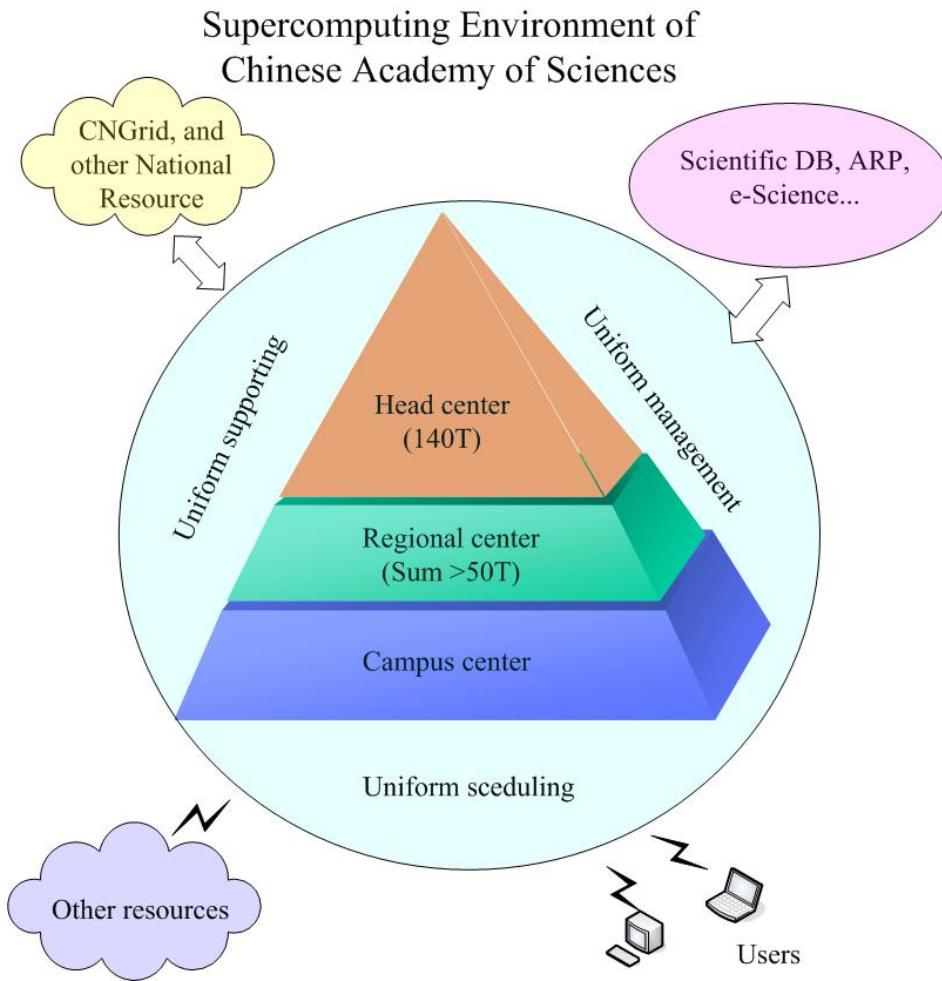
- Top - 150 Tflops
 - ✓ SCCAS, 2009
- Middle - 10 Tflops each
 - ✓ 10 nodes
 - ✓ general or specific purpose
- Bottom - 5 Tflops each
 - ✓ ~20 institutes from CAS
 - ✓ general or specific purpose

● Software

- web-based portal
- command line in traditional terminal
- GUI client for Windows users

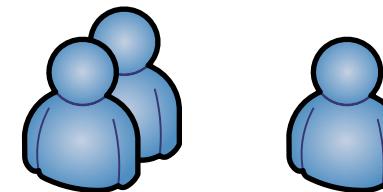


Pyramidal computing resources infrastructure

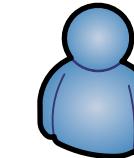


- Knowledge Innovation project of CAS
- Central High Performance Computing infrastructure of China (CNGrid/NCAP)



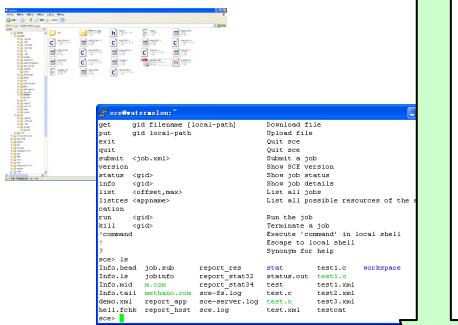


Users

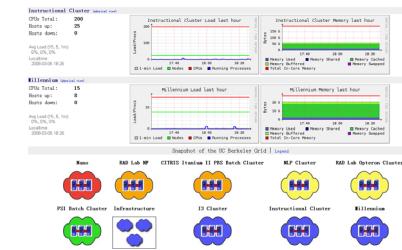
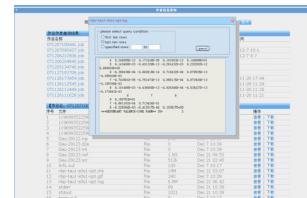


Administrator

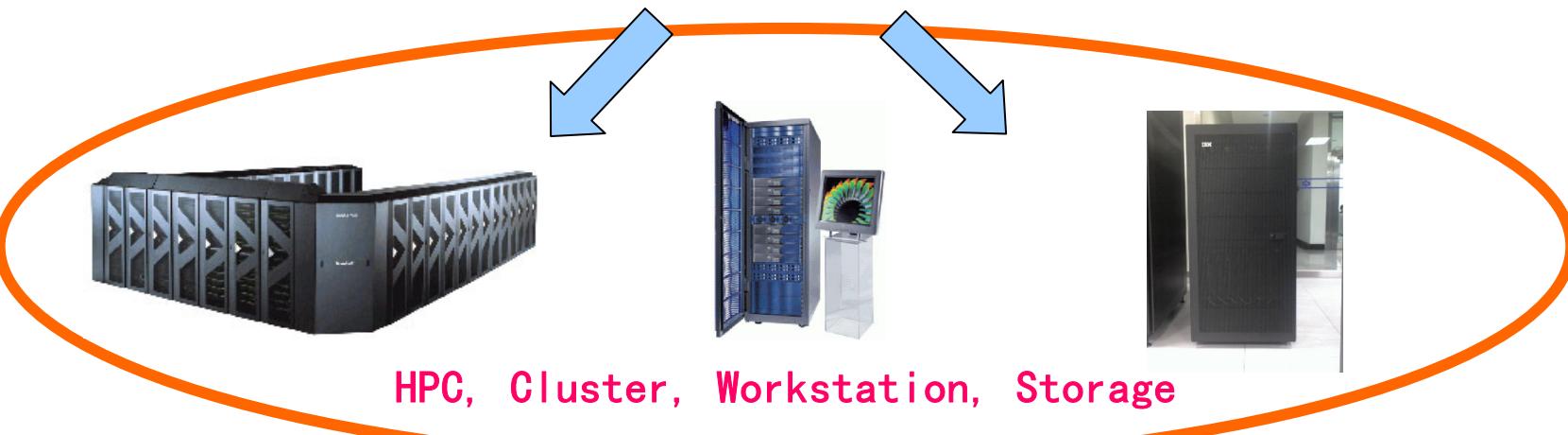
Windows / Linux Clients



Web Portal



Grid Middleware

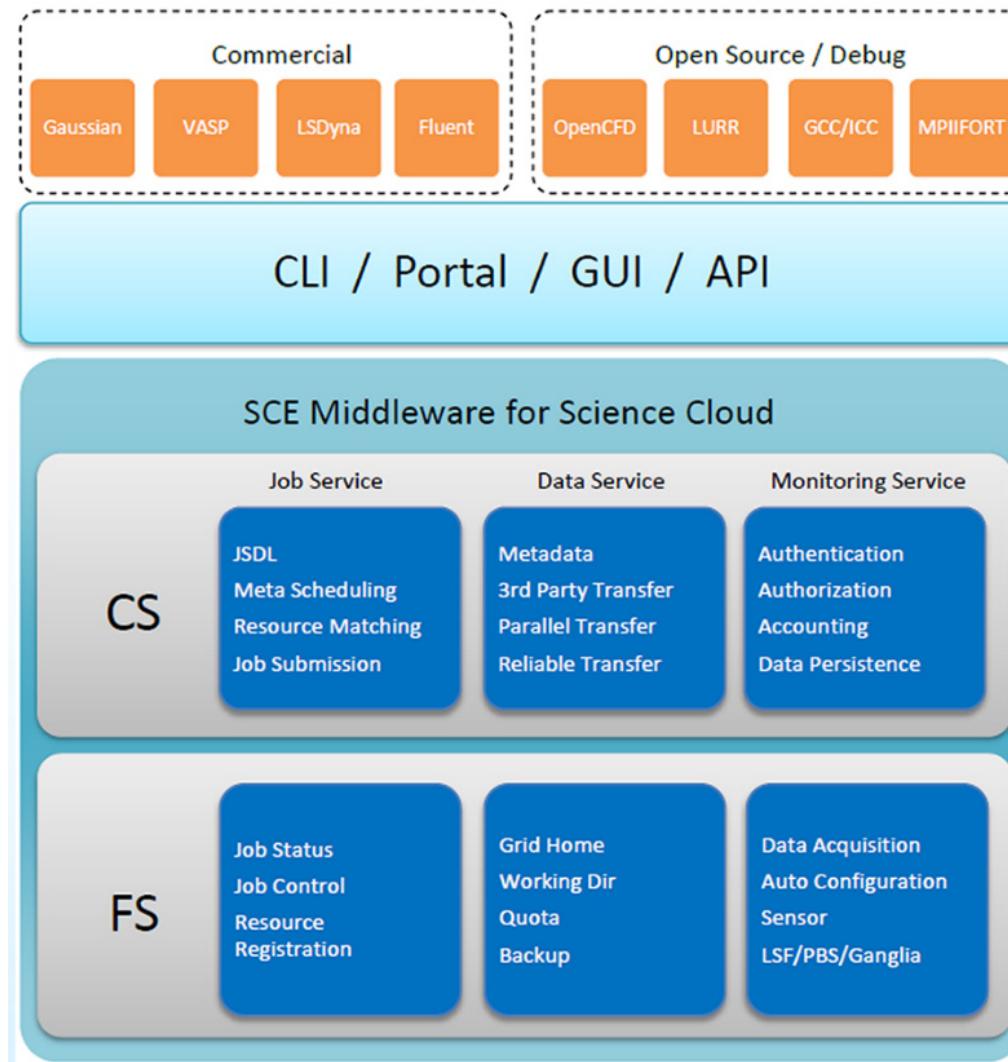


Grid middleware - SCE

- Scientific computing oriented
- Lightweight
 - mainly in C
 - easy to install, configure and maintain
- Robust
 - exception handle
 - fault-tolerant



Grid middleware - SCE



Applications

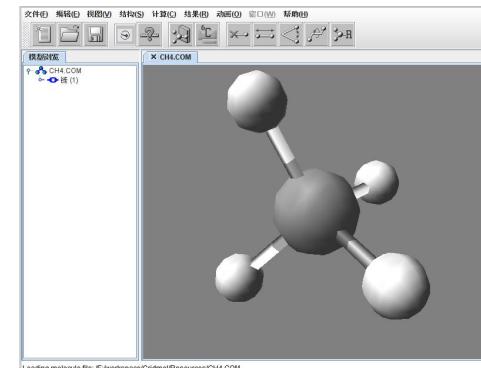
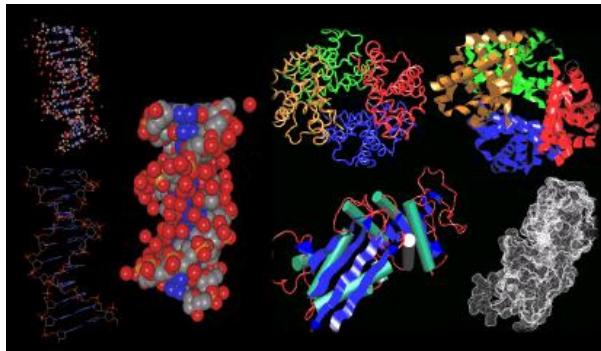
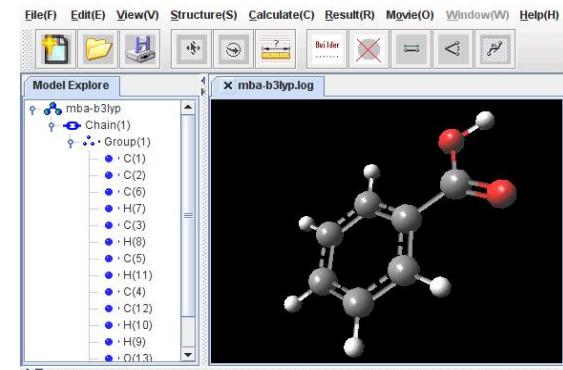
- **Foster 5~6 important demos**

- CPU cores > 1000, efficiency > 60%
- Supported by state key projects, with extremely large output
- Annual cpu time > 1M



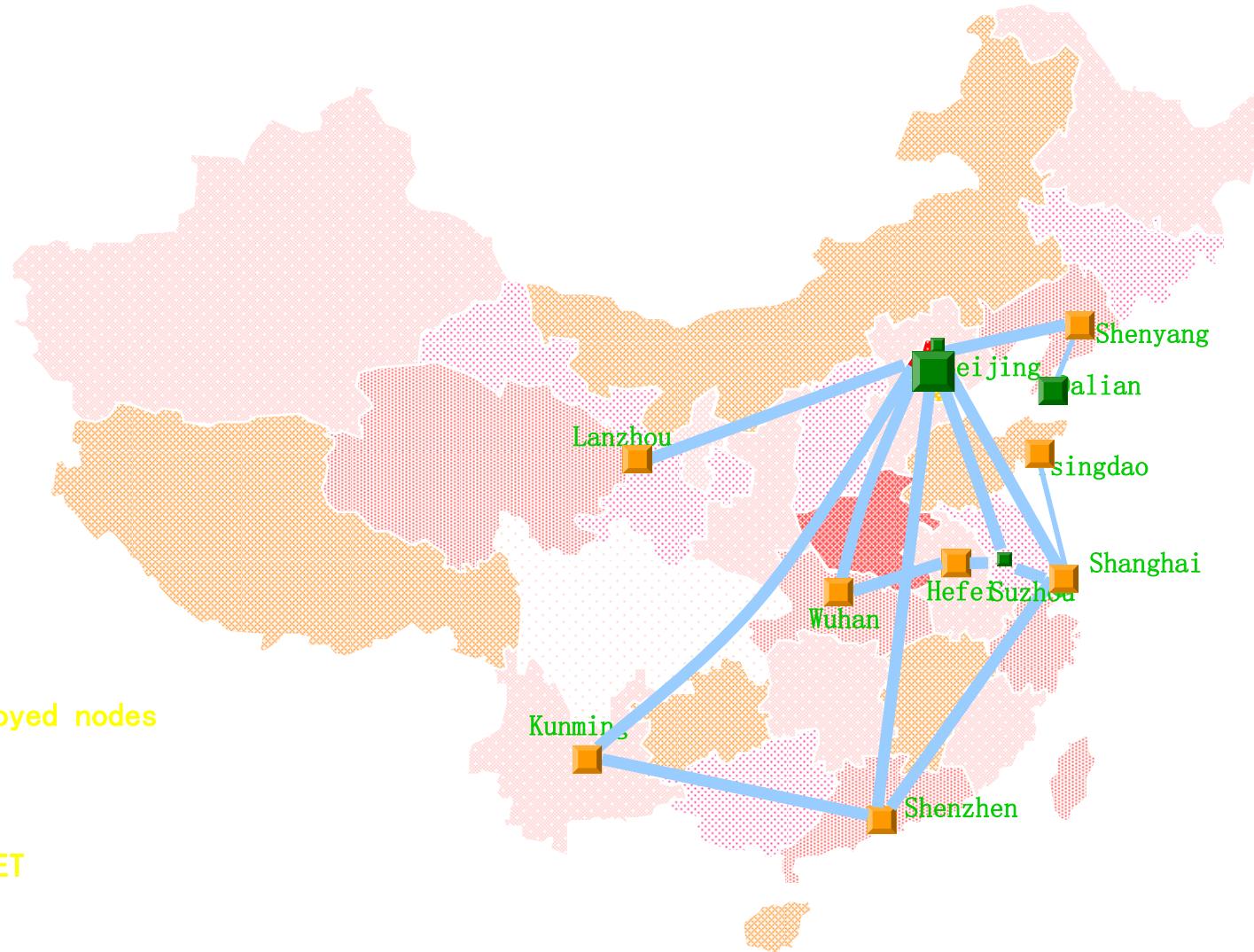
GridMol

- A typical application of SaaS for molecular modeling and visualization in computational chemistry and biology
- One-stop computing service
- Developed by a research group of SCCAS
- Server/Browser architecture
- Java/Java 3D based
- Result analysis
- Job submission
- Website: <http://gridmol.vlcc.cn/>





Map of ScGrid





ScGrid Monitoring

CSCGridEye:: China Science Computing Grid Report - Mozilla Firefox

文件(F) 编辑(E) 查看(V) 历史(S) 书签(I) 工具(T) 帮助(H)

访问最多 Name.com - Domain Name 新手上路 Name.com - Domain A... 最新头条 Google Windows Media http://www.socialne... Windows

http://eye.cscgrid.cn/

刷新

China Science Computing Grid Report for Fri, 21 Aug 2009 10:54:44 +0800

Last hour Sorted descending

China Science Computing Grid > Choose a Source

Choose a Source

CSCGrid Beijing Center

DeepComp 7000

CPUs Total: 3416
Hosts up: 427
Hosts down: 228

Avg Load (15, 5, 1m):
50%, 45%, 43%
取得数据时间:
2009-08-21 10:54

Load/Procs

China Science Computing Grid Load last hour

Bytes

China Science Computing Grid Memory last hour

CSCGridEye:: CB120103 Host Report - Mozilla Firefox

文件(F) 编辑(E) 查看(V) 历史(S) 书签(I) 工具(T) 帮助(H)

访问最多 Name.com - Domain Name 新手上路 Name.com - Domain A... 最新头条 Google Windows Media http://www.socialne... Windows

http://deepcomp7000.cscgrid.cn/?c=Nodes List Two&m=load_one&r=hour&s=descending&hc=4&mc=2&h=CBI

网格作业监控

CSCGridEye:: CB120103 Host -

CB120103 Overview

This host is up and running.

Time and String Metrics

Last Boot Time: Tue, 21 Jul 2009 15:17:50 +0800
Gexec Status: OFF
Gmond Started: Tue, 21 Jul 2009 16:50:55 +0800
Last Reported: 0 days, 0:00:01
Machine Type: x86_64
Operating System: Linux
Operating System Release: 2.6.18-53.el5
Uptime: 1 day, 0:37:06

Constant Metrics

CPU Count: 8 CPUs
CPU Speed: 3000 MHz
Memory Total: 32963608 KB
Swap Space Total: 0 KB

CB120103 Load last hour

CB120103 Memory last hour

CB120103 CPU last hour

CB120103 Network last hour

完成



ScGrid Monitoring

Network Job Monitoring - Mozilla Firefox

文件 (F) 编辑 (E) 查看 (V) 历史 (H) 书签 (S) 工具 (T) 帮助 (H)

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网格作业监控

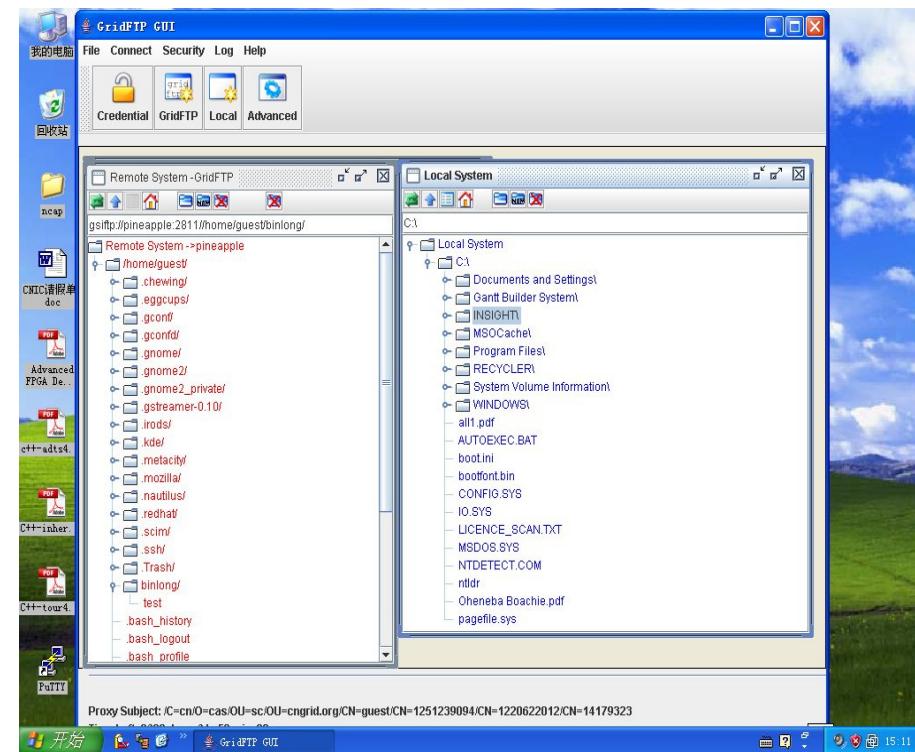
队列列表

队列名	ID	用户名	程序名	核	节点数	队列	提交时间	开始时间	已占用机时 (S)	占用内存 (M)
x64_blades_all	357536	pt0	pt0	1	1	x64_mtgroup	2009/07/16/13:18:53	2009/07/16/13:18:56	441855	1878
altix_dbg	375637	mtgroup	p8_t5w	1	1	x64_mtgroup	2009/07/16/20:54:11	2009/07/16/20:54:16	415351	1574
x64_nut	416598	mtgroup	pt0_t4w_h2w	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
sgrid	421591	mtgroup	z7	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
x64_hxdeng	422251	mtgroup	s200_t150	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
x64_mtgroup	422304	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
x64_mtgroup2	422305	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
x64_3950dbg	422306	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
x64_nanoworm	422307	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
x64_xpan	422308	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
x64_jiphu	422309	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
x64_jjin	422310	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altix_dbg	422311	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
x64_zbj	422312	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
NVGPU	422313	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
fluent	422314	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
cfx	422315	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
cfx_t	422316	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
cfx_sg	422317	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
dyna	422318	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
ansys	422319	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
msi	422320	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
msi_tmp	422321	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
msi_tmp	422322	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
x64_large	422323	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altix_l	422324	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altix_n	422325	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
x64_3950	422326	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altix_s	422327	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_n	422328	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_s	422329	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_t	422330	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_u	422331	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_w	422332	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_x	422333	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_y	422334	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_z	422335	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_a	422336	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_b	422337	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_c	422338	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_d	422339	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_e	422340	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_f	422341	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_g	422342	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_h	422343	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_i	422344	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_j	422345	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_k	422346	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_l	422347	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_m	422348	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_n	422349	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_o	422350	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_p	422351	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_q	422352	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_r	422353	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_s	422354	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_t	422355	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_u	422356	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_v	422357	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_w	422358	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_x	422359	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_y	422360	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_z	422361	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_a	422362	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_b	422363	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_c	422364	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_d	422365	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_e	422366	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_f	422367	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_g	422368	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_h	422369	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_i	422370	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_j	422371	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_k	422372	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_l	422373	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_m	422374	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_n	422375	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_o	422376	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_p	422377	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_q	422378	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_r	422379	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_s	422380	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_t	422381	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_u	422382	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_v	422383	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_w	422384	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_x	422385	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_y	422386	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_z	422387	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_a	422388	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	1624
altbx_b	422389	mtgroup	s200_t200	1	1	x64_mtgroup	2009/07/16/20:54:20	2009/07/16/20:54:24	460520	



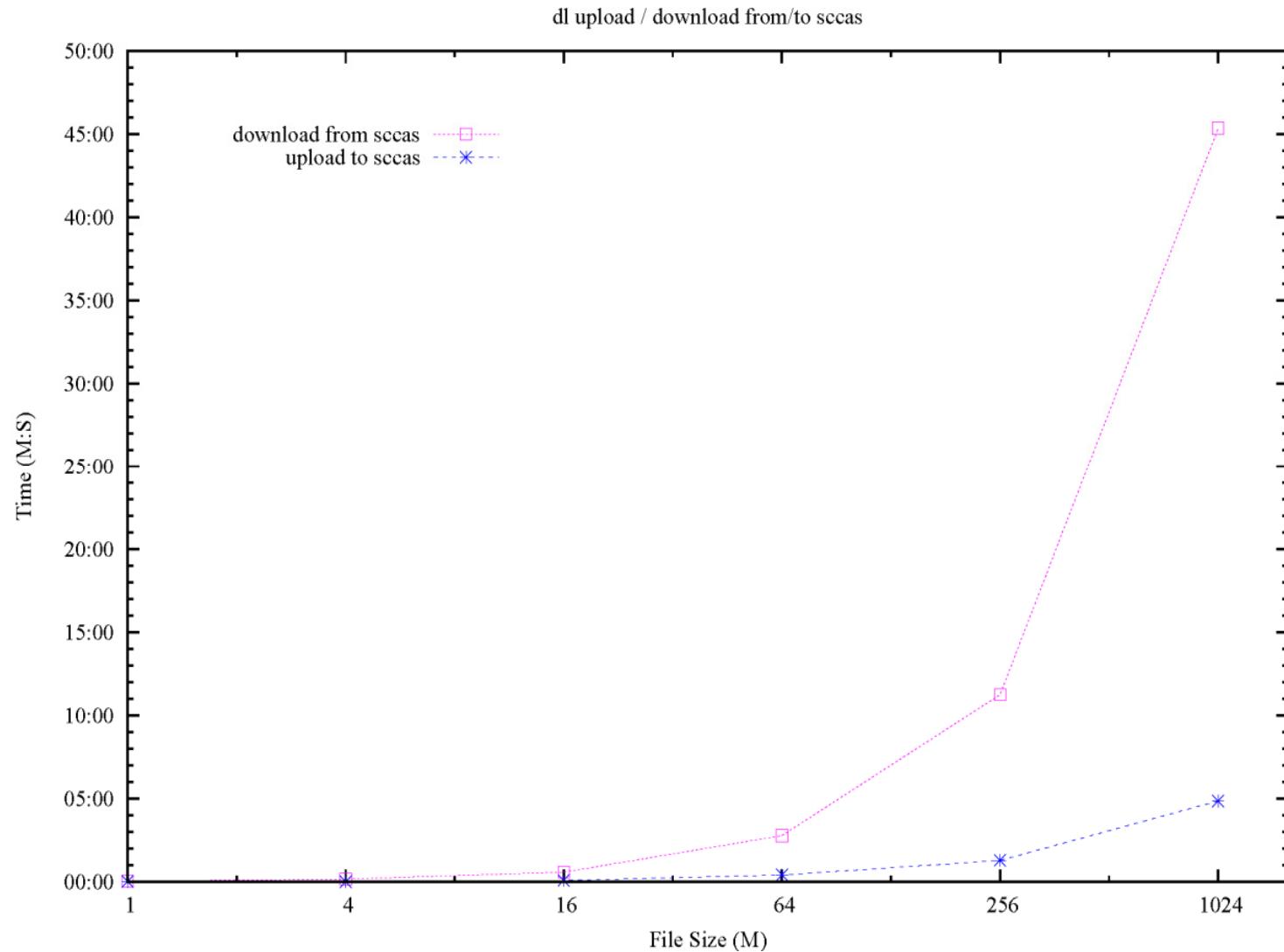
Data transfer (cmd/gui)

```
[guest@apple ~]$  
[guest@apple ~]$ dd if=/dev/urandom of=1000M-test bs=1M count=1000  
[guest@apple ~]$ ls -l  
total 1058836  
-rw-rw-r-- 1 guest guest 1048576000 Mar 30 14:31 1000M-test  
-rw-rw-r-- 1 guest guest 33554432 Mar 30 15:21 32M  
-rw-rw-r-- 1 guest guest 1048576 Mar 23 15:59 test  
[guest@apple ~]$ globus-url-copy -vb file:///home/guest/1000M-test gsiftp://pineapple/tmp/1000M-t  
Source: file:///home/guest/  
Dest: gsiftp://pineapple/tmp/  
1000M-test -> 1000M-t  
  
 1048576 bytes      4.07 MB/sec avg      4.07 MB/sec inst  
 122683392 bytes    93.92 MB/sec avg     116.00 MB/sec inst  
[guest@apple ~]$ es      54.64 MB/sec avg     25.24 MB/sec inst  
[guest@apple ~]$  
[guest@apple ~]$
```



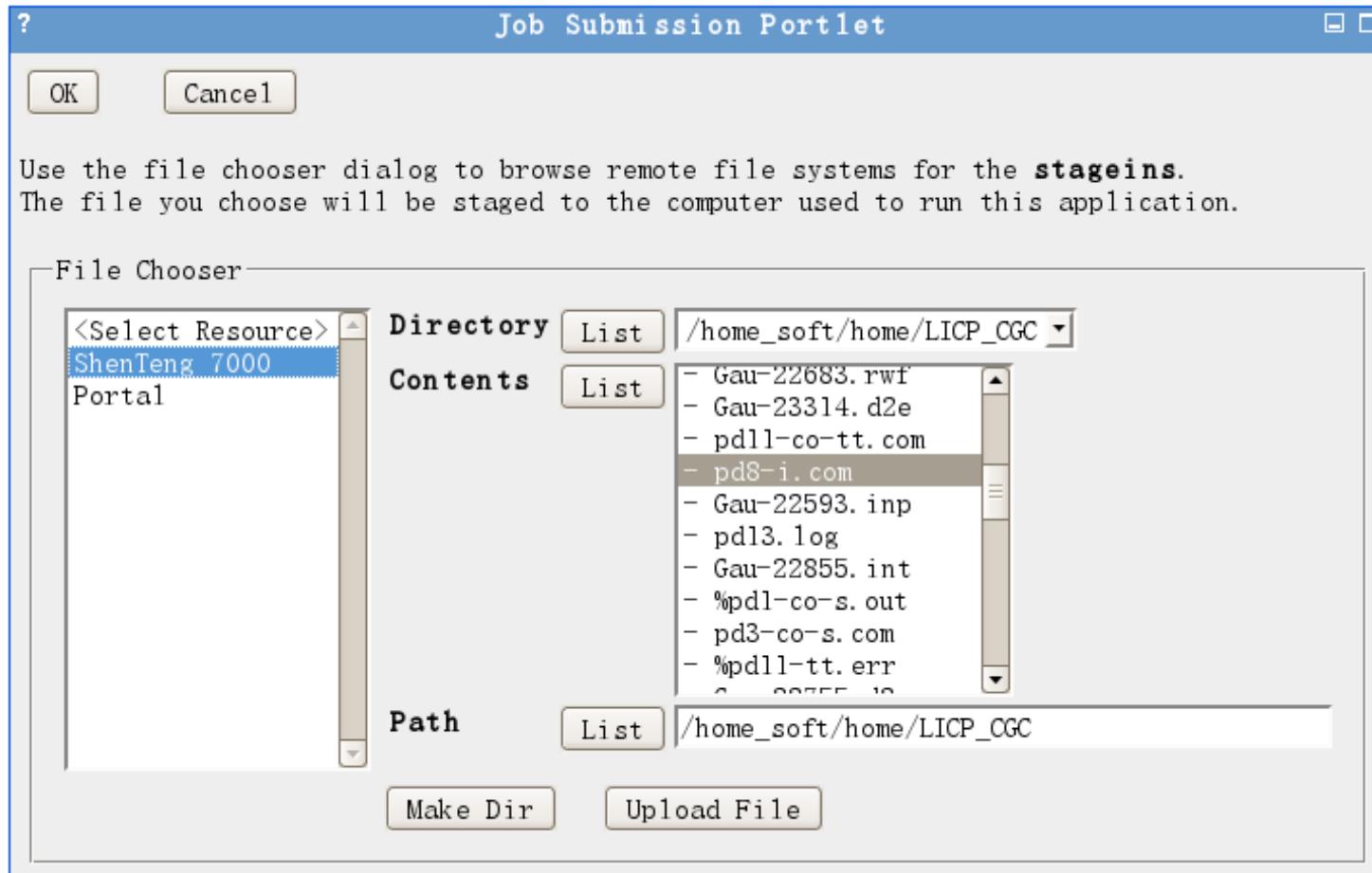


Data transfer performance between master node and sub-node





Data choose from target cluster for a task



Thank You!