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EUChinaGRID Project

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Outline

- ▶ Europe and China
- ▶ Grid Infrastructures across the continents
- ▶ EUChinaGRID
- ▶ Objectives
- ▶ Participants
- ▶ Project Status and Collaborations
- ▶ Achievements
- ▶ Issues
- ▶ Conclusions

Europe and China

- ▶ China is one of the fastest growing economies in the world with a specific infrastructure for Science GRID (CNGrid).
- ▶ Many groups of scientists in Europe have already established good relationships with Chinese Research Groups.
- ▶ Grids can provide an infrastructure to enhance the level of collaboration, deploying new applications and shared access to scientific data.
- ▶ GRID is a reality which allows new ways of sharing resources (not all of them completely exploited) in scientific collaboration (eScience) and in other fields (eGovernment, eHealth, eBusiness, etc.)
- ▶ EU has largely invested in GRID technology in the past 4 years and is planning to invest more in FP7.

GRID Infrastructures across the Continents

- ▶ Few countries are actively involved in the deployment of a (national) GRID infrastructure: one of those is China.
- ▶ A World Wide GRID infrastructure can be of potential benefit for all the applications in 2 main ways (at least):
 - Fostering new international groups/applications.
 - Enabling new kind of world-class collaborative solutions.
- ▶ To make this happen, interoperability and interoperation has to be guaranteed by the middleware and by the different regional infrastructures.

EUChinaGRID Main Objectives

- ▶ Main objective is to support the Interconnection and Interoperability of Grids between Europe and China.
- ▶ Main focus is on two specific infrastructures:
 - CNGRID in China
 - EGEE in Europe
- ▶ Dissemination of advanced knowledge in Grid technology is also a relevant part of the activity.
- ▶ Strengthening the collaboration between scientific groups in both Countries, supporting existing and new Grid applications.

Participants

1	Istituto Nazionale di Fisica Nucleare (IT) (coordinator)
2	European Organisation for Nuclear Research CERN (CH)
3	Dipartimento di Biologia - Università di Roma Tre (IT)
4	Consortium GARR (IT)
5	Greek Research & Technology Network (GR)
6	Jagiellonian University – Medical College, Cracow (PL)
7	School of Computer Science and Engineering – Beihang University Beijing (CN)
8	Computer Network Information Center, Chinese Academy of Sciences - Beijing (CN)
9	Institute of High Energy Physics, Chinese Academy of Sciences - Beijing (CN)
10	Peking University – Beijing (CN)



Third Parties

- ▶ ACADEMIA SINICA GRID COMPUTING CENTRE (ASGC), TAIPEI (CERN)
- ▶ Physics Department – UNIVERSITÀ DI ROMATRE – ROMA (INFN)



Project Information

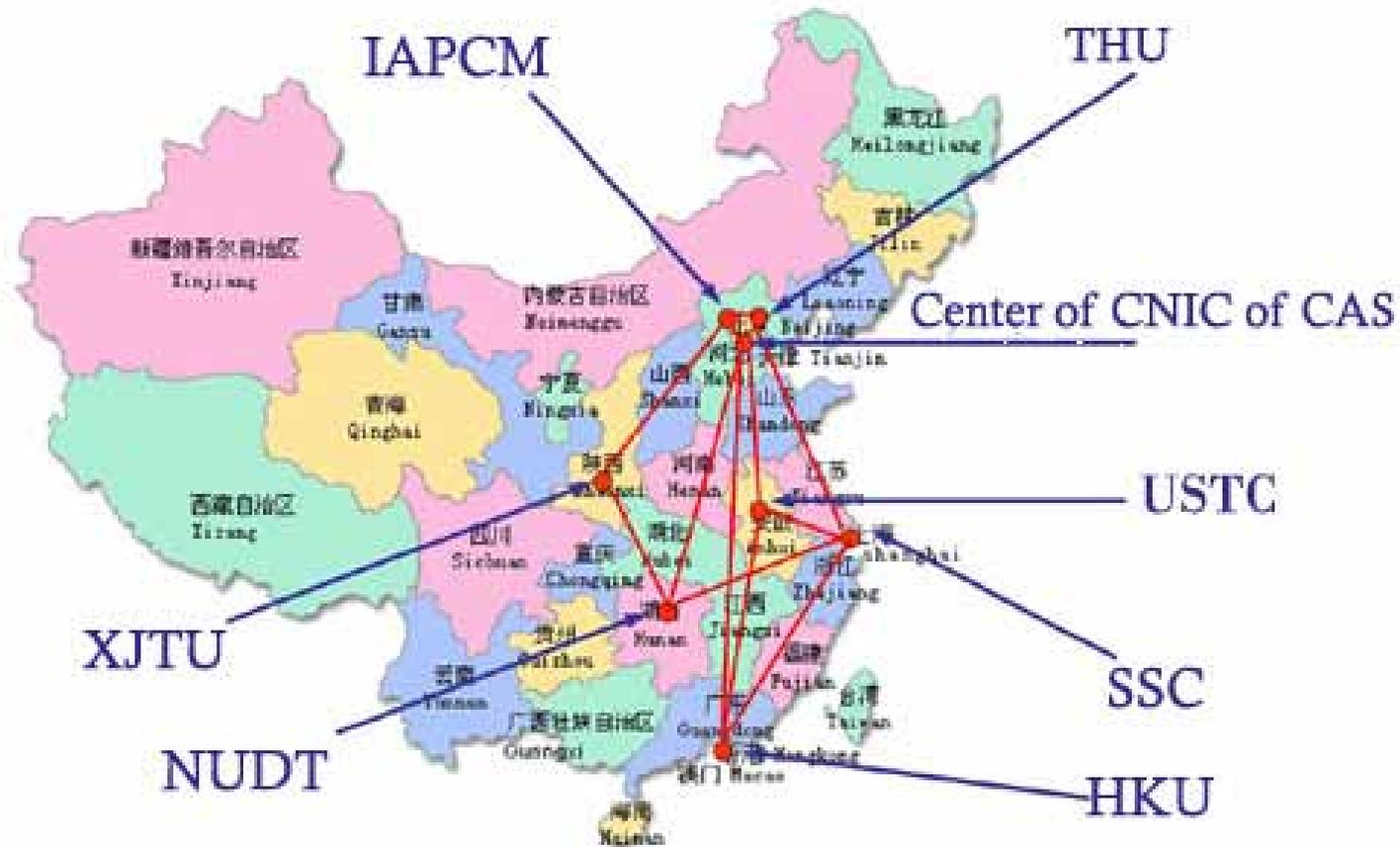
- ▶ The project started on the 1 January 2006.
- ▶ 24 Months duration.
- ▶ EU Contribution of 1,299,998 €.
- ▶ A total of 495 Person Months (325 Funded).

EUChinaGRID WP's

- ▶ WP1 – Project Administrative and Technical Management
- ▶ WP2 – Network planning and interoperability study
 - Specific activity to study IPv4/IPv6 GRID interoperability.
- ▶ WP3 – Pilot infrastructure operational support
 - Specific activity to study interoperability between EGEE & CNGrid.
- ▶ WP4 – Applications
 - EGEE applications (LHC, Bio, etc.)
 - ARGO-YBJ and Gamma Ray Bursts
 - Never Born Proteins
- ▶ WP5 – Dissemination
 - Dissemination of advanced knowledge on Grid technologies.

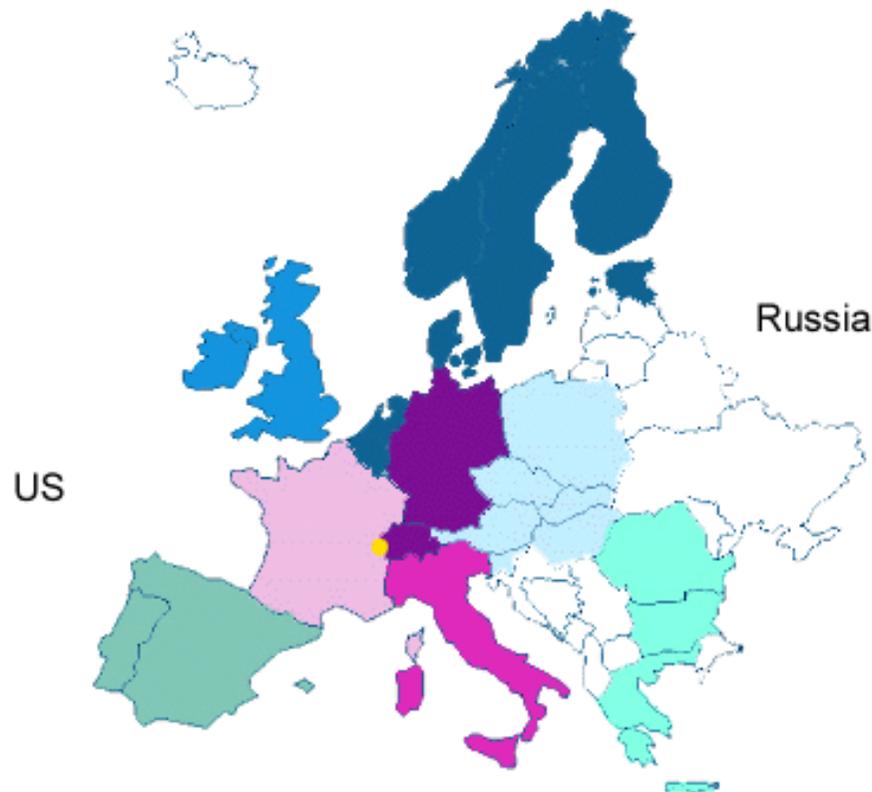


Infrastructures: CNGRID





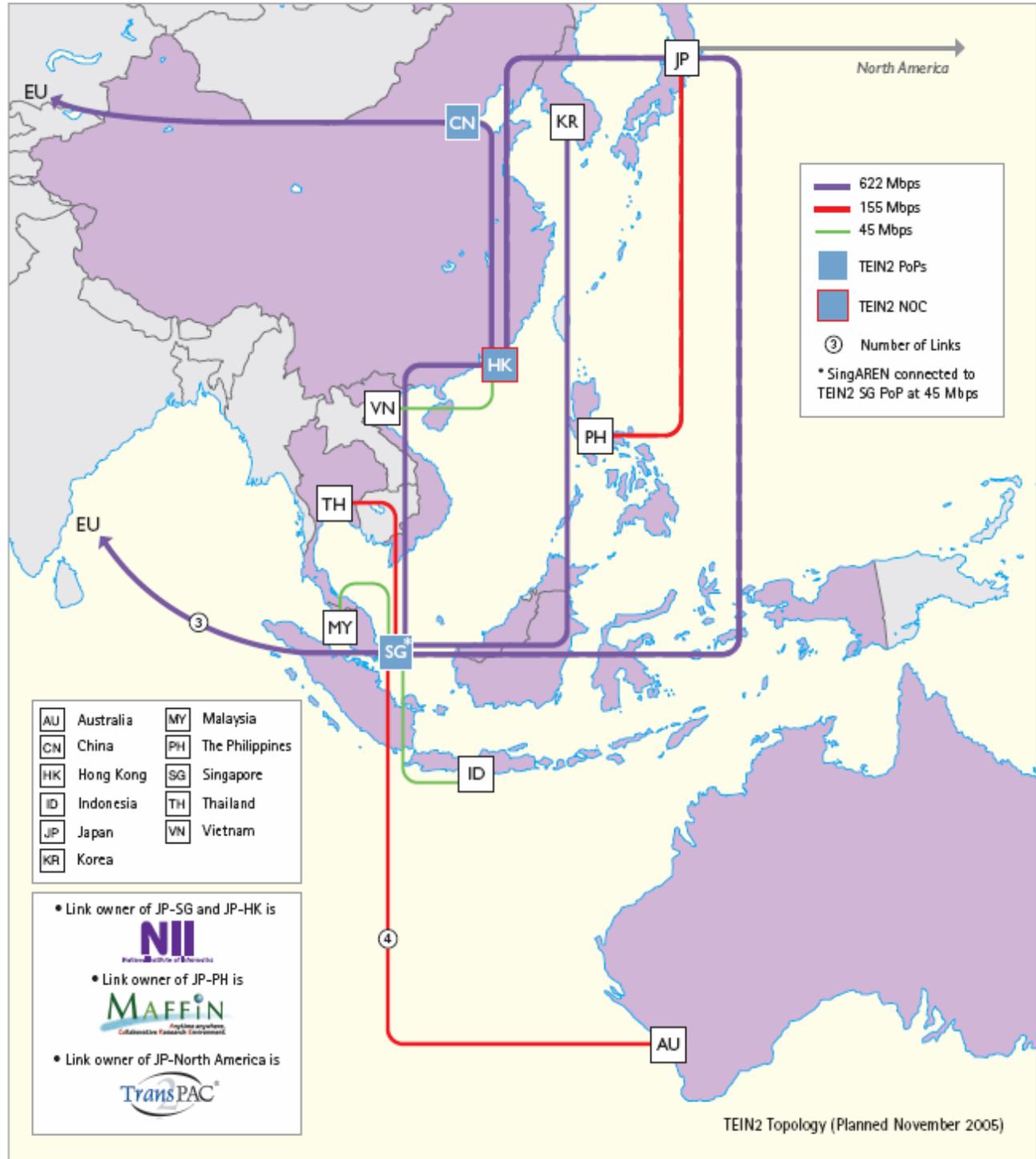
Infrastructures: EGEE



- CERN
- Central Europe (Austria, Czech Republic, Hungary, Poland, Slovakia, Slovenia)
- France
- Germany and Switzerland
- Ireland and UK
- Italy
- Northern Europe (Belgium, Denmark, Estonia, Finland, The Netherlands, Norway, Sweden)
- NRENs
- Russia
- South-East Europe (Bulgaria, Cyprus, Greece, Israel, Romania)
- South-West Europe (Portugal, Spain)
- USA

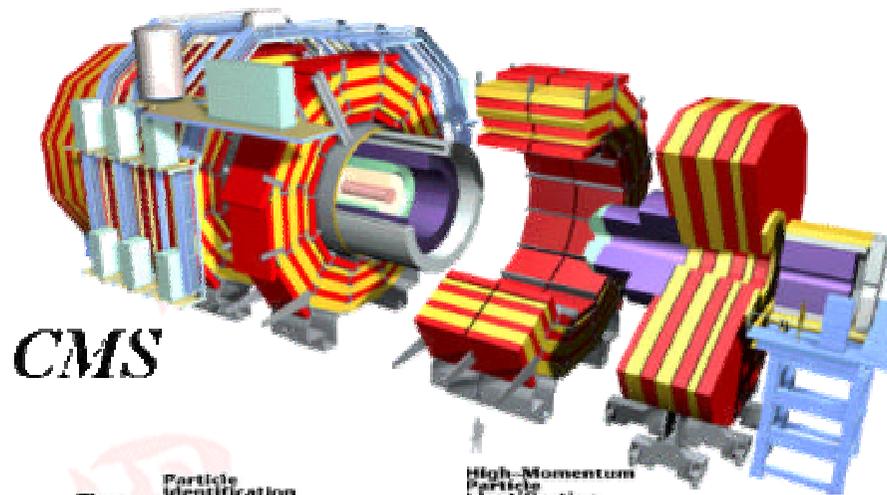
Network: TEIN2

ORIENT will upgrade to 2.5 Gbps

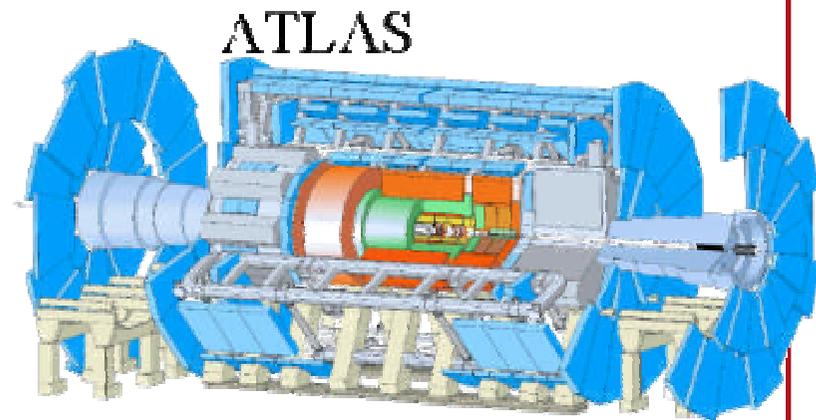




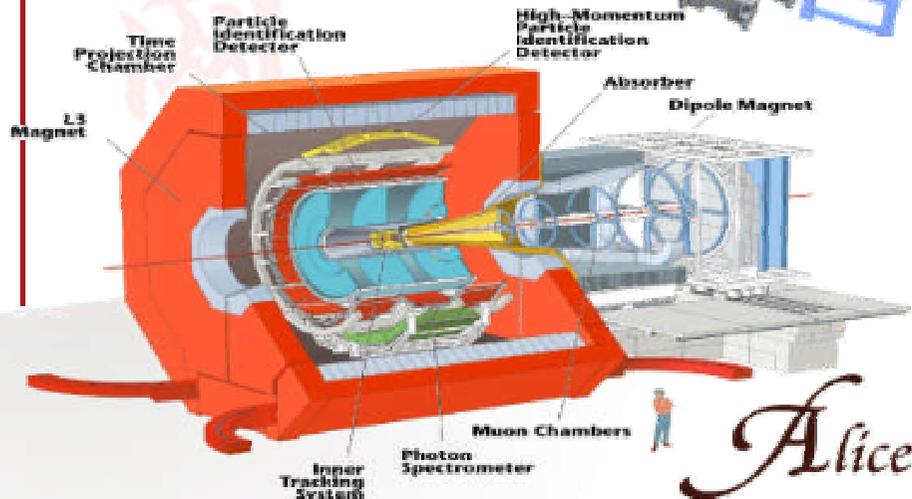
Applications: LHC Experiments



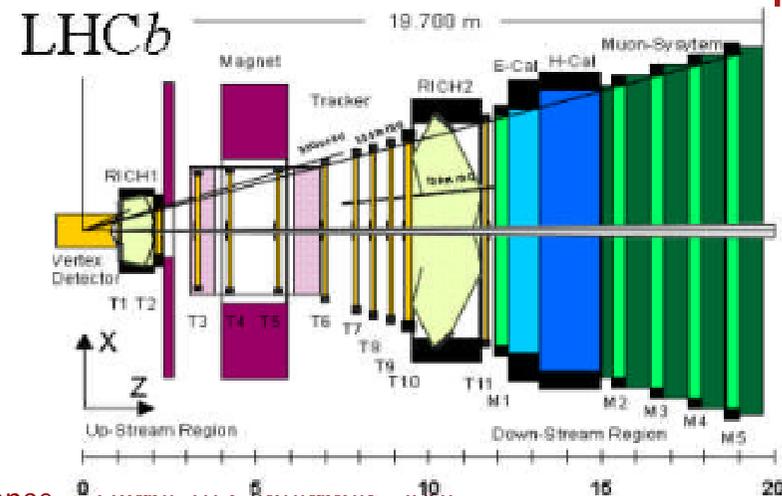
CMS



ATLAS



Alice





LCG: LHC Computing Grid



Applications: ARGO – YBJ Laboratory



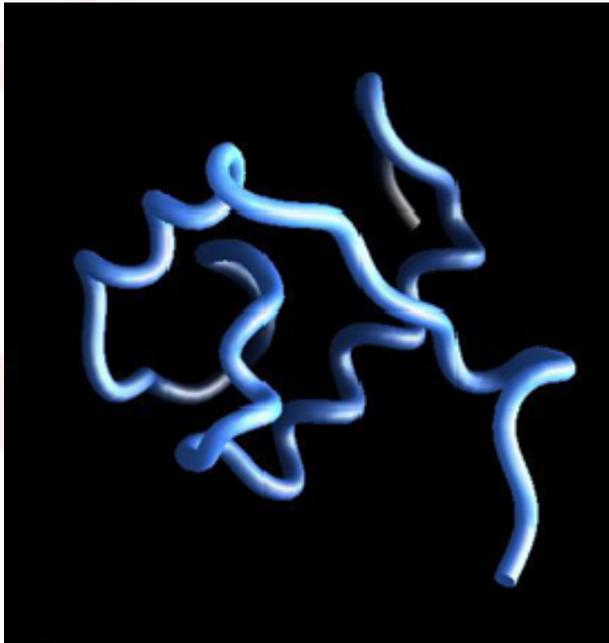
- Unique High Altitude Cosmic Ray Laboratory (4300 m) Tibet, 90 km North to Lhasa. Chinese-Italian collaboration.
- The Experiment data rate to be transferred is 250 TB/Year requiring a steady transfer rate of the order of 100 Mbps to Beijing and from there to Italy.

Applications: Never Born Proteins

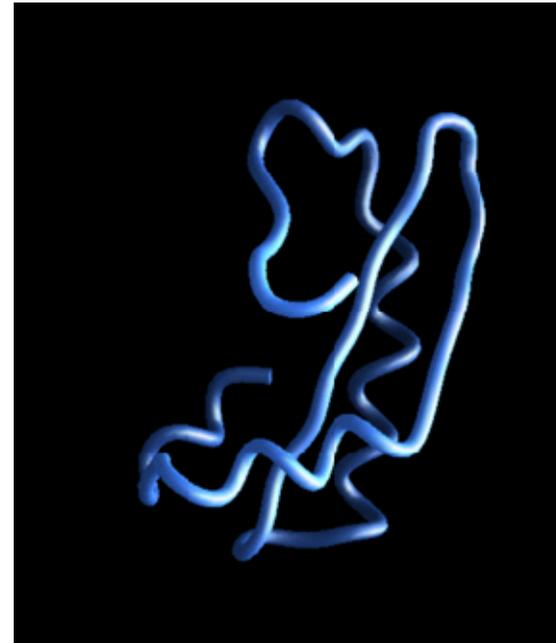
- ▶ The number of natural proteins on Earth, although apparently large, is only a tiny fraction of the possible ones:
 - with 20 different co-monomers (the 20 different natural amino-acids), a polypeptide chain with 60 residues ($n=60$) can exist in 20^{60} different chain structures.
 - In nature, we have around 10^{13-14} different proteins, so that the ratio between the possible and the actual number is staggeringly large.
- ▶ This means that there is an astronomically large number of proteins that have never been seen on Earth - an incredibly large number of “never born proteins” (NBP).
- ▶ The present research in the field is based on a computational approach to study a large library of NBP (10^9 protein sequences) to the aim of clarifying the structural principles that characterize them and of selecting a reasonable number of sequences which can potentially give rise to stably folded proteins.

NBP – First results

- ▶ Rosetta *ab initio* protein structure prediction method



- NBP1 – 1Trp exposed
1 SS bond



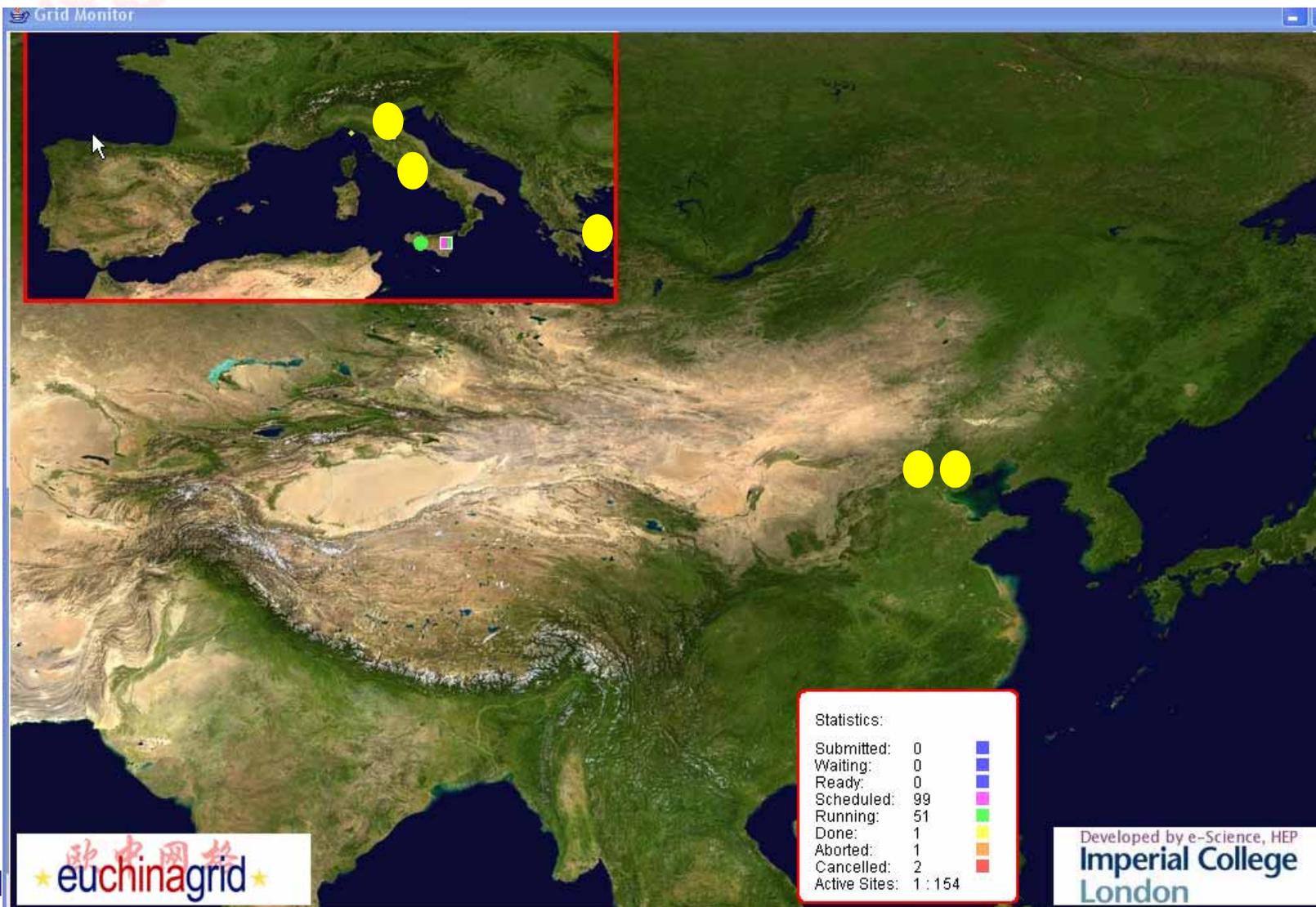
- NBP2 - 1Trp exposed, 1 buried
2 SS bonds

Achievements in the first 8 months

- ▶ Kick-Off Meeting in Athens (February)
- ▶ First Project Workshop in Beijing
- ▶ Two tutorials for Users and Site Managers in Beijing – China April and June of this year starting the creation of the core of Chinese trainers in the future events in China.
- ▶ Preliminary pilot infrastructure set-up (8 sites).
- ▶ First applications requirements analysis started.
- ▶ Dissemination in other conferences and in the press: a Chinese version of the project web site has been produced.



Real Time Monitor





GridIce Monitor (1/2)

GridICE logo
the eyes of the grid

is monitoring ★ euchinagrid ★

Geo view Site view VO view Help About

GridICE >> Geo

XML

Poland

GRNet

INFN Catania, CNAF, Roma3

CNIC IHEP

The image shows a screenshot of the GridICE Geo view interface. At the top, there is a navigation bar with the GridICE logo and the tagline 'the eyes of the grid'. To the right, there is a banner for 'euchinagrid' with the text 'is monitoring' and 'Interconnection & Interoperability of Grids between Europe & China'. Below the navigation bar, there are links for 'Geo view', 'Site view', 'VO view', 'Help', and 'About'. The main content area shows a map of Europe and China. Several locations are marked with red dots and labeled with yellow boxes: 'Poland', 'GRNet', 'INFN Catania, CNAF, Roma3', and 'CNIC IHEP'. A mouse cursor is visible over the GridICE logo.



GridIce (2/2)

GridICE the eyes of the Grid

is monitoring ★ euchinagrid ★

Geo view Site view VO view Help About

GridICE >> Site::ALL

General **Gris** Host Job Charts Network XML

Overview Computing Management Downtime

Computing Resources Storage Resources

Site ▼	Region	GK#	Q#	RunJob	WaitJob	JobLoad	Power	WN#	CPU#	CPUload	Available	Total	%	MH#		
BEIJING-CNIC-LCG2-IA64	World	1	6	22	24	72%	0	8	32	68%	51.1 GB	62.8 GB	19%	11		
BEIJING-LCG2	CERN	1	7	0	1	0%	0	3	3	0%	2.2 TB	2.4 TB	9%	18		
CYFRONET-IA64	CentralEu	1	12	27	0	-	-	-	-	-	21.4 GB	158.4 GB	86%	-		
CYFRONET-LCG2	CentralEu	1	15	230	5	100%	0	142	284	2%	16.4 TB	20.6 TB	21%	2		
GR-01-AUTH	SEE	1	11	12	14	-	-	-	-	-	187.4 GB	217.6 GB	14%	4		
INFN-CATANIA	Italy	1	6	188	0	85%	307K	83	219	66%	5.2 TB	7.1 TB	27%	96		
INFN-CNAF	Italy	2	8	18	30	90%	10K	5	10	79%	474.8 GB	1.7 TB	72%	23		
INFN-ROMA3	Italy	1	3	10	0	88%	31K	12	24	83%	685.9 GB	692.8 GB	1%	14		
TOTAL: 8		4	5	9	68	507	74	64%	348K	253	572	48%	25.1 TB	32.9 TB	31%	168

Issues and Perspectives (1/2)

- ▶ EGEE and CNGrid MW are presently not IPv6 compliant.
- ▶ China is going to deploy the largest production IPv6 network in the world.
- ▶ IPv6 is the natural choice for new generation IP telephony in convergence with Wireless Networking.
- ▶ Grid services should be able to run on the future IPv6 enabled PDA's, portable phones, etc.
- ▶ A specific workshop is organized at the EGEE'06 Conference also on this subject.

Issues and Perspectives (2/2)

- ▶ Connectivity between China and Europe was not satisfactory:
 - Long hops from EU to US and then back to Russia.
 - More than 400 ms round trip times.
- ▶ New TEIN2 links at 622 Mbps and, later on, ORIENT link at 2.5 Gbps are creating direct connectivity between European Research and Academic Network (GEANT) and Chinese Research and Academic Networks (CSTNET and CERNET).

Conclusions

- ▶ EUChinaGRID project has started to create a joint Grid community between China and Europe.
- ▶ Applications of interest for both Countries are being deployed on the Grid.
- ▶ Technical Issues on Interoperability, IPv6 Compatibility and Network connectivity are already under discussion and some possible solutions will be available, hopefully, in short time.
- ▶ Still a long path is in front of us, but we're sure to be on the right track.



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Thank you for your kind attention !



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