

# TIGRIS: K\*Grid Infrastructure

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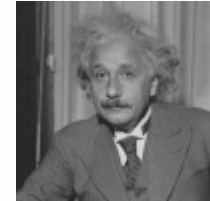
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# Motivation

# Macro Trends in Science

- Science is becoming a team sports
  - Easy problems are solved, challenging problems require
    - Large resources, particularly human
    - Knowledge from many discipline
  - Amazing advances in IT (Information Technology)
    - Moore's Law: advances in CPU, network, storage
    - Widespread use of IT in science
    - Computational science becomes the third way of science

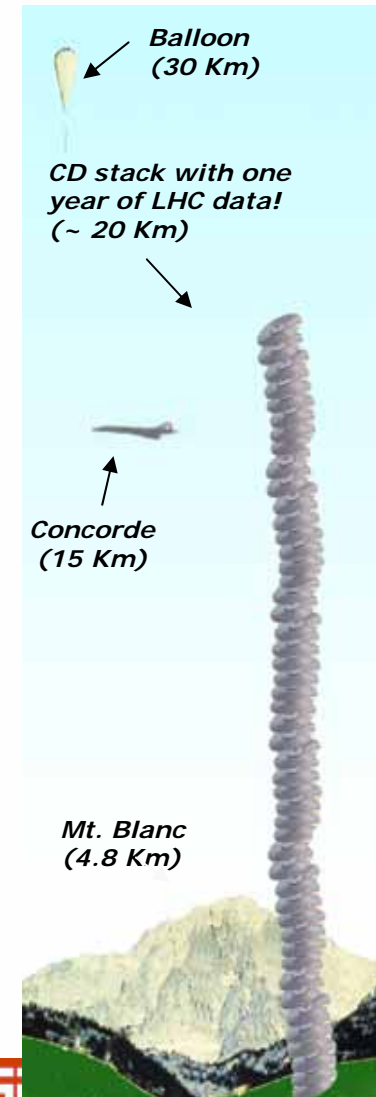


➔ IT-based Science Environment!

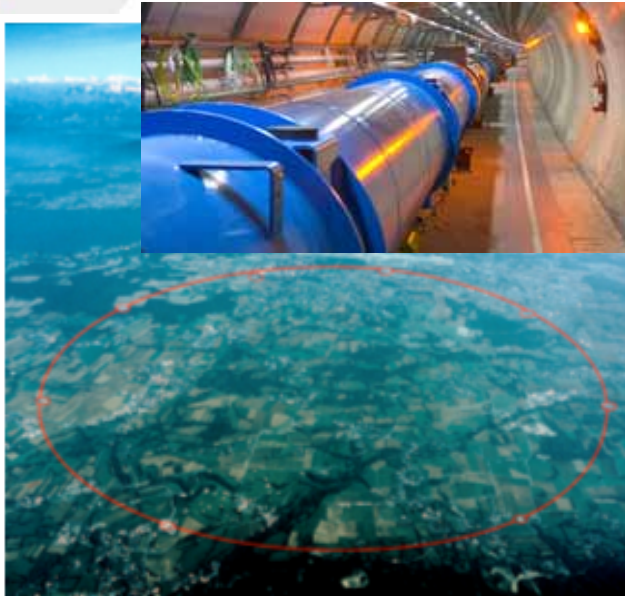
## Example: Physics

- A field of physics pursues for fundamental constituents of matter and basic principles of interactions between them
  - Need giant accelerators
  - Deal with hugh amount of data
  - Teams with many members form around detectors

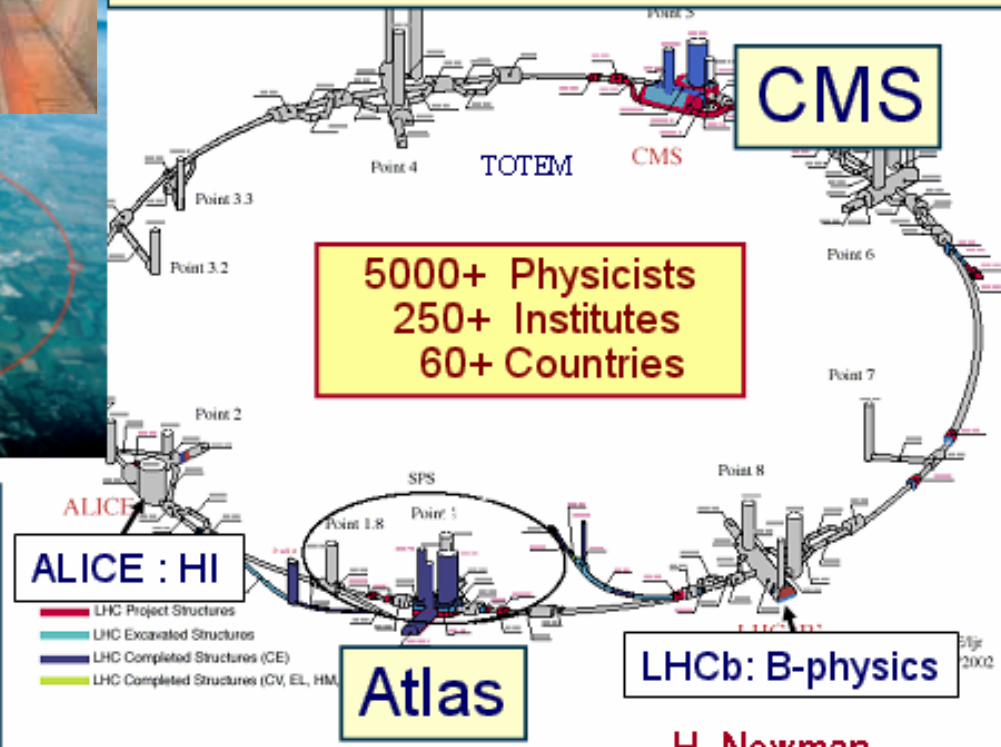
➔ Distributed analysis of data



# Example: Physics



\*  $pp \sqrt{s} = 14 \text{ TeV} \quad L = 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$   
 \* 27 km Tunnel in Switzerland & France



First Beams:  
Summer 2007  
Physics Runs:  
from Fall 2007

H. Newman



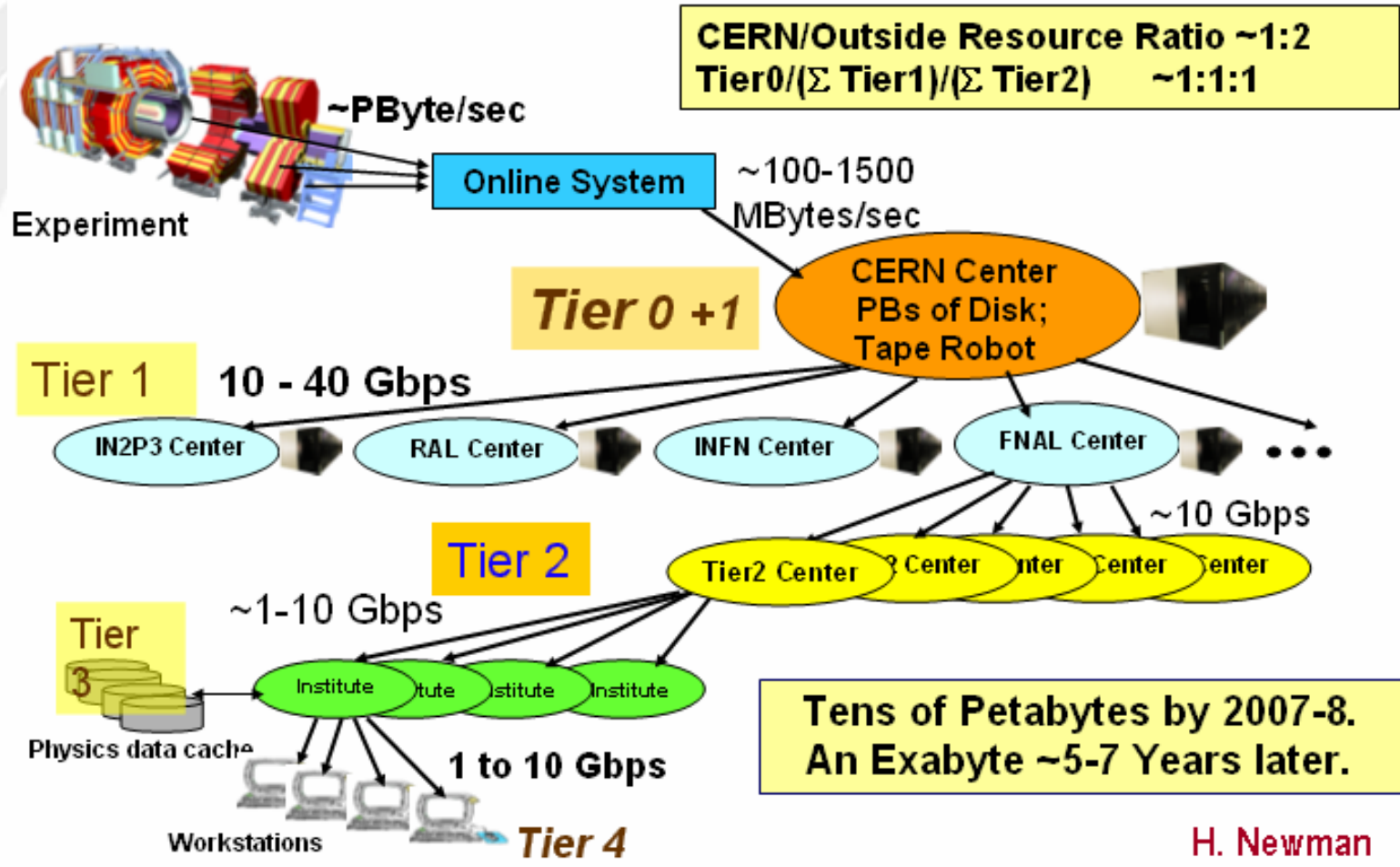
# Example: Physics

## Typical HEP Collaboration at Present



~700 Collaborators  
~80 Institutions  
18 Countries

# Example: Physics





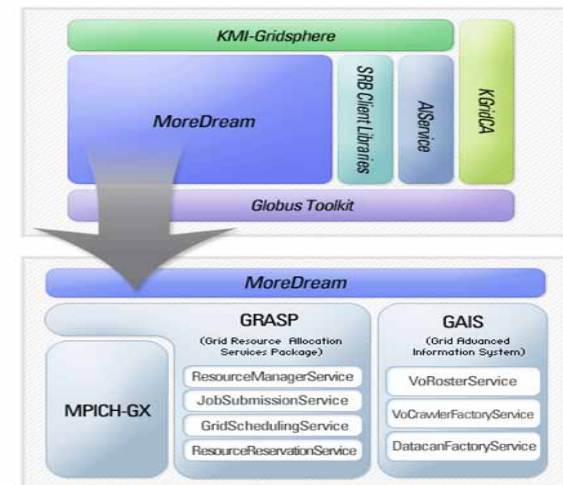
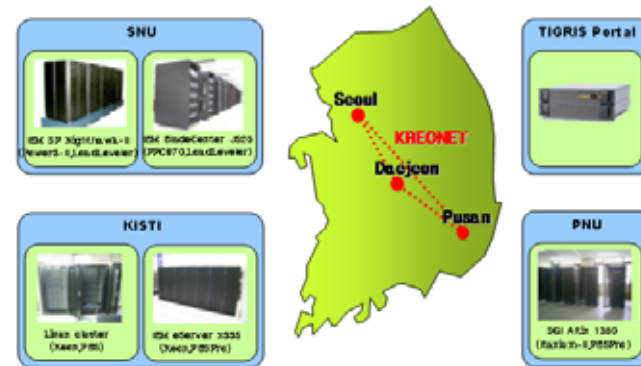
# Overview of K\*Grid Project

# Introduction to K\*Grid Project

- Goal: Implementation of the Nation-wide Grid infrastructure in Korea
- Fund: Government level support by MIC(Ministry of Information and Communication)
- Period & Budget: 2002-2006 (5 yrs) & US 32M
- Leading organization: KISTI
- PI of K\*Grid project: Dr. Jysoo Lee
- Partners: Various research partners selected from academia, industry and government lab. Through a public competition

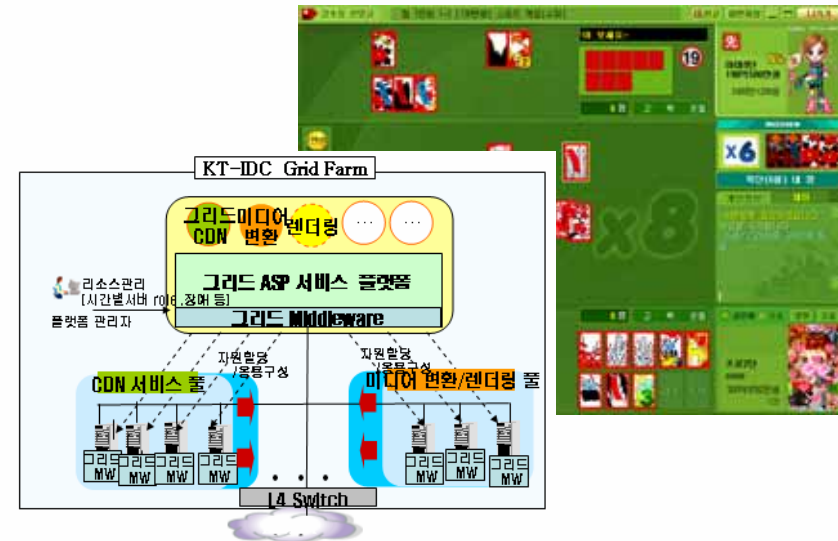
# Scopes of K\*Grid Project(1/2)

- Construction of K\*Grid infrastructure
  - Phase I(2002-2004): Experimental Grid testbed for the pilot K\*Grid applications
  - Phase II(2005-2006, hereafter): Production-level Grid infrastructure for the national Grid research and development process (TIGRIS)
- Development of Grid middleware technology
  - KMI-R1(K\*Grid Middleware Initiative – Release 1): Integrated Grid middleware service package
  - MoreDream: OGSI-based Grid middleware toolkit



# Scopes of K\*Grid Project(2/2)

- Research on Grid Applications
  - Phase I(2002-2004): Scientific application
    - Molecular simulation Grid
    - Grid-based remote services for high-tech scientific instruments (UHV-TEM)
  - Phase II(2005-2006): Business application
    - Online game server administration
    - Application Service Provider(ASP)
- Grid Forum Korea(GFK)
  - Outreach program for Korean Grid community and international collaboration for standardization process
  - Invited the 13<sup>th</sup> Global Grid Forum(GGF13) in Seoul, March 2005



# TIGRIS: Tera-scale Infrastructure for K\*GRId Services


# Introduction to TIGRIS: Tera-scale Infrastructure for K\*GRId Services

- Nation-wide sustainable Grid Infrastructure in Korea
- For providing production-level Grid services
- To national research and development process
- Open infrastructure with Grid services compatible with open standards




# TIGRIS Architecture

SNU




IBM SP Nighthawk-II  
(Power3-II, LoadLeveler)




IBM BladeCenter JS20  
(PPC970, LoadLeveler)

KISTI



Linux cluster  
(Xeon, PBS)



IBM eServer x335  
(Xeon, PBSPro)



TIGRIS Portal



PNU

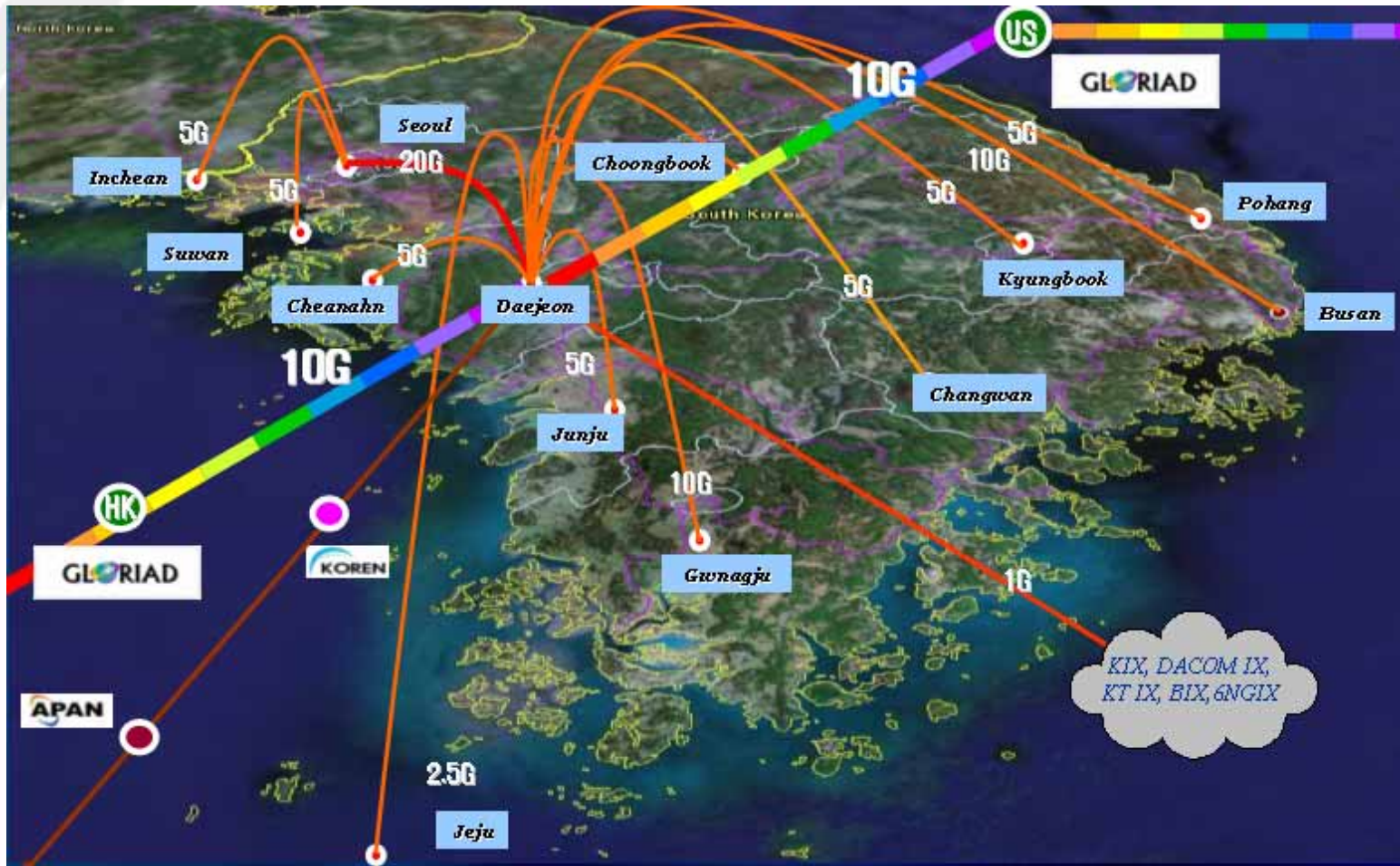


SGI Altix 1350  
(Itanium-II, PBSPro)

# TIGRIS Major Resources

		SNU	PNU	KISTI
Type		Linux cluster	CC-NUMA	Linux cluster
Model		IBM BladeCenter JS20	SGI Altix 1350	IBM eServer x335
OS		SLES 9.0	RHEL3AS + SGI ProPack3	Redhat 7.3
CPU	CPU	PPC970	Itanium-II	Xeon
	Clock	2.2GHz	1.5GHz	2.8 GHz
	#CPU / Node	2	16	2
	#Node	480	7	256
	Total	960	120	512
RAM	#RAM / Node	2 GB	16 GB	3 GB
	Total	960 GB	120 GB	768 GB
Disk	#Disk / Node	23.5 GB	146 GB, 36 GB	36.4 GB
	Total	11 TB + 10 TB	1 TB	9 TB + 10 TB
Performance (theoretical)		8 TF	0.7 TF	2.4 TF

# TIGRIS Network Infrastructure

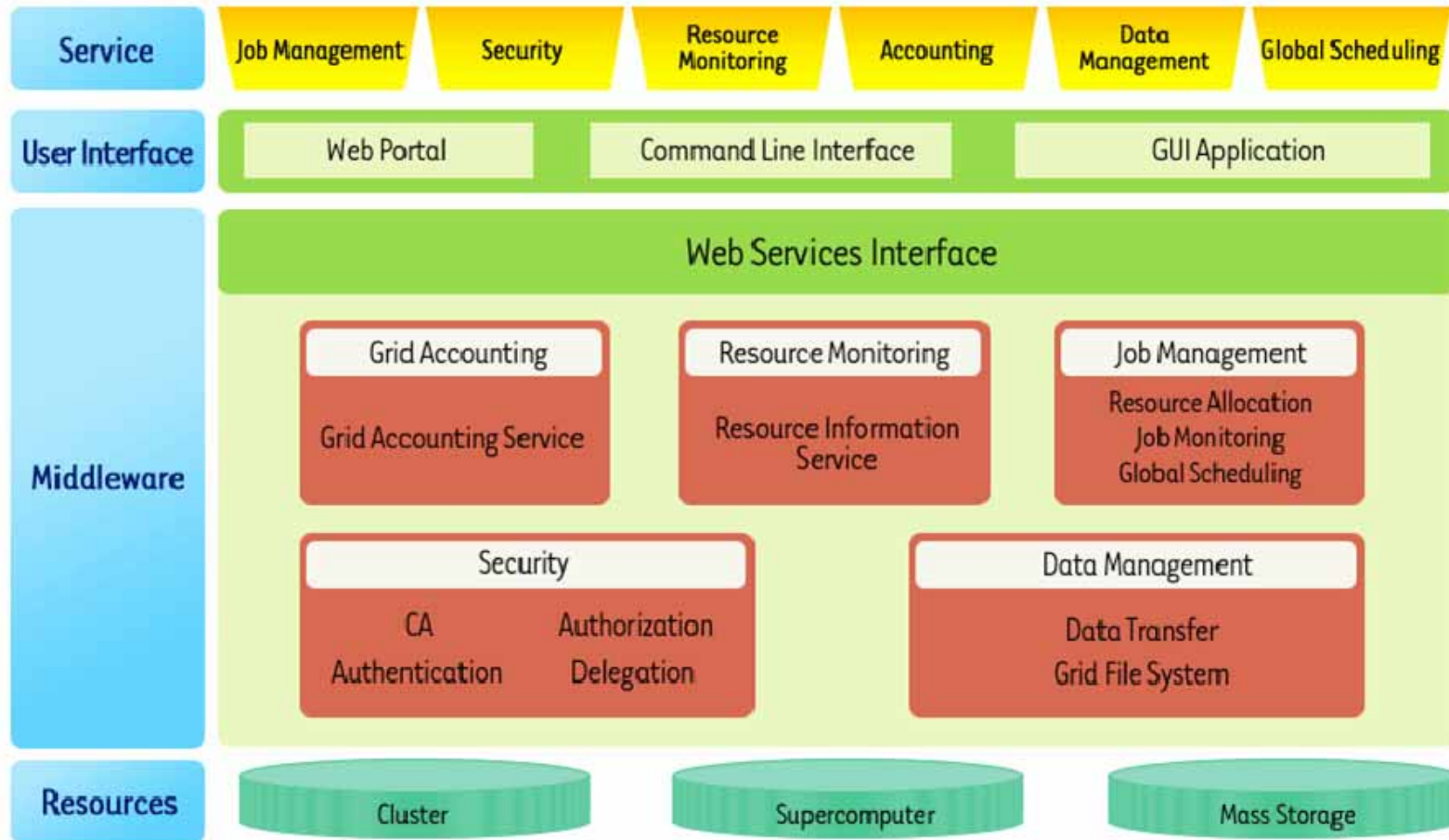


## TIGRIS Services Stack(1/2)

- Uses Globus Toolkit v4 as basic Grid middleware
- Will provide improved high-level Grid services on top of Globus Toolkit v4
  - Enhanced Grid job management
  - Grid file system
  - Extension of Grid-enabled MPICH
    - Fault tolerant job execution of MPI application
    - MPI communication between private IP clusters



# TIGRIS Services Stack(2/2)

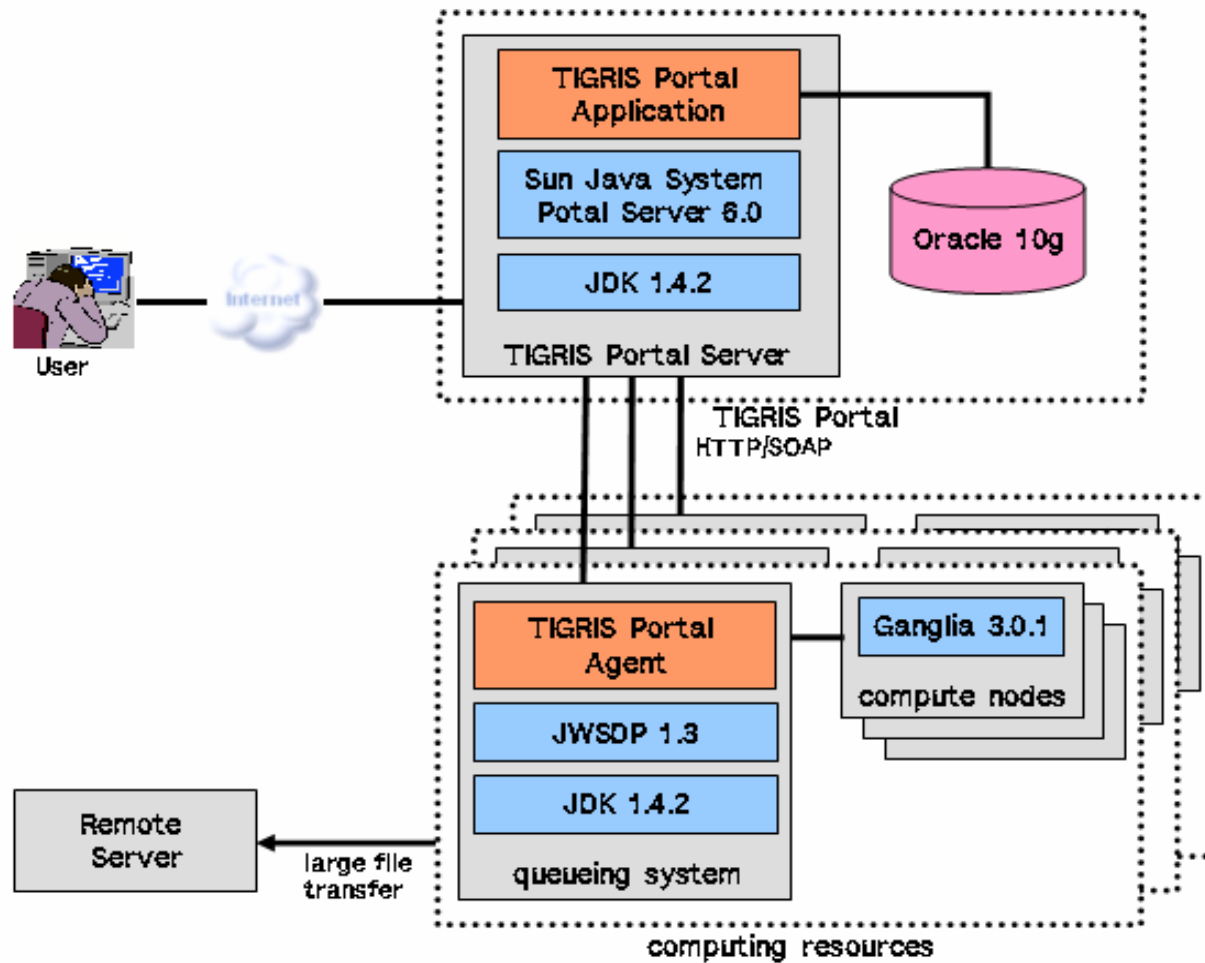


## TIGRIS Web Portal(1/2)

- Develops Grid portal system to provide easy-to-use user interface to support efficient Grid operations to Grid users
- Provides virtualized workspace on heterogeneous computing resources
  - Modularized batch job script generator
  - Application-dependent UI reconfiguration
- Provides integrated resource monitoring interfaces
  - Grid resource monitoring services based on Ganglia
- Provides integrated resource usage accounting on the Grid
  - Collection of resource usage accounting info based on GGF UR-WG



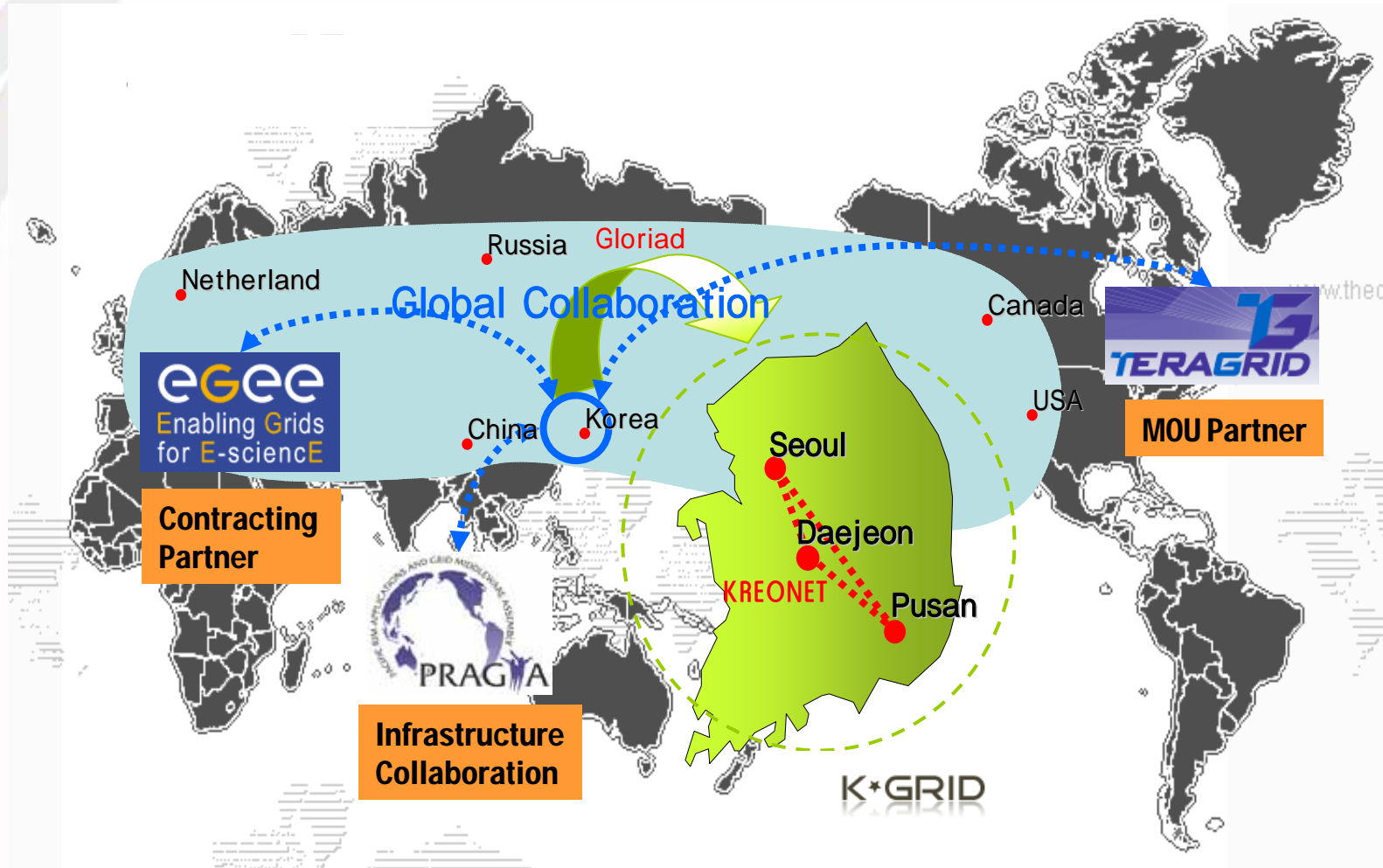
# TIGRIS Web Portal(2/2)



# Quick Look at TIGRIS Web Portal

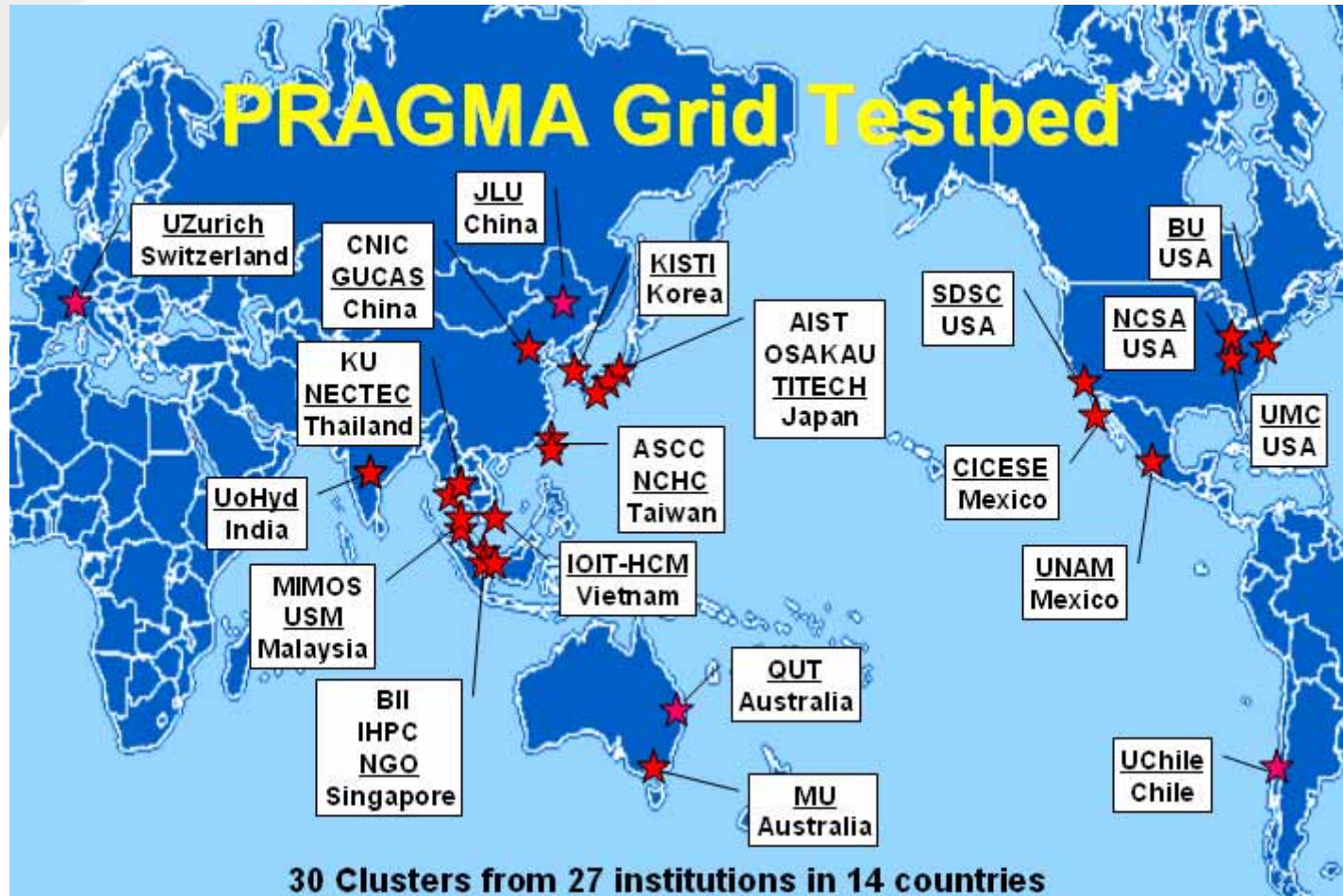
# International Collaboration

# International Collaboration





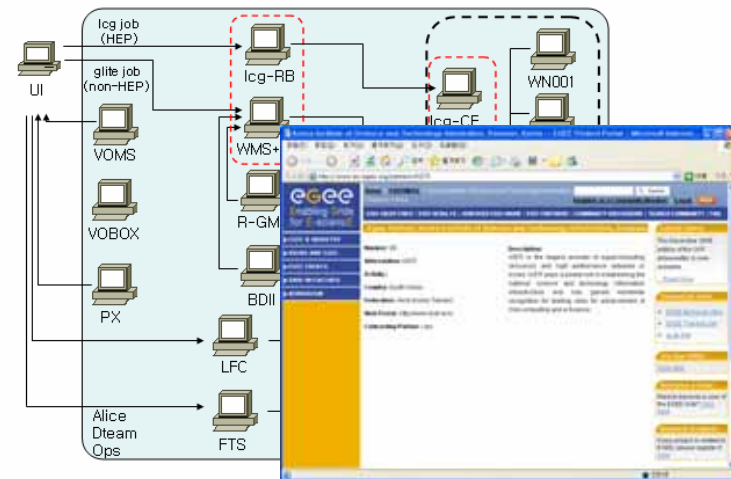
# PRAGMA Collaboration



Courtesy: Cindy Zheng from PRAGMA resource W/G

# EGEE Collaboration

- EGEE-II contracting partner
  - Unfunded partner in the EGEE project
  - Cooperating with CKSC team, another EGEE-II partner in Korea
- Participating area: SA1
  - In this year, focusing on having an experiences about EGEE Grid infrastructure collaboration between KISTI and EGEE-II
- Not production site yet
  - The work is under way





# Summary

- TIGRIS as national shared cyber-infrastructure in Korea



Source: NSF homepage



Republic of Korea

Thanks

USA

Grazie

Italy

謝謝

China

ありがとう

Japan

Danke

Germany