

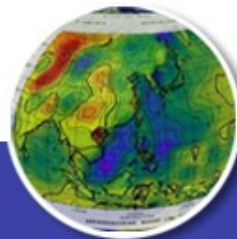


BIRUNI GRID: UPM's Resource Contribution to EUAsiaGrid Through TEIN3

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Outline



- **Introduction**
- **Academic Grid Malaysia**
- **BIRUNI GRID**
- **APAN and TEIN3 Networks**
- **Issues and Challenges**
- **Lesson Learned and Future Plans**
- **Concluding Remarks**

Introduction



- **Motivation**

- Academic staffs, research officers/assistants, and post-graduate students **made up of over 80% of the entire research community in Malaysia!** (Not including undergraduates)
- Working on Grid computing and its application in various disciplines
- Requires minimal facilities in their labs of respective universities to carry out their R&D
- Need something that they can “**play around**” and should anything happens to the facilities (eg. Nodes crashing, hanging, etc) they can simply poweroff and restart!

Introduction-cont



- **Basically two types of users:**
 - Researchers/students doing research on certain aspects of GRID
 - Researchers/students using GRID for computation; (Bioinformatics, Cheminformatics, Medical Informatics)
- **Need basic Grid facilities and have total control of the entire Grid Ecosystem (all aspects of Grid)**
- **After acquiring certain level of expertise or if they want more compute power, then they can tap on other production facilities**
- **Hence the need for a learning and discovery Grid**

The Academic Grid (A-Grid)



- **Generally, some universities have long been involved in Grid R&D and its application in several domains (Lifesciences, Pharmacy, Chemistry, Physics, Mathematics)**
- **But some universities are still at very initial stage and have only a few clustered PCs BUT they are very enthusiastic researchers and students**
- **Some universities have already assembled a number of small clusters of HPCs and SMPs for internal use but they are not connected together**
- **Some managed to connect together and created Campus Grid**
- **Researchers are reluctant to share the resources; even among research groups within a university**
- **Server hugging!!**

The Academic Grid (A-Grid)



- **Universities already having cluster(s) on campus build Campus Grid and explore if it/they can be shared and linked together using MYREN (Now entering Phase 2)**
- **Universities are to develop Grid Policies to facilitate and encourage sharing of resources with security guarantee**
- **Universities with greater experience and knowledge on Grid should help the lesser universities**
- **All universities should be committed and support each other towards the success of Academic Grid**



A-Grid...



- Each University should form Campus Grid linking clusters of HPCs, SMPs and PCs.
- Campus Grids will be connected together via MYREN (MYREN Phase 2 is on Tender Process and expected to be fully implemented by Q3)
- A-Grid Operation Centre (A-GOC) will be formed (USM already received Provisional Certification Authority (CA) status and UPM is in the process of getting CA (considering CA for A-Grid and Malaysia))
- Some of the A-Grid facilities will be on production Grid and can peer with facilities at MIMOS or other Grid partners internationally via TEIN3, INTERNET2, and other networks
- Addressing redundancy



BIRUNI GRID



- UPM has just commissioned BIRUNI GRID with the hope of making it the Nucleus HPC Clusters for A-Grid
- Hardware Racking and Power up were done by suppliers while the rest of the configuration and deployment was done by UPM Grid Team; Excellent learning opportunities.
- BIRUNI GRID has:
 - 50 IBM Blade HS21 Servers (2x Intel Xeon Quad Core 2 Ghz, with 8 GB rams).
 - 3 IBM x3650 servers, one as Head Node and two as Storage Nodes.
 - 2 IBM DS3000 series SAN with 24 Terabytes of storage capacity.

BIRUNI GRID-cont



- **BIRUNI GRID consists of three clusters:**
 - **Khaldun Sandbox Cluster (10 worker nodes with GB)**
 - **Razi Cluster (28 worker nodes with GB)**
 - **Haitham Cluster (8 worker nodes with Infiniband)**
- **Khaldun Sandbox Cluster is used for Experimental Grid (Development, and Learning purposes) while Razi and Haitham Clusters are designated as Production Grid.**
- **At any time, the Haitham Cluster and Khaldun Sandbox Cluster worker nodes can support Razi Cluster worker nodes to perform computation.**

BIRUNI GRID-cont



- For job resource management, Sun Grid Engine is installed on each worker node as well as the computing element.
- Each worker node has 2 x 147GB storage capacity. However only 1 x 147 GB will be opened for the first phase of BIRUNI GRID deployment while the other 1 x 147 GB storage is reserved for future use (multilayer grid).
- Internal storages on each server are used to host operating system and application only. Any userspace dataset will be stored on SAN through Lustre network.
- BIRUNI GRID is located at DMZ and connected through UPMNet and MYREN.

BIRUNI GRID-cont



- **Middleware deployment:**
 - **Scientific Linux 4.7** installed on each server, with an option to run virtualization on blade servers to support multilayer grid computing.
 - **Lustre Filesystem 1.6** installed on two storage nodes with **SAN** as main storage target.
 - **Head node** provides grid operational application (software repository, routing into another network/internet, **DNS** and monitoring)
 - **Two Blade Servers** serve as **Computing Element**, **VO manager**, **Information System**, and **gLite Middleware Operation**.

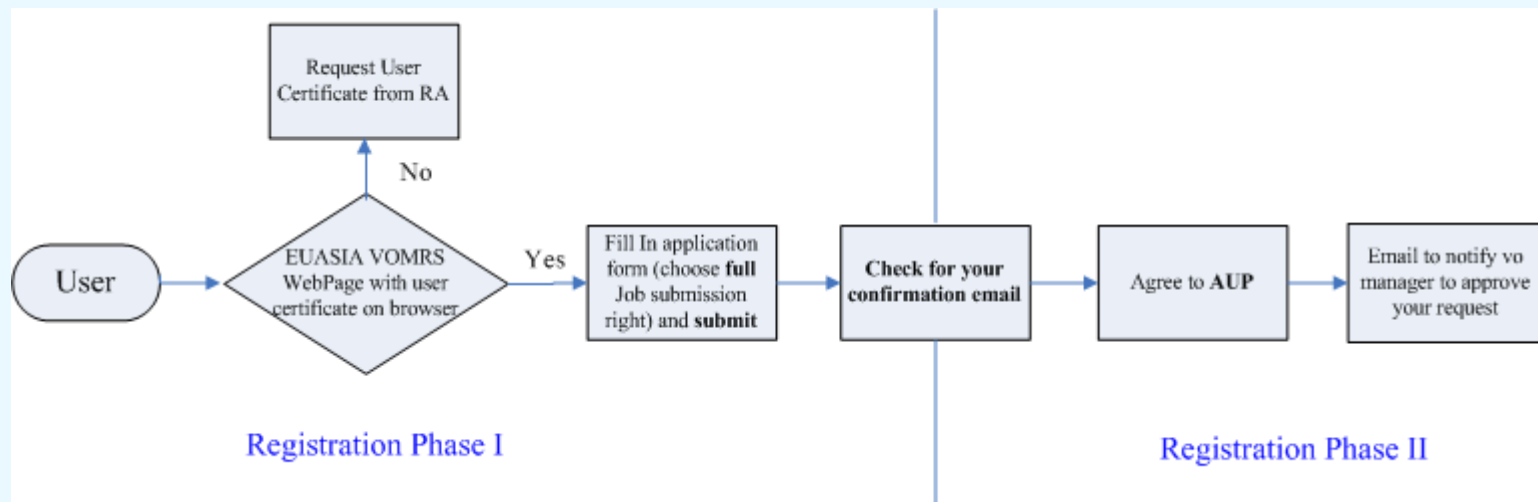
BIRUNI GRID-cont



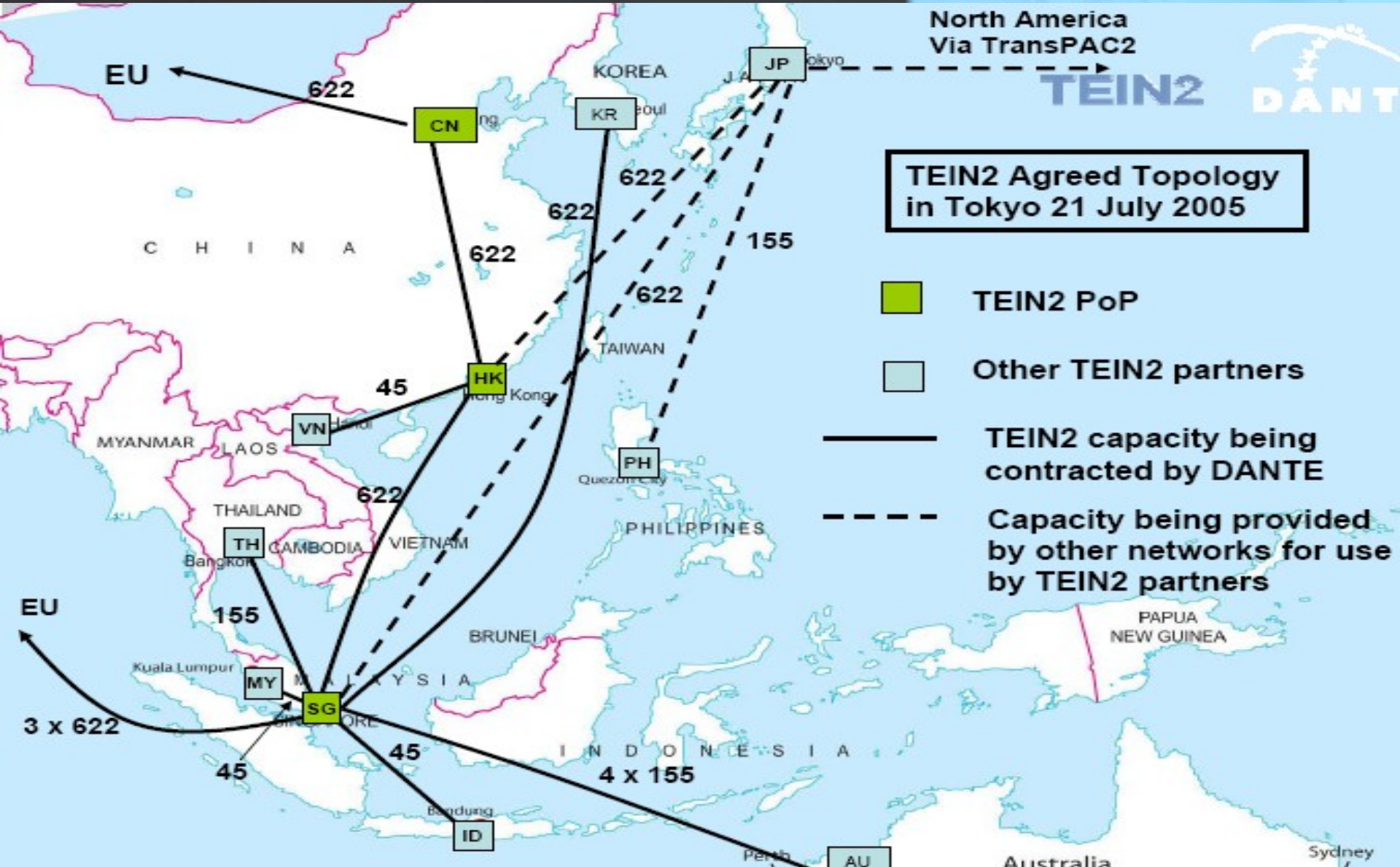
BIRUNI GRID-cont



- In parallel with gLite installation and configuration, the certification process is under way.
- All installation and configuration are now completed and final site testing is currently being done
- Preparing the necessary for site certification



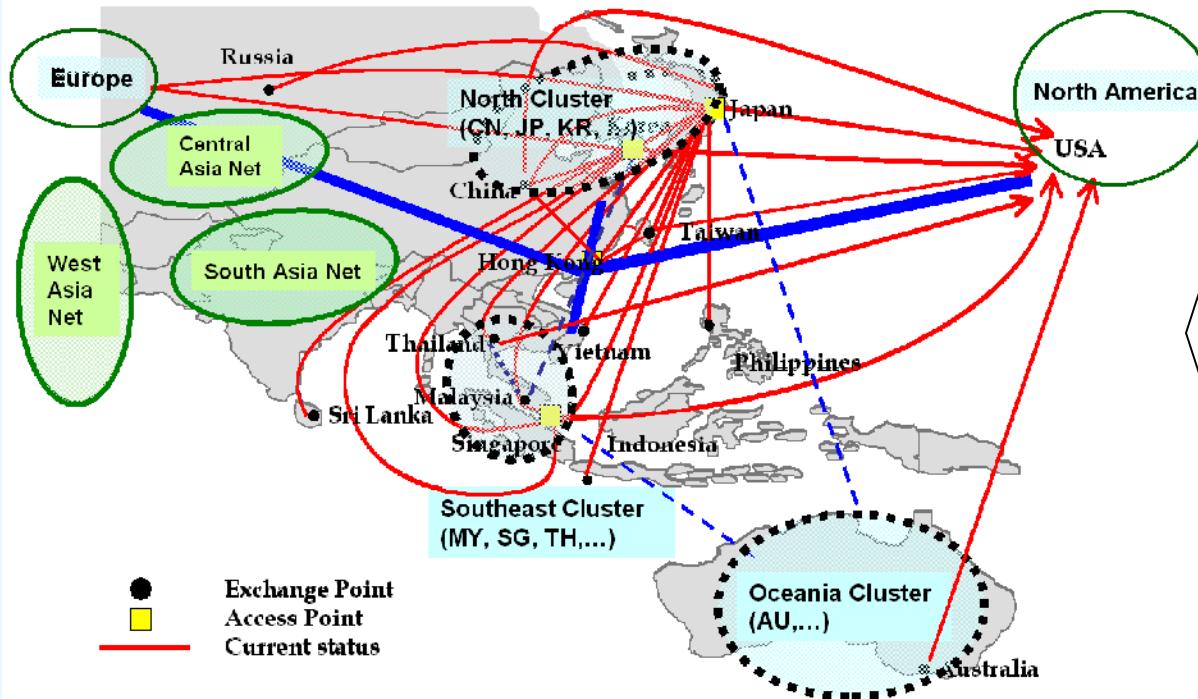
TEIN3 – Launched January 2009



TEIN3

ASTRENA Framework

Network – with regional nets



APAN
 TransPAC



Issues and Challenges



- **Assuming that most of the potential users do not have enough knowledge on how to use BIRUNI GRID facility, how we will address this challenge?**
- **A website that provide easy-to-understand information on how to use the facility, FAQ, etc.**
- **What applications/software that UPM wishes to provide? Licensed/Proprietary or Open Source?**
- **Need more input from the users especially experienced users**
- **Promotion, training,...training,...and training 😊**

Lesson Learned...



- **Happy to have been able to build BIRUNI GRID from scratch (nearly 😊); very satisfying and at the same time acquire the skill to deploy HPC Clusters**
- **UPM wishes to acknowledge Academia Sinica for their undying support right from the planning of what to purchase right up to certification**
- **All these has been made possible through EUAsiaGrid Project; bridging not just between EU and Asia but also equally important among asian countries**

Future Plans



- **Efforts to have CA for UPM and hopefully for Academic Grid**
- **Grid Application deployment for Bioinformatics/Cheminformatics and Medical Informatics and Graphic/Image Rendering**
- **Promote greater awareness on Grid Computing and shared resources among researchers and stakeholders of Institutions of Higher Learning in Malaysia through the Ministry of Higher Education which will soon be the custodian of MYREN Phase 2**
- **Registration of Malaysia Grid Forum Society to be affiliated with OGF, launching of Grid Journal, yearly scientific conference on Grid**

Concluding Remarks



- **Universities do not have enough resources to build massive compute facilities but should have access to sandbox, pre-production and also production Grid**
- **A small but modest compute facilities where students have the freedom to try out new things without fear of wrecking a big Grid system should be available**
- **If bigger and faster compute resource is needed for individual researchers, then they can send jobs to other partners outside the A-Grid**
- **After graduating from the A-Grid, students will have the skills and ready to move on to a bigger facility**

Concluding Remarks-cont



- **Academic Grid IS a Learning and Discovery Grid**
- **Provide a platform and compute facilities where students and academics learn about Grid technology and its applications,**
- **Promote TRUST and CONFIDENCE and encourage sharing for example by implementing and acculturating Federation (eg VOMS or GridShib, Digital Certificates) and developing policies for harmonization of Raw and Clean Data coming from various disciplines**
- **Provide a single point of contact for peering partners for universities**
- **Most importantly contribute towards the development of skilled Grid human resource necessary to support National Grid Initiative**
- **The deployment of BIRUNI GRID, through close collaboration between UPM and Academia Sinica as well as other EUAsiaGrid Partners certainly facilitate the realization of all the above...**

**28th Asia Pacific Advanced Network
(APAN) Meeting
and
GridDotMy2009 Conference**

**20-24th July 2009
Kuala Lumpur, Malaysia**