

Asia-Pacific Special Issue

Covering countries such as Australia, Vietnam, Japan and Indonesia, the Asia-Pacific region is both geographically vast and culturally diverse. But while the Asia-Pacific is home to a number of languages, cultures and peoples, its countries face similar challenges, such as natural disasters, climate change and connectivity to the rest of the world. Global e-Infrastructures, such as networks and grids, are already helping scientists in the Asia-Pacific contribute to science on a world-wide stage, in areas such as natural disaster modelling and life sciences. By further exploiting these infrastructures, scientists from the region can collaborate, share and store data, and achieve far more than they could alone.

Funding an infrastructure

Distributed computing technologies such as grids, clouds and volunteer computing could be vital in helping Asia-Pacific researchers work together to tackle regional challenges such as mitigating natural disasters, and to contribute to global questions such as climate change. But, as with any large infrastructure, securing and coordinating funding across an entire region is an enormous challenge.

In 2008 the EUAsiaGrid project, funded by the European Commission with partners across Europe and Asia, set out to promote awareness of the Enabling Grids for E-science grid infrastructure, middleware and services in Asia. Over its two-year duration, EUAsiaGrid built up a community in Asia, supporting research such as earthquake mitigation and drug development. While the EGEE project ended in 2010, its work is now being continued in the European Grid Infrastructure, coordinated by EGI.eu on behalf of its participants and part-funded by the EGI-InSPIRE project, which includes eight partners from the Asia-Pacific region.

The Asia-Pacific market is large and fragmented, with individual countries taking different approaches to grid and cloud technologies. In countries such as Vietnam, for example, researchers have accessed grid technologies through the EGEE and EUAsiaGrid projects. While emerging cloud technologies are seen as a new opportunity, securing sufficient funding for engineers and PhD students to establish a reliable distributed infrastructure in the country remains a problem.

In Singapore on the other hand, distributed technologies are well adopted, with many government departments relying on clouds for their work. However, the Singapore government does not fund grid and cloud computing through academia, choosing instead to promote these technologies through industry. Nevertheless, in the research community, a variety of biomedical researchers use distributed technologies in vaccine design, virus research and genomic projects.



Simon Lin, ASGC - "Distributed computing is capable of combining the results of exponential growth from information and communication technologies. Academia Sinica started as a Tier 1 centre for the Worldwide LHC Computing Grid but we are now taking advantage of the progress made and applying this to important issues of the region such as earthquakes, tsunamis and floods."

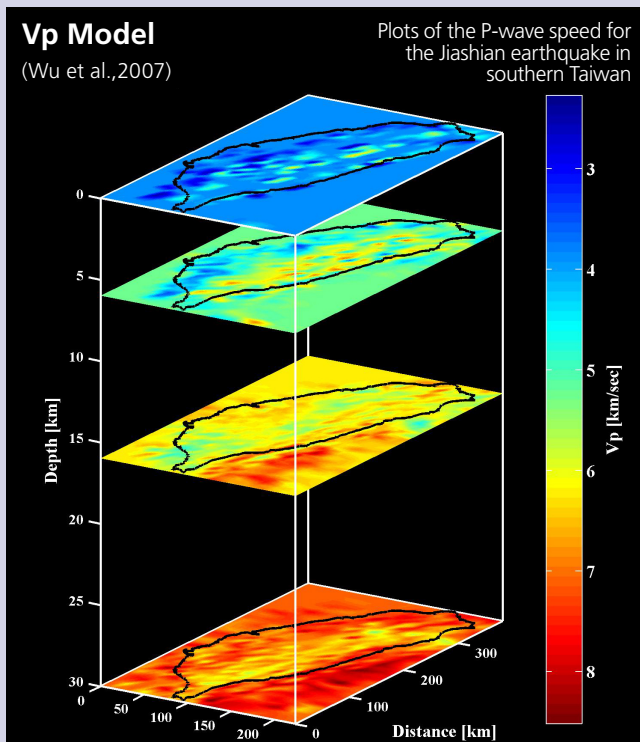
Shake, rattle and roll

For those living in countries along the so-called Ring of Fire, natural disasters such as earthquakes are a very real threat. And when disaster strikes, detailed knowledge about the event can make all the difference.

Researchers often use shake movies to visualise the motion of earthquakes after they occur. These movies can give valuable information to aid rescue efforts, education and outreach as well as helping to evaluate future risks.

Researchers create shake movies by performing calculations on models of earthquakes as well as the Earth's structure. However the production process is computationally intensive, taking more than an hour to create a movie on a large computing cluster.

Scientists at the Institute of Earth Sciences at Academia Sinica, Taipei now plan to farm out tasks to volunteers' computers - cutting the time needed to create shake movies to not hours, but minutes.



Examples of distributed computing across the Asia-Pacific

China

The EUChinaGrid project, which ended in 2008, aimed to design an e-Infrastructure which allowed full interoperability between European and Chinese e-Infrastructures. Today ChinaGrid, a project funded by Chinese Ministry of Education, aims to construct a platform for research and education in China. The country is also host to a Tier-2 centre for the Worldwide LHC Computing Grid (WLCG).

Pakistan

The National Centre for Physics in Pakistan is a Tier-2 centre for the WLCG.

Vietnam


EGEE grids were introduced to Vietnam by CNRS in France and used mainly in health research. Vietnam has now established a dedicated network for research and education (VinaREN) which is member of the TEIN3 consortium. It also participates in PRAGMA.

India

Indian e-Infrastructures include GARUDA NGI, the Indian component of WLCG and the National Knowledge Network. The EUIndiaGrid2 project, with partners in both India and Italy, consolidates and enhances cooperation between European and Indian e-Infrastructures. The project supports biology and materials science, climate change and High Energy Physics. It also promotes a sustainable approach to e-Infrastructure across the country.

Thailand

Thailand has participated in EUAsiaGrid, and is currently a member of PRAGMA and EGI-InSPIRE. The Thai National Grid Centre supports active research and is looking into cloud technologies, and the National e-Science Project aims to provide national infrastructure for e-science in Thailand.

 **Tan Tin Wee, National University of Singapore** - "As an EUAsiaGrid and EGI-InSPIRE participant from Singapore, we see tremendous value in being connected to the R&D computational and storage e-Infrastructure. One exciting project which we are pioneering with the Asia Pacific Bioinformatics Network is building interoperable databases and resources for the life science research communities in Europe and Asia."

Indonesia

inGrid is the Indonesian Grid infrastructure. Research areas include weather forecasting, natural disaster mitigation, chemistry and bioinformatics and establishing a digital library.

Australia

NeCTAR - Australia's National eResearch Collaboration Tools and Resources programme - aims to enhance research collaboration through the development of shared e-research infrastructure. The project is split into four streams - virtual laboratories, research cloud, research tools and a national server program.

South Korea

KISTI, Korea Institute of Science and Technology Information, contributes one of the products of EMI and is an unfunded partner in EGI-InSPIRE. It has also been an ALICE Tier 2 Centre for the Worldwide LHC Computing Grid since 2007. In clouds, South Korea's Communications Commission (KCC) has committed over US\$500 million to the development of Korean cloud computing facilities.

Japan

The REsources liNKage for E-science (RENKEI) project aims to develop middleware to share resources distributed among multiple organisations, such as research laboratories, national computer centers and international grids. For clouds, GICTF, a non-profitable open technology forum, identifies the technical needs for secure cloud interworking and promotes global standardisation of inter-cloud system interfaces through collaboration between academia, government and industry. Japan also participates in the computing needs of the ATLAS particle physics experiment on the LHC accelerator at CERN, through an ATLAS Tier-2 centre based in Tokyo.

Taiwan

EUAsiaGrid has been a major driver for grid development in Taiwan. All resources are integrated and managed by the Academia Sinica Grid Computing Centre. Research supported by the e-infrastructure includes earthquake hazard maps, shake movies and understanding changing climate and environmental changes.

Philippines

PSciGrid - the country's e-science grid - aims to establish a national e-science grid infrastructure to enable collaborative science in the areas of earth science and life science. The Philippines is a contributor to EUAsiaGrid and a member of PRAGMA.

Malaysia

MYREN, the Malaysian education and research network is connected to TEIN3, and is planning to merge grid and cloud services for its user communities. MYREN 2 is set to offer MYRENCLOUD services which will also be open to bodies such as community centres and schools.



Marco Paganoni, INFN - "The entire world is facing issues like climate change, an increasing population, economic problems as well as competitive disaster mitigation. I believe in all these issues, as well as biomedical, biochemical research and particle physics we need cooperation from everyone to profit from the continuously increasing amounts of data. Projects like CHAIN are looking into this and trying to foster this type of collaboration worldwide."

Preserving Malaysia's cultural heritage

Malaysia is well known for its diversity. With both a multi-ethnic and multi-religious population, it is a country with a rich culture and heritage.

However, Malaysia is at risk of losing this. Cultural artefacts, folklores, performances and rites are gradually being forgotten thanks to the adoption of foreign values and cultures.

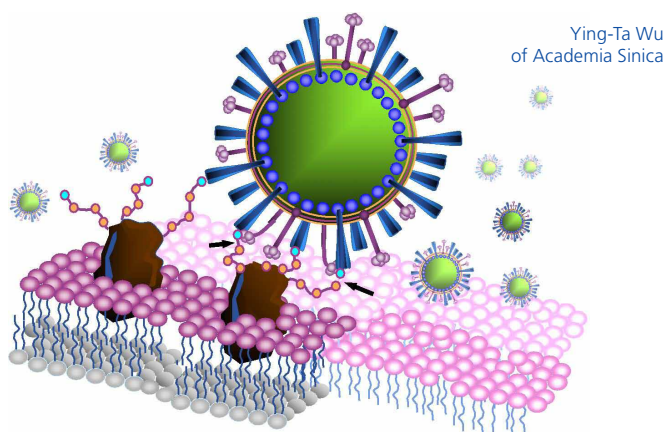
In an effort to preserve its heritage, Malaysian researchers are turning to e-technologies to create digital versions of cultural objects and traditions. For example, dances are being mapped and stored as 3D coordinates while objects are being digitised and annotated for future generations.

Malaysian researchers hope grid technology could hold the key to the long-term preservation and processing of this highly heterogeneous material, as well as storing it in geographically distributed digital archives. By building up an e-culture and heritage digital library, Malaysia's cultural diversity can be preserved for the years to come.



Global science

By its very nature big science requires collaboration, and a key challenge for the Asia-Pacific area is to enable cooperation between countries in the region, as well as with the wider world. Collaborations between Asia and Europe for example, have already been used to find new drug targets for malaria, through the WISDOM project, which used the EGEE infrastructure.



The Trans-Eurasia Information Network (TEIN3) provides a dedicated internet link for research and education communities in the Asia-Pacific. TEIN3 connects academics in Australia, China, India, Indonesia, Japan, Korea, Laos, Malaysia, Nepal, Pakistan, the Philippines, Singapore, Sri Lanka, Taiwan, Thailand and Vietnam. The project will soon expand to include institutes in Bangladesh, Bhutan and Cambodia.

TEIN3 also enables connectivity to the rest of the world thanks to direct links to similar initiatives such as GÉANT in Europe. This particular link enables users in the Asia-Pacific region to participate in joint projects with their European peers. To date TEIN3 has been used in the genetic sequencing of rice and has even connected dancers in Korea to music being played by an orchestra in Stockholm. The stable, reliable network provided by TEIN3 and GÉANT, also proved vital during Typhoon Emong, which hit the Philippines in 2009. In the lead up to the event, the Philippine Weather Bureau used this link to collaborate with the German Weather Bureau, DWD, in order to forecast and issue warnings about the oncoming disaster, saving thousands of lives.

Cooperation and interoperability

The CHAIN project, funded by the European Commission also aims to foster cooperation between different regions. A report from the project, due in September 2011, will include an analysis of which middleware is being run on sites across the world in order to understand what is needed to achieve interoperability between them.

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In terms of technology development, the Pacific Rim Application and Grid Middleware Assembly (PRAGMA) sustains collaborations and advances the use of grid technologies. PRAGMA works with a community of investigators from leading institutions around the Pacific Rim. Its members can share technologies, test each other's code and provide useful feedback, in order to improve applications.

On the other hand the Asia Cloud Computing Association encourages stakeholders - developers, users, policy makers and researchers - to collaborate in order to accelerate adoption of cloud services. The Association aims to complement work done by other organisations, such as the Open Grid Forum, the Distributed Management Task Force, Inc. and the Cloud Security Alliance, all of which take more of a global standpoint.

Should I stay or should I go?

Migration has played an important part in Taiwanese social development since the 1600s. However, determining the motivations behind this phenomenon is far from straightforward.

The SimTaiwan project, headed by researchers from Taiwan and the UK, aims to discover the motivations behind Taiwanese migration. The team of computer and social scientists use a technique called agent based modelling to simulate the interactions that might take place in a dynamically populated and changing environment such as Taiwan.

In social based modelling, different attributes such as age, gender, health, or socio-economic status are assigned to a large number of individual 'agents'. By running the model on a computer, researchers can act out different scenarios over time.

SimTaiwan uses census data to provide attributes for the 'agents'. But, before running the simulation, researchers need to test the performance and scale of the model. The SimTaiwan team have been helped by grid computing resources provided by Academia Sinica in Taipei to debug the model, as well as running stability and sensitivity tests to validate and verify simplified models.

For more information:

Academia Sinica Grid Computing Centre: www.twgrid.org

Asia Cloud Computing Association: www.asiacloud.org

CHAIN: www.chain-project.eu

PRAGMA: www.pragma-grid.net

TEIN3: www.tein3.net

EGI: www.egi.eu

iSGTW: www.isgtw.org

e-ScienceTalk: www.e-sciencetalk.org