CASE STUDY

TEIN
Global collaboration

Predicting the Climate:
Protecting lives, protecting livelihoods

TEIN network enables local climate prediction without the need for expensive computing resources on the ground.

The Trans-Eurasia Information Network (TEIN), a high-speed information network connecting scientists and researchers across Asia-Pacific, is transforming climate and weather prediction, especially in regions with poor technical infrastructure. TEIN is hosting a demonstration project to show how cloud computing makes it faster and cheaper to develop high resolution regional climate prediction systems.

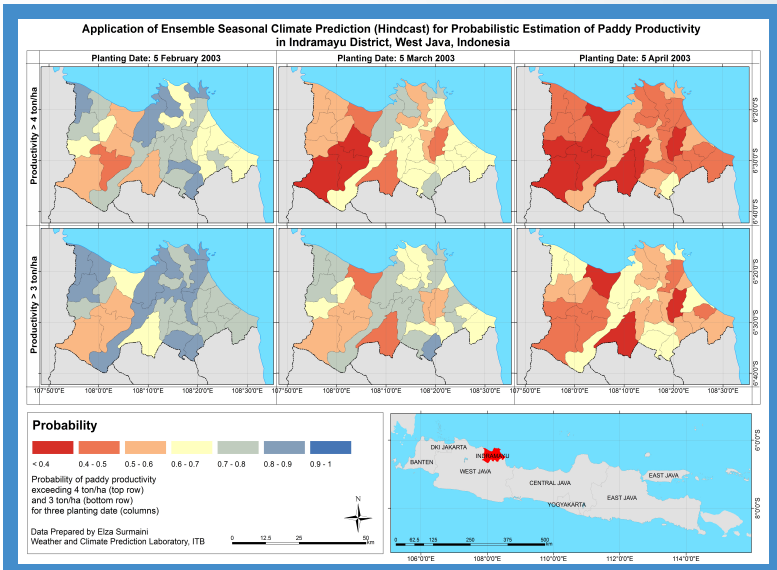
Predicting the climate is more important than ever

As the world shrinks under the impact of globalisation, climate information is becoming an increasingly important element in social and economic decision making.

Although the long-term impact of global warming on climate is still being debated, great variability of climate and extreme weather events are problems in the present, and pose real threats to human security, as well putting at risk billions of dollars of investment. In the past 20 years alone, there has been a severe drought in Indonesia (1997), prolonged flooding in Thailand (2010), and devastating typhoon Haiyan in the Philippines (2013). Reducing the risks posed by these disasters is a matter of urgency – and we understand better than ever how to achieve this goal. It needs investment in climate prediction services to make them widely available to the governments and agencies affected, so they are forewarned and able to prepare.

TEIN – connecting users to the resources they need

TEIN's high speed network – an essential part of a cloud computing solution – links researchers on the ground to huge computing resource – and all at minimal cost. TEIN is facilitating a collaborative demonstration project to show how cloud computing can be used to develop and deliver high resolution regional climate prediction systems – more quickly and more cheaply.



The Challenge :

To help provide accurate long-range climate and weather forecasts across Asia-Pacific, in regions where the technology infrastructure is poor.

The Solution :

Cloud computing solutions give researchers a powerful supercomputing environment that is easily accessible and fully available – at any time and from any location.

Key Benefits :

TEIN brings all the social and economic advantages of sophisticated and powerful climate prediction to people who lack the necessary resources. It provides an infrastructure for international collaboration on research into the many unanswered fundamental climate questions. And it acts as a conduit for knowledge and technology transfers that build climate science literacy across the globe.

Institut Teknologi Bandung

INHERENT

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Climate prediction: the challenges

Decision makers, especially in developing countries, face two challenges: the accessibility of climate information, and its quality.

High quality climate prediction can be produced only through complex global climate simulation and the further processing of the output produced by these computer models. The technology is constantly increasing in power and effectiveness, and it is now possible to produce global seasonal predictions up to six months ahead.

Some of the necessary infrastructure of truly global capacity is already in place. For example, the APEC Climate Center in Busan, Korea, collects and publishes global seasonal prediction information. But insufficient spatial information means that the output cannot be directly used for such applications as the early warning of hydro-meteorological disasters, or for agricultural planning.

In order to make the information more useful, the predictions have to be downscaled into regional domains and the results further analysed with impact modelling tools to provide estimates of local flood hazard levels, crop yields, energy production, and so on. Turning global climate simulations into useful assessments of the impact of particular events on local areas involves a huge amount of data processing, data transfer, and data mining, requiring substantial computer power and fast, reliable computer networks. There are wide gaps in this computing capacity between the developing countries and the advanced industrialised countries; cloud computing is filling these gaps.

> The speed and reliability provided by TEIN is crucial to our ability to predict weather. Our short range predictions involve downloading and processing some 6 gigabytes of data every day and we would simply not be able to do this without the reliable terabyte capacity that TEIN gives us.
>
> My dream is to establish a regional center to predict the impact of weather and climate at seasonal timescales. It's hard to see how we can achieve this goal without TEIN.
>
> *Dr. Tri Wahyu Hadi*
> *Weather and Climate Prediction Laboratory*
> *Bandung Institute of Technology, Indonesia.*

> Our international research collaboration on extreme weather is based on our ability to shift large volumes of data between several institutes scattered across the region. We rely heavily on the reliable high capacity provided by TEIN.
>
> TEIN links the institutes in Kyoto University in Japan, Bandung Institute of Technology in Indonesia, Hanoi University in Vietnam and Nanyang Technological University in Singapore.
>
> Working together, the researchers in these centres perform high-data volume multi-analysis experiments using the cloud computing model.
>
> Without TEIN the routine collaboration between scientists that is achieved in these four widely separated locations would not be possible.
>
> *Professor Shigeo Yoden*
> *Department of Geophysics*
> *Kyoto University*

How cloud computing works

Cloud computing integrates large numbers of computers, located anywhere across the globe; but to users it appears that they are using one computer – with enormous power, gigantic memory and huge data storage. Of course, to work successfully, such a distributed system needs to be able to shift data between locations with lightning speed and complete reliability. This is where TEIN's high speed network comes into the picture. To make full use of this extraordinary computing power needs only a terminal and a link to TEIN – relatively cheap and thus ideal for developing countries.

Cloud computing is already providing answers

Cloud computing is a well-established technology and is already delivering benefits to climate researchers and policy makers.

- The National Oceanic and Atmospheric Administration (NOAA) in the US maintains the world's largest climate data archive and provides its data to users worldwide using cloud technology.
- The aerospace authorities of Japan and the US (JAXA and NASA) are collaborating in the collection of global weather data, using satellites. Again, the invaluable data they gather is being made available to researchers and policy makers across the world by means of cloud computing.

TEIN – the Trans-Eurasia Information Network – is a high speed network connecting scientists and researchers across the Asia-Pacific Region and, through direct connectivity with GÉANT, the pan-European network, to the entire global research and academic community. Co-founded by the EC and Asian partners, and managed by TEIN*CC, the network began operating in 2000 and is now in its fourth phase – TEIN4.

TEIN COOPERATION CENTER

For more information

- TEIN: www.tein.asia / www.teincc.org
- JAXA in Japan: http://global.jaxa.jp
- NOAA in USA: www.ncdc.noaa.gov

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