CASE STUDY

TEIN3
global collaboration

High-speed networking: saving lives by typhoon forecasting

Typhoons are major natural killers. High winds and extreme rainfall damage property, while collapsing buildings, flood waters and disruption to food supply, sanitation and communications cause injury and death. Nothing can be done about the weather, but a great deal can be accomplished if local authorities have the precious advantage of time to prepare. Effective disaster warning systems rely on accurate storm forecasts and the speedy communication of weather alerts. In this race against time, high-speed data networks can make all the difference to typhoon-prone regions like the Philippine archipelago.

Two typhoons contrasted

Typhoon Uring made landfall in the Philippines in November 1991. One of the deadliest tropical cyclones in Philippine history, there were so many casualties that the number had to be estimated – 9000, of which nearly 6000 were deaths.

Typhoon Emong, a much stronger storm with winds of up to 140 km/h, hit the Philippine town of Bolinao in May 2009. Despite its fearsome strength, Emong caused far fewer casualties than Uring 18 years before – 126, of which 60 were deaths.

The people of Bolinao were benefiting from accurate storm warnings issued by the Philippine weather bureau PAGASA. The bureau was in turn relying on the power of high-speed networks – the pan-European GÉANT, its Asia-Pacific counterpart TEIN3 and PREGINET in the Philippines – for the transfer of global meteorological data essential to the timely forecasting of possible disaster. Well before Emong reached Bolinao, emergency teams had been issuing SMS text message alerts, had been patrolling the town, warning people with loud hailers, moving residents to evacuation centres, positioning heavy lifting equipment and getting food to distribution points. The early warning made possible by these networks significantly reduced casualties both from the storm and from its aftermath.

Global data for local forecasting

PAGASA (Philippine Atmospheric, Geophysical and Astronomical Services Administration) collaborates with its German counterpart, Deutscher Wetter Dienst (DWD) which provides it with an accurate, real-time flow of meteorological data to drive its forecasting. The collaboration rests on the power of high-capacity networks, which enable the speedy transfer of vast amounts of data from DWD to PAGASA, the local agency at the sharp end.

Courtesy of Mariela Casis

Bolinao after Emong struck in May 2009

Connect - communicate - collaborate

The world is criss-crossed with high-capacity data-communications networks, connecting and serving research and academic institutions across the globe. Amongst these are GÉANT, serving Europe, and TEIN3, its counterpart in Asia-Pacific.

Separate from the public Internet for reasons of security and performance, many of these networks are designed, deployed and run by the networking organisation DANTE and make an enormous practical contribution to research in a wide variety of areas – saving lives, building knowledge, establishing real-time collaboration between scientists all over the world.

GÉANT and TEIN3 provide a stable and reliable connection between the expertise and high-speed computing capacity of the DWD in Germany and the meteorologists of PAGASA in the Philippines. They play a vital role in the timely transmission of global meteorological data and make prediction of typhoons a reality.

GÉANT PREGINET DWD

The equipment necessary for typhoon forecasting is too expensive to provide in every locality vulnerable to hostile weather. The solution is to link the resources that do exist – in this case DWD computing expertise – with the people who can directly benefit – in this case the people of the Philippines. High-speed networks like TEIN3 provide the essential linkage.

PAGASA: protecting life and property

PAGASA's key function is to ensure the safety and well-being of the inhabitants of the Philippines. Its world-class expertise in monitoring, analysing, forecasting and warning of tropical storms saves lives.

PAGASA is connected to PREGINET – the Philippine Research Education and Government Information Network, managed by ASTI (the Advanced Science and Technology Institute in the Philippines) – through which it connects to the regional high-speed networks TEIN3 in Asia and GÉANT in Europe and further afield. PAGASA and ASTI are agencies of the Department of Science and Technology (DOST).

How a computer in Germany saves lives in the Philippines

Forecasting typhoons and warning of disasters are examples of the kind of international co-operation enabled by networks like GÉANT and TEIN3.

The technology is based on distributed computing and on two numerical weather forecasting models developed by Dr Detlev Majewski of the DWD and his research team. A global model - GME, running at DWD in Germany - produces data for a high-resolution regional model - HRM, running at PAGASA's computing facility in the Philippines. Based on a set of equations defining particular weather conditions (temperature, wind speed, humidity, pressure and so on), the models use observations and previous forecasts to estimate the current and future state of the atmosphere. GME is run on powerful computers at DWD and an extract is produced that serves as input data for the HRM covering the Philippines and surrounding areas. This extract, consisting of huge data, is sent to PAGASA over a network path consisting of GÉANT, TEIN3 and PREGINET.

The GME forecast is produced twice every 24 hours and the volume of data is so large that it takes 75 minutes to transfer. Handling this amount of data with absolutely predictable consistency is vital in applications like typhoon forecasting. Networks like TEIN3 are built for stability and reliability and are ideal for time-critical, complex applications with vast geographical reach.

> "We co-operate with the DWD and have access to the enormous power of their supercomputers to run our weather prediction models. This is an expense we would find it difficult to manage on our own and it is only a viable method because TEIN3, GÉANT and PREGINET together provide an absolutely stable and predictable network for transferring the data we need."
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> *Dr Alan Pineda, Officer-in-Charge, Hydrometeorological Division, PAGASA, Philippines*

> "PAGASA saved lives – it's as simple as that. We were no match for Emong – it was far too strong. All we could do was move people out of its path and get rescue teams ready to deal with whatever it threw at us."
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> *Hon. Alfonso F. Celeste, Municipal Mayor of Bolinao Pangasinan, Philippines*

TEIN3 – the research and education network for Asia-Pacific

- the third generation of the Trans-Eurasia Information Network
- dedicated high-capacity Internet for the research and education communities across Asia-Pacific
- direct connectivity to Europe via GÉANT
- gateway for global collaboration for more than 30 million users in Asia-Pacific
- supported by €12m EU-funding until 2011

For more information:

TEIN3: www.tein3.net
GÉANT: www.geant.net
PREGINET: www.pregi.net

PAGASA: www.pagasa.dost.gov.ph
DWD: www.dwd.de
DANTE: www.dante.net
EC: http://ec.europa.eu/europeaid/index_en.htm

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