Special Mention: e-Gov Projects

INCOIS

Indian Tsunami Early Warning System

With nearly 400 million people living along coastal India, a system was needed to send off tsunami related warnings, prevent damage and save cost of evacuation in case of a false alarm

Natural disasters are a harsh reality that we all have to live with. While their occurrence is beyond human control, the damage caused by them can be minimized. We all remember the devastation caused by the tsunami that occurred in the Indian Ocean on Dec 26th, 2004. Had there been an early warning system to sound off the impacted Indian coastal areas, a lot of damage could have been prevented. Though what has happened can't be reversed, that tragic incident has served us a key lesson to prepare ourselves for the future. The Tsunami Early Warning System (TEWS) was thus established on Oct 15, 2007.

TEWS has been established by the Ministry of Earth Sciences in collaboration with Department of Science and Technology, Department of Space, and the Council of Scientific and Industrial Research. The National Tsunami Early Warning Center has been set up at INCOIS (Indian National Center for Ocean Information Services),Hyderabad.

The implementation

The system uses GIS-based N2 modeling, and real time data monitoring sub-systems for seismic data, tide gauge as well as BPR (bottom pressure recorders) from various national and international sources. There's a decision support system based on a data warehouse and data mine, created for spatial and non-spatial data, for generating accurate tsunami alerts to disseminate this information to scientists, researchers, administrators and general public through email, SMS and by publishing on a website.

Q What sets this project apart from others in its class?

Prior to this, India was dependent on the Pacific Tsunami Early Warning Center that used to issue warnings to this region also. However, these had to be correlated to Indian conditions before the Ministry of Home Affairs could embark on disaster management. This often served as a postmortem solution rather than a proactive one. But with the availability of TEWS (Tsunami early warning system), the center can predict the exact location and wave height of Tsunamis with the actual timing of impact. The application identifies the exact inundation areas, thus reducing the evacuation costs incurred by various state and central governments.

Q What were the business and technical challenges faced during deployment?

All scientific apps implemented for this project required high computing and huge database facilities. These include TEWS, fishing zone advisories, and ocean state forcasting systems. The Tunami-N2 model, which is a part of this deployment, requires high computing facilities for generation of travel time contours and directivity maps for the given input data obtained from seismic stations. Plus, huge data storage facilities are required for storing the scenarios in a central database. In the absence of TEWS, it is impractical to generate the model scenarios and store their output in a database.

Dr. Shailesh Nayak, Secretary, Ministry of Earth Sciences

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The system monitors all seismic activity in the Indian Ocean and reports 6.5+ earthquakes in real time and posts them on the TEWS website.

The N2 model app displays output as layers on maps with appropriate symbology. There's a WebGIS based website that displays real-time seismic activity on INCOIS's website. For instance, as of writing this article, there was an earthquake in the Irian Jaya region of Indonesia with a magnitude of 6.4. This was promptly displayed on the INCOIS website.

Apart from the above, there's a system in place for disseminating tsunami warnings through emails and SMS alerts.

Overall impact

The impact of such a system is immense. It's helping INCOIS accurately detect tsunamis in the Indian Ocean and alert potentially affected surrounding countries. It can even predict the travel time for a tsunami to reach a particular location along the coast, and disseminate tsunami alerts to scientists, administrators and the general public, thereby helping reduce the damage to life and property. It can provide the location of impact, the key contact persons, and areas of inundation with expected heights.

TEWS was able to validate the September 12, 2007 earthquake off southern Sumatra within 12 minutes. The tsunami warning center swung into action and issued a tsunami alert for Andaman and a tsunami watch for main land within 13 minutes. In fact, further online watches of various data sources of the Early Warning System have enabled the client to downgrade these warnings, thereby saving huge revenue outflows required for evacuation and also proving the effectiveness of this system should a high magnitude undersea earthquake occur in the Indian Ocean region.

The key performance indicators for the system are also quite impressive. It takes less than 10 minutes to issue an earthquake warning with 100% accuracy in determining the location, depth, and magnitude. All countries in the Indian Ocean receive timely watch. The system is intelligent enough to do self corrections in case the wave height varies and can cancel a warning with immediate verifications. It has recorded over a 1000 events ever since its inception.

Also, the citizens can register for tsunami alerts from INCOIS's tsunami website, www.tsunami.incois.gov.in for receiving alerts through various media like email & SMS. Lots of action is in store for further development of this system as well, like developing this portal in local languages, generating mass awareness amongst the people living in coastal areas, increasing the center's capabilities to include warning mechanisms for cyclones and storm surges. □

COMPANY SCENARIO

Before Deployment

- Information on Tsunamis and earthquakes in Indian Ocean was coming from international sources.
- Only a post-mortem was possible of the information after the calamity

After Deployment

- The system can disseminate Tsunamigenic earthquake related information in less than 10 minutes.
- The system can predict the time a tsunami will take to hit a particular location along the Indian coast.

What was deployed:

- A decision support system to monitor and measure all seismic activity in the Indian Ocean
- A system to disseminate tsunami related information to the entire Indian coastal region.

Implementation Partner

Tata Consultancy Services