



High-speed networking: helping to win the race against severe weather

With extreme weather events increasingly hitting the news headlines around the world, accurate and timely forecasts are essential for effective disaster warning and mitigation systems. This, in turn, calls for joint research efforts within the global meteorological community to improve models and tools for predicting severe weather, such as hurricanes, tornadoes, cyclones, floods, heat waves etc. High-speed Internet connections, provided by **ORIENTplus** and its pan-European counterpart GÉANT, are vital for such international research collaborations.

In 2003 the World Meteorological Organization (WMO) established The Observing system Research and Predictability EXperiment (THORPEX) to accelerate improvements in the accuracy of one-day to two-week high-impact weather forecasts for the benefit of society, the economy, and the environment. A key component of this programme is the THORPEX Interactive Grand Global Ensemble (**TIGGE**) project which facilitates research on numerical, probabilistic (i.e. ensemble) weather prediction by providing academic researchers access to ensemble forecast data collected daily in near-real time from 10 leading operational forecasting centres across the world. The databases and data portals have been developed by three archive and distribution centres: European Centre for Medium-Range Weather Forecasts (ECMWF) in Reading - UK, US National Centre for Atmospheric Research (NCAR) in Boulder, Colorado, and China Meteorological Administration (CMA) based in Beijing.

High-speed data network connections, such as ORIENTplus, are vital for the seamless transfer of vast amount of data and the overall success of this invaluable resource for the global meteorological



The Challenge

To meet TIGGE's mission to foster research on ensemble forecasting and the development of tools to improve the prediction of severe weather, based on the near-real time exchange of high volumes of ensemble data between multiple forecasting centres, including ECMWF in the UK and CMA in China.

The Solution

By offering the highest capacity connection and the shortest network path between Europe and China, ORIENTplus and the pan-European GÉANT network enable daily direct, seamless data exchange between TIGGE database archive centres ECMWF and CMA, connected to the UK's research network Janet and the China Science and Technology Network (CSTNET) respectively.

Key Benefits

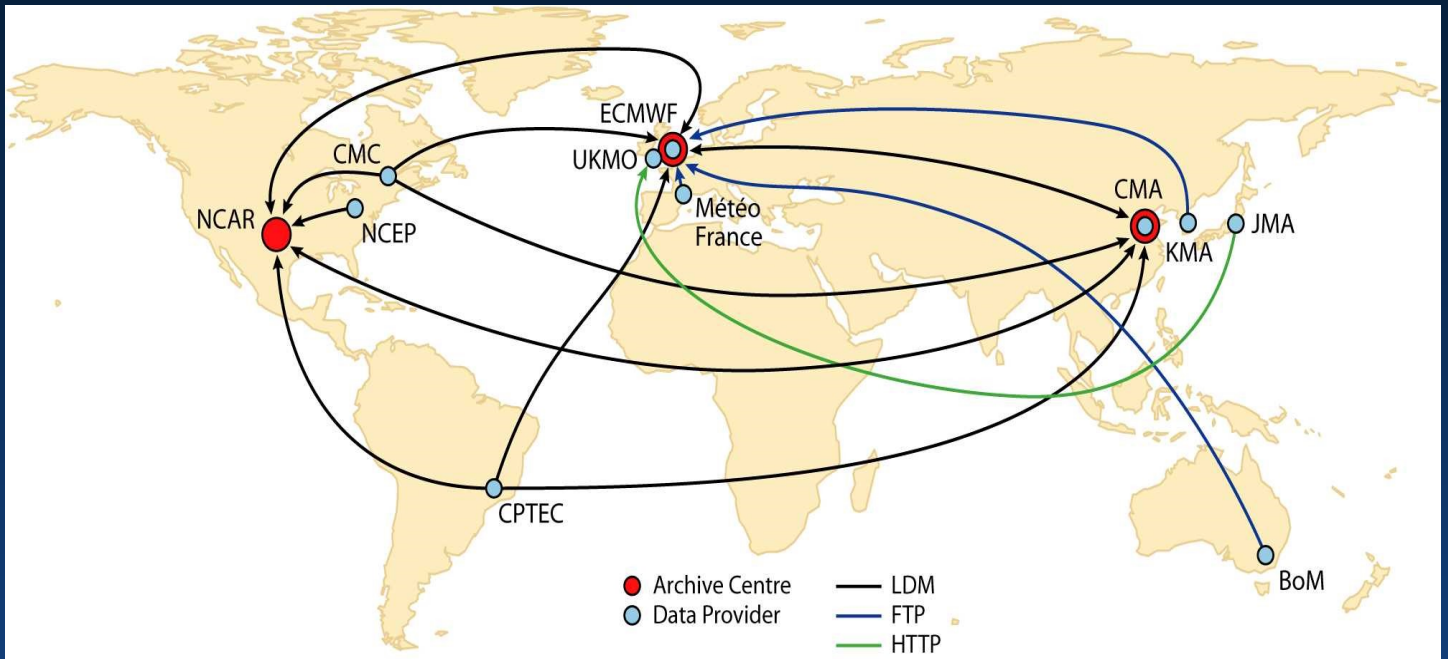
High-speed R&E network connections, such as ORIENTplus, are vital for supporting data-intensive, meteorological research tools, such as the TIGGE ensemble archive, aimed at improving severe weather forecasting and providing early warnings to civil protection agencies and the public. The UK Met Office, also supported by Janet, directly benefits from the collaboration between ECMWF and CMA, enabled by ORIENTplus.

community. ORIENTplus allows for fast database synchronisation of the TIGGE archive, hosted by ECMWF and CMA. The volume of TIGGE data exchanged every day has been steadily increasing over the years mainly due to enhanced model resolution. The data exchange between ECMWF and CMA started at some 240 GB per day back in 2006. The latest figures show a flow of TIGGE data in the region of 500 GB / day from ECMWF to CMA and some 40 GB / day in the opposite direction.

The operational forecasting centres supplying daily forecasts are:

- European Centre for Medium-Range Weather Forecasts (ECMWF)
- US National Centers for Environmental Prediction (NCEP)
- Meteorological Service of Canada (MSC)
- Australian Bureau of Meteorology (BoM)
- China Meteorological Administration (CMA)
- Brazilian Centra de Previsao de Tempo e Estudos Climatico (CPTEC)
- Japan Meteorological Administration (JMA)
- Korea Meteorological Administration (KMA)
- Météo-France
- UK Met Office





In addition to the TIGGE exchange, ECMWF and CMA have a bilateral agreement by which CMA can make use of all operational real-time forecasts produced routinely by ECMWF. Data requested by CMA are transferred over ORIENTplus at approx. 50 GB per day.

Prior to the upgrade of ORIENTplus at the beginning of 2013, due to bandwidth-constraints the data exchange between ECMWF and CMA was feasible only via the third archive centre at NCAR in the USA. ORIENTplus has enabled the direct transfer between the two centres, making time-critical, complex applications with vast geographical reach and huge societal impact an everyday reality.

“TIGGE is a good example of international cooperation that provides a Petabyte-sized resource to the benefit of the research community as well as to providers and users of meteorological services. ECMWF alone has 2500 registered users worldwide. Without high-speed networks the daily database input and synchronisation between the archive centres would simply not be possible”.

Manuel Fuentes,
TIGGE Project Manager, ECMWF



The route of data between ECMWF and CMA, via national and regional R&E Internet networks/links

ORIENTplus – linking China and Europe

dedicated internet link interconnecting the research and education communities of China and Europe; links CERNET (China Education and Research Network) and CSTNET (China Science and Technology Network) with the pan-European GÉANT network via super-fast connectivity between London and Beijing; jointly funded by the European Commission through its 7th Framework Programme, the European NREN partners and the Chinese government until 2014; at 10 Gbps, the highest capacity link and the shortest network path between the two regions; in use by more than 25 substantial, bandwidth-hungry, data intensive collaborations, including participation in the Large Hadron Collider (LHC) studies, Shanghai Astronomical Observatory and genome projects.

This document has been produced with the financial assistance of the European Union. The contents of this document are the sole responsibility of DANTE and can under no circumstances be regarded as reflecting the position of the European Union.

To learn more about ORIENTplus visit:
<http://www.orientplus.eu>

To find out more about TIGGE visit:
<http://tigge.ecmwf.int>

