ICHEC

Irish Centre for High-End Computing

2006–2016

Contents

Director's Welcome

Welcome to this commemorative booklet celebrating ICHEC's 10th Anniversary. From a small group of six people supported through seed funding from Science Foundation Ireland (SFI), ICHEC has rapidly grown to become an established Centre of international reputation.

Indeed, the establishment of the Irish Centre for High-End Computing (ICHEC) has had a broad and profound impact in Ireland, bringing a significant step change not only to academic research but also for industry and the public sector. Our partners and clients include prestigious organisations from a variety of domains, and this booklet reflects its breadth and diversity. I hope you enjoy reading these 10 success stories of innovation. These are just our "best of"; we could easily have included 20.

As HPC is now widely recognised by policy makers across the world as one of the key platforms for innovation and competitiveness, Ireland is well placed, through ICHEC, to leverage fully the exceptional enabling power of this technology.

Reflecting on 10 years, I feel that ICHEC is on the cusp of achieving something very special indeed. As a great Irish technologist once said: "Ireland cannot be the leaders in High-Performance Computing in terms of ownership of world-leading hardware infrastructure, but it can be among the world leaders in the effective use of High-Performance Computing."

It is my ambition to deliver on this dream!

Beir bua is beannacht oraibh go léir,

JC Desplat
ICHEC DIRECTOR

HPC: Accessing the hidden force behind Irish research and discover

"I would like to congratulate ICHEC on the 10th anniversary. They have provided essential High Performance Computing support to the academic community in Ireland and I think they will deserve a big cake perhaps with 1200 candles for each of the projects they supported in the past 10 years."

DR JIRI VALA,
Chair of the National HPC Service Science Council

HEA
Higher Education Authority
An tÚdarás um Ard-Oideachas

AN ROINN OIDEACHAIS AGUS SCILEANNA
DEPARTMENT OF EDUCATION AND SKILLS

SFI Fondúireacht Eolaíochta Éireann Science Foundation Ireland

An Roinn Post, Fiontar agus Nuálaíochta
Department of Jobs, Enterprise and Innovation

ICHEC'S FACILITIES AND EXPERTISE IN HIGH PERFORMANCE COMPUTING PROVIDE A 'HIDDEN ENERGY' IN IRISH RESEARCH, DRIVING SCIENTIFIC DISCOVERY.

Data fuels scientific discovery and researchers need increasingly powerful computers to analyse data and bring those discoveries to light, whether it's learning about our solar system, discovering new materials and processes to power our world or designing technologies to improve our health. For the last decade or so in Ireland, ICHEC has been guiding and providing researchers with access to High Performance Computing that functions like 'hidden energy', a driving force behind discovery.

Stepping stones with HPC

Some projects need more computing power than others, and ICHEC's National Service offers a 'step stone' model to match the appropriate projects and levels of HPC, explains ICHEC's Technical Manager, Dr Michael Browne.

At the 'entry level' or Level C, researchers can gain access for small-scale projects with minimal review, but support is on hand so they become familiar with HPC.

"Researchers can condense what would take a century of data analysis on a laptop into one or two years on these parallel and powerful computers."

DR MICHAEL BROWNE, Technical Manager, ICHEC

"PhD researchers can apply for Level C in their own names," explains Dr Browne. "These projects are relatively small – the entire Level C takes up only around 7% of computer time on the National Service, but the aim is to have lots of researchers using the resource, getting what they need and becoming comfortable with the system."

"As projects get larger and need more computing power and time, and the application process ramps up: Class 'B' projects need to pass peer review and researchers often undergo training."

Recent examples of 'B' projects have included a search for signals in the body called biomarkers to help diagnose epilepsy, mapping the genetic ancestry of Ireland, decoding DNA sequences in cancer and designing stents to remedy blocked blood vessels.

The next level up, and the highest at a national level, is Class A, which offers millions of hours of computing time. "Researchers can condense what would take a century of data analysis on a laptop into one or two years on these parallel and powerful computers," says Dr Browne.

Applications for Class A first need to pass muster, including an international review, but recent beneficiaries have included an analysis of the Sun's atmosphere, work to design catalysts for producing biogas and simulations of ocean energy systems.

"PRACE is important because the really top end computing resources can only be provided on a continental scale, and until ICHEC joined PRACE eight years ago, Irish researchers really had no access to these world-leading facilities. Since then however, we have had access to approximately 2.7 million Euros-worth of computing time."

LUKE DRURY, Acting Director, ICHEC

ICHEC'S NATIONAL SYSTEM FOR HPC BY THE NUMBERS	
Number of research projects hosted to date:	> 1200
Typical number of users per day:	50-60
Number of active users in 2016:	Approx. 450

Keeping 'PRACE' with HPC in Europe

For projects that need computing power beyond the National Service, ICHEC links into PRACE, the Partnership for Advanced Computing in Europe, which allows researchers in Ireland to secure time on some of the world's most powerful computers and enable scientific discovery.

PRACE manages access to seven machines and of those some are in the top 10 in the world," says Dr Browne. "PRACE has delivered 11 billion core hours to European Science, which equates to 115,000 years worth of compute time were you to do it serially.
That is longer than the history of humanity."

Parallel lines: ICHEC on a twin track to success with Intel

ICHEC IS WORKING WITH INTEL TO OPTIMISE SOFTWARE FOR THE NEXT GENERATION OF HARDWARE PROCESSORS AND MAKE THE MOST OF BIG DATA.

Computer hardware and software go hand-in-hand – and to make the most of the Big Data revolution, we need both hardware and software to be able to handle enormous volumes of information.
That's why ICHEC is working with Intel on new-generation hardware to ensure that software performance is optimised to get the job done.

The collaboration between ICHEC and Intel dates back to 2013, when the chip-manufacturing giant launched a new 'code modernization programme' by creating Intel Parallel Computing Centres (IPCCs). Intel was introducing new processors that were far more parallel than previous models, enabling software to run faster - but only if the software too is made sufficiently parallel, explains Dr Michael Lysaght, a Computational Scientist and Principal Investigator of the IPCC at ICHEC.

Running in parallel

Intel's family of massively parallel Xeon Phi processors have been designed to underpin High Performance Computing, and now codes need to be able to perform accordingly.

"At ICHEC we had done some work on parallelising molecular dynamics software on highly parallel hardware platforms in the past," recalls Dr Lysaght. "So Intel started talking to us and ICHEC became the sixth Intel Parallel Computing Centre globally."

ICHEC was not only able to work on optimising the code, it also demonstrate its real-world application through ICHEC's partnership with energy exploration company Tullow Oil. "We were able to demonstrate that algorithms for Tullow's analysis of seismic signals from the Earth's substructure could work more effectively on the Xeon Phi with the optimised code," says Dr Lysaght.

"To properly exploit the abilities of the hardware, we need revolutionary approaches to modernising software, including at the algorithmic level, and ICHEC has that expertise."

DR MICHAEL LYSAGHT, ICHEC

Bright forecasts

More generally, optimising High Performance Computing software to run on the next generation of processors will be key to making the most of data at scale, he adds.

"This will have a direct impact on data-intensive activities such as weather forecasting, climate modelling and anticipating conditions at sea," he says. "Through the IPCC programme with Intel we have been working with the National Oceanic and Atmospheric Administration (NOAA), Professor Frederic Dias's Wave Group at University College Dublin and the US Naval Research Lab in the USA on high resolution wave prediction, and separately in Ireland we have been working with Met Éireann on building more accurate models of future climate and even sharper weather forecasts."

The advent of 'exascale' computing (capable of a million million million calculations per second) will open up possibilities such as weather forecasts that don't just tell you whether it will likely rain in Dublin tomorrow, but pinpoint the likelihood of when it will rain on a particular side of a building tomorrow, notes Dr Lysaght.

That level of resolution will need both hardware and software to be at the top of their parallel games: "To properly exploit the abilities of the hardware, we need revolutionary approaches to modernising software, including at the algorithmic level, and ICHEC has that expertise."

Brian Quinn, Director of European Innovation at Intel Labs Europe says: "ICHEC joined our global Intel Parallel Computing Centre programme in 2013. There is a very competitive, and global scoped, selection process for the programme and ICHEC were chosen for of their exceptional parallel software skills and their resourcefulness (built on a broad discipline experience) in problem solving for HPC and big data challenges."

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BRIAN QUINN
Director of European Innovation
at Intel Labs Europe

What lies beneath: ICHEC helps Tullow Oil to explore

ICHEC IS HELPING ENERGY EXPLORATION COMPANY TULLOW OIL TO USE THEIR DATA MORE EFFICIENTLY TO SCAN BENEATH THE EARTH'S SURFACE FOR HIDDEN NATURAL RESOURCES.

"Increasingly in all areas of science and computing, it has become impossible to know everything to solve a particular problem, so more and more we need specialists, and ICHEC has expertise that can apply to many real-world problems in industry."

DR SEÁN DELANEY,
Computational Geophysicist, Tullow Oil

Knowing what lies beneath the Earth's surface is a big deal for energy exploration. Pockets of oil and natural gas offer valuable natural resources, but how do exploration companies find them? And how can Big Data help?

One method, used by Irish company Tullow Oil, involves sending a pulse of sound energy from a boat using a compressed air source and measuring the sound that reflects back from the Earth's subsurface, which contains hidden information about what lies beneath.

To gather and analyse that information effectively, Tullow must develop complex algorithms, and a long-running collaboration with ICHEC is delivering the goods.

For such 'seismic surveys,' the boat is rigged with specialised microphones that record the returning vibrations, and from that you can start to construct an image of the Earth's subsurface, explains Dr Seán Delaney, a computational geophysicist who worked first with ICHEC and is now employed by Tullow Oil.

"The oil and gas exploration and production business is a very complex environment to work in, it involves acquiring a huge amount of data. We need to collaborate with an organisation such as ICHEC because we need to draw on their computational skills and their people. Oil and gas exploration and production is a long-term investment and we expect our collaboration with ICHEC to be a long-term investment "

JOE MONGAN, Global Manager Geophysical Technology at Tullow Oil

Efficiency gains

"We use a technique called Reverse Time Migration, which is computationally very expensive," he says. "These surveys take in tens to hundreds of terabytes of Information, and it would take a combination of hundreds of desktop computers months to process it."

With such large volumes of data being collected and processed, small inefficiencies can make a big difference, notes Delaney, both in wasted energy for processing power and time to solution.

ICHEC has been working closely with Tullow to optimise the code and make the process more streamlined and efficient. "ICHEC have helped us to speed up our code by factors of five to 10," says Dr Delaney. "That means we can apply more complex imaging algorithms in a shorter timeframe using Tullow's existing cluster."

With Big Data comes Big Storage and ICHEC has recently worked with Tullow to help assess their data storage and management needs – the findings of that collaboration stand to further enable Tullow to pursue the data analysis it needs.

Dr Delaney sees ICHEC as a valuable source of expertise for the company: "Increasingly, in all areas of science and computing, it has become impossible to know everything required to solve a particular problem, so, more and more, we need specialists like ICHEC, who provide expertise that can apply to many real-world problems in industry."

Tapping into expertise

ICHEC computational scientist Ruairi Short has also worked on the collaboration in recent years, and the ICHEC-Tullow partnership is now tackling further steps in the workflow of imaging the Earth's subsurface at survey sites to explore resources below. "Tullow could not have done this without a blend of people with different backgrounds," says Ruairi. "And that includes ICHEC's physicists and computational scientists and links with data storage experts."

Getting to grips with future climate change

"The users of our climate modelling results include the Office of Public Works and the Government, who need to prepare for the greater likelihood of flooding in Ireland this century as well as agricultural and resource stresses such as drought."

ALASTAIR MCKINSTRY,
ICHEC Environmental Sciences Activity Leader

HORIZON 2020 seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND epa Environmental Protection Agency An Gníomhaireacht um Chaomhnú Comhshaoil European Commission

BY EXPERTLY FORMULATING, HANDLING AND PROCESSING DATA, ICHEC HELPS TO ANTICIPATE CHANGES IN CLIMATE TRENDS – INCLUDING FINE-GRAINED MODELS FOR IRELAND.

Climate change affects us all – but how will Ireland's climate change over the next 20, 50 and 100 years? ICHEC has played a key role in initiatives to estimate Earth's projected global climate and is showing that Ireland probably needs to plan for increased temperatures and less frequent but more intense bouts of rainfall.

Climate past and future

How can we tell? By running high-power simulations of possible future climate scenarios, scientists can work out the most likely trends. For nearly a decade, ICHEC has been working with Met Éireann as part of a global climate consortium called EC-Earth, which feeds into the high-profile Intergovernmental Panel on Climate Change (IPCC) reports.

The ambitious EC-Earth project tested its simulations by running them into the past, to see how well they 'predict' what we know happened during those decades.

Understandably, crunching centuries of climate data needs enormous computing power, and this is where ICHEC's skills, expertise and capacity came in, linking data-rich models from land, sea and atmosphere to see the bigger picture of global climate.

Global view

The calculations for EC-Earth were vast: the consortium ran around 50 experiments that each took several months on a supercomputer the equivalent of 200 desktop computers, explains Alastair McKinstry, ICHEC Environmental Sciences Activity Leader at NUI Galway.

"The simulations covered what climate conditions were like in the past, they showed how well we could 'forecast' the 20th century based on the models and delivered predictions are for the 21st century, given various greenhouse gas scenarios."

Those results informed the IPCC report in 2013 and the models will continue to feed into future international reports as well as enabling ongoing research.

"Climate models tell you averages, you can't pick years and say 2020 is going to be bad, it is looking at the probability of events over the years," explains Ray McGrath. "There is still a lot of uncertainty and our research looks to sharpen that."

Mind the data

ICHEC runs a node on the Earth System Grid Federation for Ireland, where climate scientists can publish and access climate model data. But there is more to it though than simply holding the information, explains McKinstry.

"We need to understand the science of climate modelling to be able to anticipate what questions scientists will want to ask of the data," he says. "This means we can format, store and process the information in a way that makes the data useful for others."

Ireland's change

The EC-Earth model assesses climate for large regions, but what about a specific country like Ireland? By running higher-resolution simulations, ICHEC researcher Dr Paul Nolan is zooming in on Ireland and builds in important local aspects such as soil temperature, wind speeds, vegetation and land structures.

The three-year project, funded by the EPA, found that by the mid-21st century Ireland will likely be warmer (with annual average temperatures increasing by 1-1.7°C), to experience less rainfall in spring and summer but more heavy rainfall events in autumn and winter, to have fewer but more intense storms and to have variations in wind energy.

Researchers and public agencies are now using the data to help understand how Ireland can mitigate against the effects of climate change through strategies such as sowing more resilient crops and identifying regions likely to be affected by flooding and storm activity.

"We could have used European computers to downscale climate predictions for Ireland, but it would have been difficult to be awarded time to focus on one country. Having ICHEC meant we could run climate model simulations for Ireland ourselves."

DR PAUL NOLAN, ICHEC

Weather rain or shine – zooming in on the forecast for Ireland

ICHEC IS WORKING WITH MET ÉIREANN TO DEVELOP HIGH-RESOLUTION MODELS THAT FORECAST THE WEATHER FOR SPECIFIC LOCATIONS.

Did you check the weather forecast for today? We consult it on the television, the radio and even our phones to plan for journeys, sporting and social events - or maybe our livelihood depends on the weather - so getting a decent local forecast is in everyone's interest.

For almost a decade, ICHEC has worked closely with Met Éireann to help improve the quality and resolution of the forecast, so that today we have a better idea of whether the sun will shine on the Aviva Stadium in Dublin for the match, or if impending frost, gales or stormy conditions means we would be wise to take preventive action at home, on journeys or on the farm.

Ireland's next top (weather) model

ICHEC has been working with the national meteorological service to develop ever-more-powerful computer models to forecast for the coming hours and days.

Such forecasts can never be 100 per cent certain, but thanks to improved models and computing power, we can now tell with reasonable confidence what the weather will be like in specific areas.

"When we started working with Met Éireann in 2007, their model had a resolution of 16km, which meant that we could tell where a weather event was going to happen to the nearest 30-40km," explains Alastair McKinstry, ICHEC Environmental Sciences Activity Leader. "Now we run the models at a resolution of 2.5km, and that means being able to give a forecast for specific locations - like a particular sports stadium in Dublin."

The next step is to bring the resolution from 2.5km to below 1km, and ICHEC and Met Éireann are currently experimenting with this extreme close-up, he adds.

Relying on reliability

Keeping Ireland informed about the weather is a 24/7 business, explains Ray McGrath, Head of the Research and Applications Division at Met Éireann, and ICHEC are up to speed.

"From our experience, ICHEC is a very good facility and has excellent people for advice for high-performance computing. I find it surprising that ICHEC's resources are not used more in Ireland."

RAY MCGRATH
Head of the Research and
Applications Division, Met Éireann

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ALASTAIR MCKINSTRY
ICHEC Environmental Sciences
Activity Leader

to be reliable, so you can't afford to have things breaking down on a Friday and not running over the weekend," he says. "It has happened that to keep things running ICHEC staff have needed to get out of bed on Christmas morning to fix a problem."

ICHEC's technical ability in high-end computing and scientific knowledge of modelling make them perfect partners for developing next-generation approaches to forecasting with international consortia, notes McGrath. "The days when you could write your own model, are long gone - developing a forecast model is now an international effort and ICHEC is deeply involved in this process."

Finer, faster future

The simulation 'crunching' that underpins weather forecasting needs both smart model design and serious computer power - and the technology develops quickly, explains McKinstry.

"The machine we use at the moment is 100 times faster than the one we had when we started working with Met Éireann," he says.

As well as researching, informing and enabling more powerful forecasts, ICHEC also clues in manufacturers of computers about what the field of meteorology needs.

Examples include the SGI Centre of Excellence on Climate Modelling co-located with ICHEC, and ICHEC's work with the European H2020 ESCAPE project on the suitability of novel technologies from Intel and NVIDIA for climate and forecasting codes.

"We have collaborations with companies who want to build the next generation of chips," explains McKinstry. "Companies need to know what people will require from their supercomputers, and we are in a position to tell them what those needs are."

MET éireann

ENTERPRISE IRELAND

DDN and ICHEC: Cracking codes for optimised data management

ICHEC STARTED OFF AS A CUSTOMER OF DDN, A GLOBAL HPC DATA STORAGE COMPANY WHO SOLVE HPC & ENTERPRISE BIG DATA CHALLENGES, AND IS NOW COLLABORATING WITH DDN TO IMPROVE DATA STORAGE AND APPLICATION PERFORMANCE AS WELL AS ACCESS METHODS.

DDN® STORAGE

ICHEC started off as a customer of DDN, a global HPC data storage company who solve HPC & Enterprise big data challenges, and is now collaborating with DDN to improve data storage and application performance as well as access methods.

"We put this code development problem out to major organisations in the US and Japan, but ICHEC was the only organisation that was able to get the code up and running."

Data needs to be stored, and when you are dealing with enormous amounts of data, you need to be clever about it. This is where ICHEC and DDN have formed an intelligent and productive collaboration that is already solving real-world problems for companies.

From customer to collaborator

ICHEC started using DDN's services as one of the world's leading data storage organisations, explains John Sheahan, Head of Sales Operations for EMEA with DDN. "ICHEC started out as a DDN customer, they bought a national supercomputer for academic and industry and they had a really good understanding of what they required in terms of data storage and access," he says.

DDN and ICHEC soon realised their strengths were complementary, according to Sheahan."At DDN we had great expertise on hardware, HPC parallel file systems and getting High Performance Computing solutions running and ICHEC were experts on the software side, in applications, code optimisation and sequencing jobs," he recalls. "We got on really well and we identified opportunities to collaborate."

Cracking codes

One of those opportunities was for energy company Saudi Aramco, which needed software to run more quickly for seismic analysis in oil and gas exploration.

"ICHEC came on board as consultants to help overcome issues with the software code," explains Sheahan. "There were lots of cynics in the room, but ICHEC turned them into advocates when they sped up the code by a factor of four to five and proposed further recommenced changes that could be made down the road."

Another opportunity came from within DDN, which is developing new "Burst Buffer" software called Infinite Memory Engine that seeks to speed up High Performance Computing systems.

"At DDN we produced rough code - a basic idea of what we wanted," says Sheahan. "Then we invited some of our best tech-savvy customers to collaborate with us and develop the code further."

ICHEC more than rose to the challenge, he notes: "We put this code development problem out to major organisations in the US and Japan, but ICHEC was the only organisation that was able to get the code up and running."

ICHEC central for HPC vision

Sheahan is a "huge supporter" of ICHEC and sees the organisation as a central to the vision in Ireland for High Performance Computing.

"I am involved in developing a strategy for High Performance Computing for Ireland," he says. "We want to create a vibrant environment with strong expertise and a supporting infrastructure with easy access to all businesses, both large & SME. ICHEC's expertise means its place is front and centre in Ireland's HPC environment in the coming decades."

Quick, small and sticky: a new blood test for heart attack and stroke risk

ICHEC IS WORKING WITH RESEARCHERS AT THE RCSI AND DCU AND WITH MEDICAL TECHNOLOGY COMPANY BECTON DICKINSON (BD) TO DEVELOP RAPID BLOOD TESTS THAT MEASURE PLATELET 'STICKINESS' AND THE RISK OF HEART ATTACK AND STROKE.

How sticky are your blood platelets? We need these tiny components in our blood to form clots when we cut ourselves, but if they are sticky and likely to clump together in blood vessels, you could be at increased risk of a heart attack or stroke - conditions that kill around 10,000 people per year in Ireland alone.

Yet platelet stickiness is not as routinely measured in the clinic as other indicators of heart disease, such as cholesterol. This lack of monitoring is especially remarkable considering that not all patients with sticky platelets respond effectively to blood-thinning drugs such as aspirin.

That's why researchers in the Biomedical Diagnostics Institute from the Royal College of Surgeons in Ireland, Dublin City University and ICHEC have been developing a new system – the Dynamic Assay of Platelet Function (DPFA).

The team, led by Professor Dermot Kenny, Professor of Cardiovascular Biology at RCSI, has developed a 'chip' platform with tiny channels in it to quickly analyse platelets within minutes from just a drop of blood.

Sticky chips

"The system flows a tiny blood sample through a chip that mimics the structures of blood vessels, and a camera takes photos of the platelets, observing their behaviour and seeing how they interact with molecules on the chip," explains Dr Simon Wong, a computational scientist with ICHEC.

"The idea is that a patient could give a drop of blood in the doctor's clinic and then by analysing the platelet behaviour, you get a measure of the person's platelet function and their risk of cardiovascular problems."

The DPFA system could in future help doctors both identify patients who are at increased risk of stroke and heart attack and also track a patient's response over time to blood-thinning medications to bring down their risk.

Enabling prototype

But first the device needs to be studied in the clinic, and ICHEC has played key roles in making the prototype detection system more rapid and sophisticated, enabling the study in two Irish hospitals of hundreds of blood samples from patients and healthy 'controls' who do not have cardiovascular disease.

ICHEC has developed key computer algorithms that allow the detection software to track platelets more accurately and measure their behaviours, and ICHEC has also sped up and automated the analysis of the system to deliver results from samples in minutes.

"It used to be that someone had to sit down for half a day to a day to process a lot of these experiments," says Dr Wong. "Now it only takes a few minutes to get the output and this means experiments can be carried out on samples from hundreds patients, which is a more powerful test of the system."

Going small

As well as speedy results, if the detection device is to be of practical use in the clinic it will need to be small, and this is where the researchers are collaborating with medical technology company Becton Dickinson (BD). "We are now exploring with BD whether the chip is compatible with a small bench-top machine," says Dr Wong.

The collaboration with BD is sponsored by an Enterprise Ireland Innovation Partnership, and the development of such a device could vastly increase the availability of the 'sticky-chip' technology to patients.

Professor Kenny sees the value in the diversity of expertise across the consortium: "Advanced diagnostics require genuine multidisciplinary engagement, our collaboration with ICHEC is a perfect example of that."

"The idea is that a patient could give a drop of blood in the doctor's clinic and then by analysing the platelet behaviour, you get a measure of the person's platelet function and their risk of cardiovascular problems."

DR SIMON WONG, ICHEC

"Advanced diagnostics require genuine multidisciplinary engagement, our collaboration with ICHEC is a perfect example of that."

PROFESSOR DERMOT KENNY,
Professor of Cardiovascular Biology at the Royal College of Surgeons in Ireland.

ICHEC enables Big Data approaches to gather official statistics

"Sandbox has gained a lot of traction in the community of experts that use it to test out Big Data for official statistics, they see the value in it."

NIALL WILSON
Infrastructure Manager, ICHEC

UNITED NATIONS

An Phríomh-Oifig Staidrimh
Central Statistics Office

eurostat

UNECE

ICHEC'S 'SANDBOX' IS HELPING EUROPEAN NATIONS TO MAKE MORE OF BIG DATA AND TO GET INSIGHTS INTO TRENDS AND ACTIVITIES FOR OFFICIAL STATISTICS

Gathering official statistics about human activity is important business. Whether it's a periodic Census or tallying up the annual tax returns, the results can help to optimise national and economic policies and to spot trends as they arise.

Yet in a digital world, there is potentially plenty more to gather. What if we could use commuter traffic levels as an indicator of economic growth? What if we could use mobile phones to gather fine-grained information from consenting citizens in the period between one national Census and the next? And what if we could gauge a nation's wellbeing by looking at social media posts?

ICHEC is helping nations around the world to make more of Big Data for official statistics in a safe, secure and appropriate way.

Sandbox for data experiments

Working with the Central Statistics Office in Ireland and with the United Nations Economic Commission, ICHEC created "Sandbox", a shared research and development environment that offers a secure and flexible platform for experimentation with new statistical frontiers.

"We came in and set up this shared service in 2014," explains ICHEC's Infrastructure Manager Niall Wilson. "And this shared platform is now used by people who want to test out methods of augmenting data gathering with Big Data and High Performance Computing."

To date, experts more than 25 organisations from around the world have subscribed to and used Sandbox, including the OECD and Eurostat. ICHEC has also been involved in discussions about best practice in High Performance Computing, data privacy and ethics and how reliable data sources can be.

"Users can all access this same platform, and at ICHEC we provide the tools to let them look at large datasets and work on the data together as a virtual group, where they can discuss methods and best practices."

Traction

ICHEC not only provides the virtual space and tools, but importantly adds in expertise and skills to support users, explains Wilson: "Sandbox has gained a lot of traction in the community of experts that use it to test out Big Data for official statistics, they see the value in it."

Mr Ronald Jansen, Chief of the Trade Statistics Branch at the United Nations Statistics Division, states: "Under a UN umbrella, the Irish Sandbox offers a level playing field for developed and developing countries to move forward with the use of Big Data for official policy purposes."

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MR RONALD JANSEN
Chief of the Trade Statistics Branch,
United Nations Statistics Division

""The ICHEC CSO/UNECE collaboration is excellent example of the benefits that strategic partnership between mission-driven Public Sector organisations and technologists can achieve. As a part of ICHEC's public sector engagement programme we have the ambition to bring the benefits of technical computing to the wider public sector".

EMMA HOGAN
Public Sector Liaison, ICHEC

Whipping the stats into shape on social media trends

ICHEC HAS WORKED WITH IRISH MEDIA ANALYSIS COMPANY NEWSWHIP TO TECHNICALLY VALIDATE THEIR MODEL.

ENTERPRISE IRELAND
where innovation means business

NEWS WHIP

"We track all of the world's news content and our customers want to know what are going to be the big news stories each day. The amount of data is so big that we needed computing power and statistical brain-power, and that's where ICHEC came in."

PAUL QUIGLEY, Co-founder and CEO of NewsWhip

News travels fast, and thanks to social media, a story can go viral around the globe in seconds. News organisations can struggle to keep up with breaking stories – but what if they could predict which stories are about to grow legs? Or track online content to see where their stories are having an impact?

Irish startup NewsWhip provides the smarts for that, with clients such as the Associate Press, the BBC, The Washington Post and Newsweek, and ICHEC technically assessed NewsWhip's approach.

The collaboration started when ICHEC's Industry Research and Development Liaison Sufian Al Aswad heard about NewsWhip as a High Performance StartUp with Enterprise Ireland. "I thought that we could probably help them, so I made contact and told them about our expertise in High Performance Computing and data analysis," he recalls.

That led to a four-month project in 2014 where ICHEC scientists took a sample of data that NewsWhip would typically mine, and then tested the company's algorithm, or underlying software approach.

"At ICHEC we were able to simulate situations and look at how the algorithm performed under those circumstances, to look at how verifiable the information coming back was, and how accurate the predictions were," says Al Aswad. "We were able to show that as the velocity of the social media information increased, the infrastructure and algorithm were robust, and in the majority of cases it could predict the 'virality' of a story within an hour of breaking, so it was a good technical feasibility analysis."

The collaboration, which was funded through Enterprise Ireland, gave NewsWhip hard data on which to plan and to approach potential investors, according to Sufian. "They were very pleased with how ICHEC's involvement could fast-track that technical validation," he says. "It was a good example of using State funding to support an Irish enterprise."

Paul Quigley, co-founder and CEO of NewsWhip says: "We track all of the world's news content and our customers want to know what are going to be the big news stories each day. The amount of data is so big that we needed computing power and statistical brain-power, and that's where ICHEC came in."

Powered by People

THROUGH ITS EXPERTISE AND INFRASTRUCTURE IN HIGH PERFORMANCE COMPUTING, ICHEC DRIVES RESEARCH AND INDUSTRY SOLUTIONS IN IRELAND AND BEYOND. BUT WHAT DRIVES ICHEC? **ITS PEOPLE.**

"ICHEC is a diverse organisation with staff from more than 12 countries who share one thing in common - a passion for HPC."

PROFESSOR JC DESPLAT

"At ICHEC we have a really high ambition on how we can drive Ireland's HPC sector."

DR MICHAEL LYSAGHT

"To use our HPC knowledge to realise solutions to some of the world's most challenging problems."

DR BUKET BENEK GURSOY

"The attraction to me of ICHEC is that it is open to new ideas and different perspectives."

DR CONOR DELANEY

"ICHEC gave me the scope to be inventive and to show initiative."

DR SEAN DELANEY

"ICHEC is powered by very passionate smart people who think outside the box"

MARCO GROSSI

"You will find shared values and visions across ICHEC."

DR KASHIF IQBAL

"ICHEC is a bridge between academia and industry."

NICOLA MCDONNELL

"Where else can you play with cutting-edge technology? ICHEC."

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