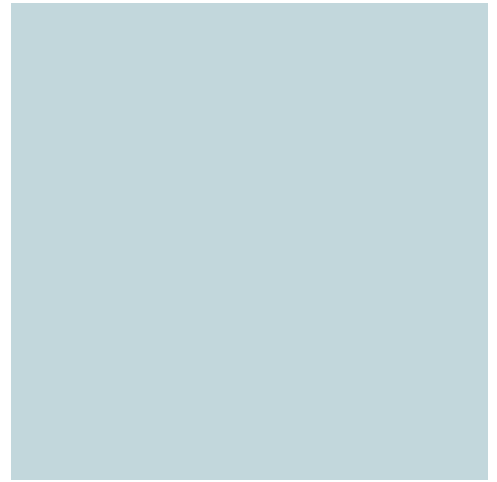
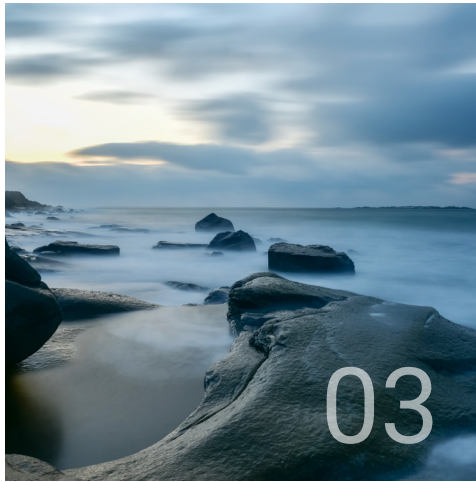
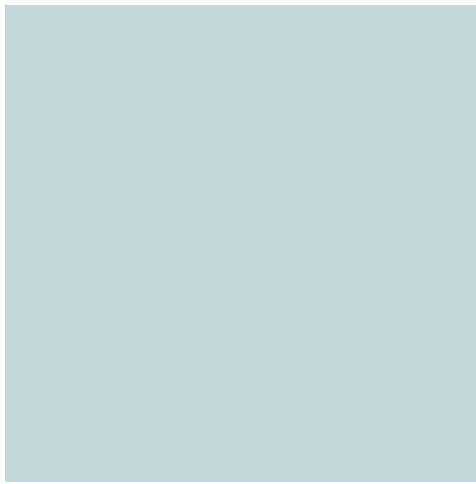


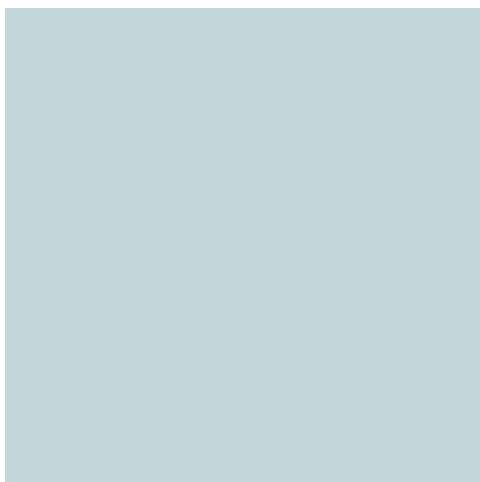
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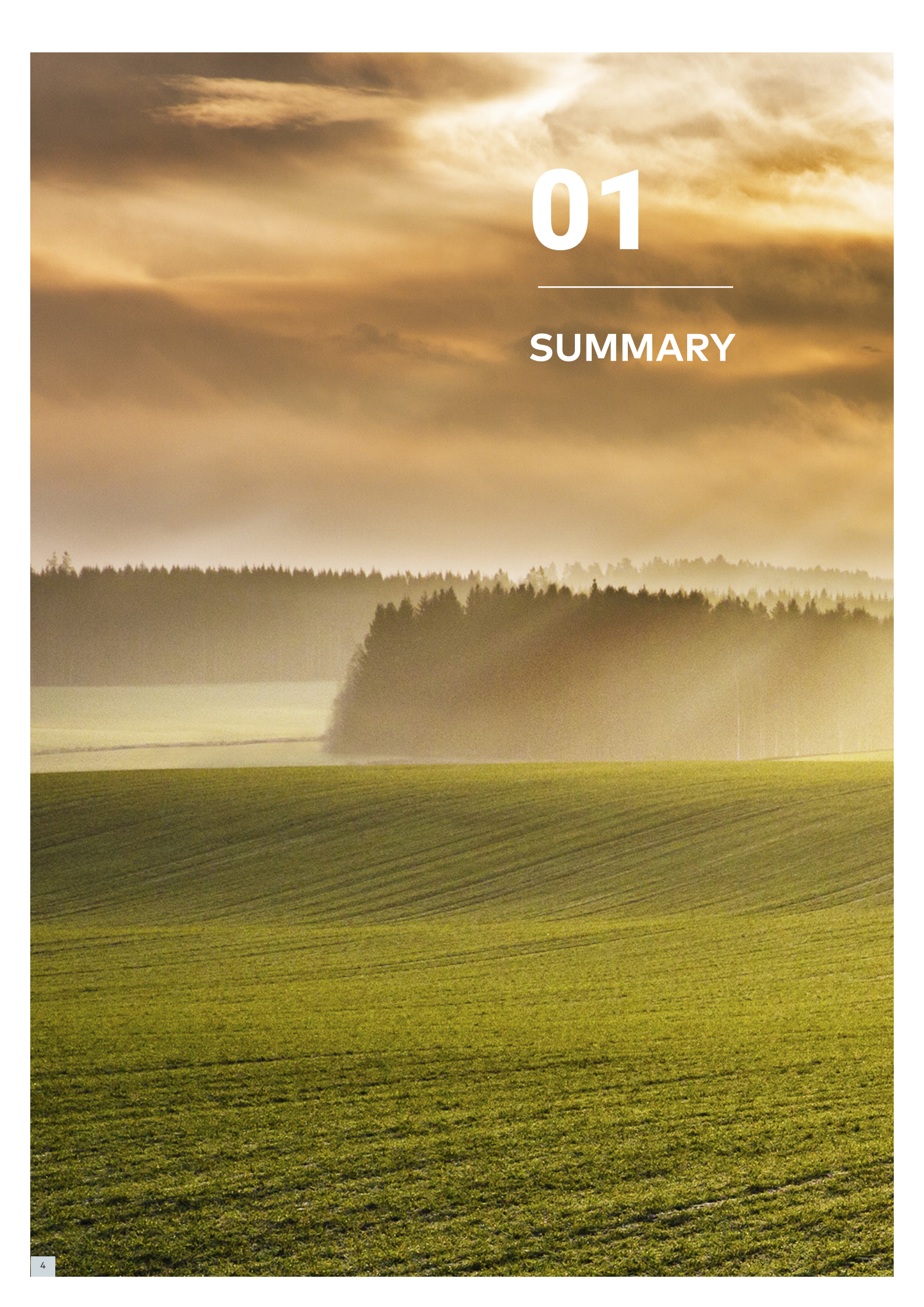
The Nordic e-Infrastructure Collaboration (NeIC) facilitates development and operation of high-quality e-Infrastructure solutions in areas of joint Nordic interest. NeIC is a distributed organisation consisting of technical experts from academic high-performance computing centres across the Nordic countries.



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A landscape photograph of a green field under a dramatic, cloudy sky at sunset or sunrise. The sky is filled with large, dark clouds illuminated from below by a low sun, creating a warm, golden glow. The field in the foreground is a vibrant green, with visible furrows or rows of crops. In the background, a line of dark trees separates the field from a body of water, which reflects the light from the sky.

01

SUMMARY

01

2017 has been a busy and rewarding year for NeIC.

We started three new projects that reach out to research communities we previously have not worked with, in the fields of Natural Language Processing, Biodiversity and Earth System Modelling. Our Nordic Language Processing Laboratory (NLPL), DeepDive and NICEST projects are about applying e-Infrastructure resources to these thematic fields.

Building on the hard work and achievements of our Glenna project in creating a Nordic federated cloud service driven by the needs of the Nordic researchers, a follow-up project (Glenna2) was launched. Glenna2 is supporting Nordic national cloud initiatives to sustain affordable Infrastructure as a Service (IaaS) cloud resources, establishing an internationally leading collaboration on data-intensive computing and assessing future hybrid cloud technology. An immediate benefit of Glenna2 is that the project provides an environment that allows “rapid time to market” for scientific software and a flexible set of resources for both developing and delivering software as service.

We also launched a follow-up project to our effort to establish a Nordic platform for collaboration on sensitive data (Tryggve). In light of the widespread interest in and success of the initial project, Tryggve2 was launched with roughly twice the commitment level and broader objectives. Tryggve develops state-of-the-art scalable infrastructure for safe, efficient, ethical, and legal storage, analysis and sharing of sensitive personal data for biomedical research between countries. The outcomes of the Tryggve project will enable researchers to conduct their research utilising sensitive data in secure settings, and will facilitate Nordic collaboration in biomedical research.

NeIC has a strategic focus on spreading knowledge, and facilitates cross-border participation in excellent training in e-Science and e-Infrastructure in the Nordic countries. Motivated by this, we set up Ratatosk, our new training and mobility programme. Grants from the Ratatosk programme enable researchers to attend training events across the Nordic countries. The programme also facilitates the establishment of new courses relevant to Nordic researchers, and is thus broadening the training available within the region.

In addition to our new projects, the existing projects in our portfolio are continuing their activities to develop, facilitate or set up new e-Infrastructure to support researchers in the Nordic region. We would like to take this opportunity to give recognition to CodeRefinery, Dellinger, EISCAT_3D Support and the Nordic Tier 1 for yet another year of continuing their valuable work.

The Project Update section of this report provides a more detailed description of what our projects have been working on in 2017 and their various impacts on their fields of influence. A key aim for NeIC is to achieve Nordic added value, and our projects have worked actively to support this aim during 2017. You can also read more about our strategy planning process to design a new strategy for 2020-2025, which strategy implementation milestones we achieved during 2017, and our commitment to social responsibility. The report also includes an overview over the 2017 accounts, our workshops and events, as well as the people who worked with us during this year.

We hope you will enjoy the read!

A person is seen from behind, walking through a field of tall, golden-brown grass. They are wearing a dark sweater with a white geometric pattern and a dark hat. The sun is low on the horizon, creating a warm, golden glow and a lens flare effect. The sky is a pale, hazy blue.

02

WHAT IS NEIC?

02

NeIC is hosted by NordForsk, which promotes and facilitates Nordic cooperation on research and research infrastructure across the Nordic region. NeIC was established in the key area of e-Infrastructure in 2012, and its sustainability was consolidated through a Memorandum of Understanding between the five national research councils and NordForsk. NeIC has two major roles. The first role is to assume operational responsibility for the Nordic distributed Tier-1 facility that is part of the Worldwide LHC Computing Grid (WLCG) that provides computing and storage for CERN and is used by high energy physicists worldwide. The second is to jointly or collaboratively explore, evaluate, develop and deploy innovative infrastructure services in response to the strategic priorities in the area of e-Infrastructure and the needs of the national e-Infrastructure providers, their users and selected ESFRI projects of joint Nordic interest. NeIC e-Infrastructure projects are collaborations on the building blocks for the future capabilities and NeIC is NordForsk's main tool for implementing the [Nordic eScience Action Plan 2.0](#).

As a result of our activities, Nordic researchers have more open avenues for resources, advanced support, collaborations and scientific advancement. Some of the specific benefits for researchers include:

- access to a common Nordic support centre and common tools for data sharing and analysis for biodiversity researchers;
- sharing mechanisms for high-performance computing resources;
- workshops for researchers to improve scientific software development;
- maximising national investments in EISCAT_3D;
- stimulating collaboration on earth system modelling;
- boosting Nordic natural language processing research;

- offering national hardware resources to the worldwide high-energy physics community that reciprocates access for national researchers;
- stimulating the development of leading-edge, secure national e-Infrastructure for biomedical data through Nordic collaboration.

ORGANISATION

NordForsk appoints the NeIC Board based on nominations by the national e-Infrastructure provider organisations. These strategic partner organisations are CSC (Finland), SNIC (Sweden), UNINETT Sigma2 (Norway), DeiC (Denmark) and RHnet (Iceland). The NeIC Board consists of one representative from each partner organisation.

NeIC is managed by an Executive Team chaired by the NeIC Director. The Executive Team coordinates the activities and participates in project steering groups as project owners.

NeIC's activities are in the interface between national, Nordic and international strategies. NeIC has worked to increase collaboration through a set of projects that include the national providers (CSC, DeiC, RHnet, SNIC, UNINETT Sigma2), partners in ESFRI projects, and other institutions in the Nordic region and Europe. NeIC projects are in place in the fields of Physics and Engineering Sciences, Environmental Sciences, Humanities, Culture and Society, Life Science and e-Sciences. The first set of NeIC projects has generated follow-on projects and new projects with new partners are being formalised. The NeIC collaboration infrastructure clearly shows a capability for both regeneration and new opportunities, which is strongly indicative of a viable, capable organisation.

OUR VISION

NeIC's vision is to become a global role model for cross-border sustainable e-Infrastructure services.

OUR VALUES

The core values underlying all of NeIC's activities are:

- that all services offered and development of NeIC will be motivated by providing added value to researchers;

- that NeIC will be a reliable partner, displaying integrity, transparency, and accountability in all processes;
- that NeIC will strive to be open to new ideas and opportunities and to its outputs in terms of knowledge, tools and services;
- that NeIC will strive for continuous improvement in all aspects of its operation;
- that NeIC will give priority to stakeholder engagement.

OUR MISSION

**Development of best-in-class
e-Infrastructure services
beyond national capabilities.**

03

STRATEGY

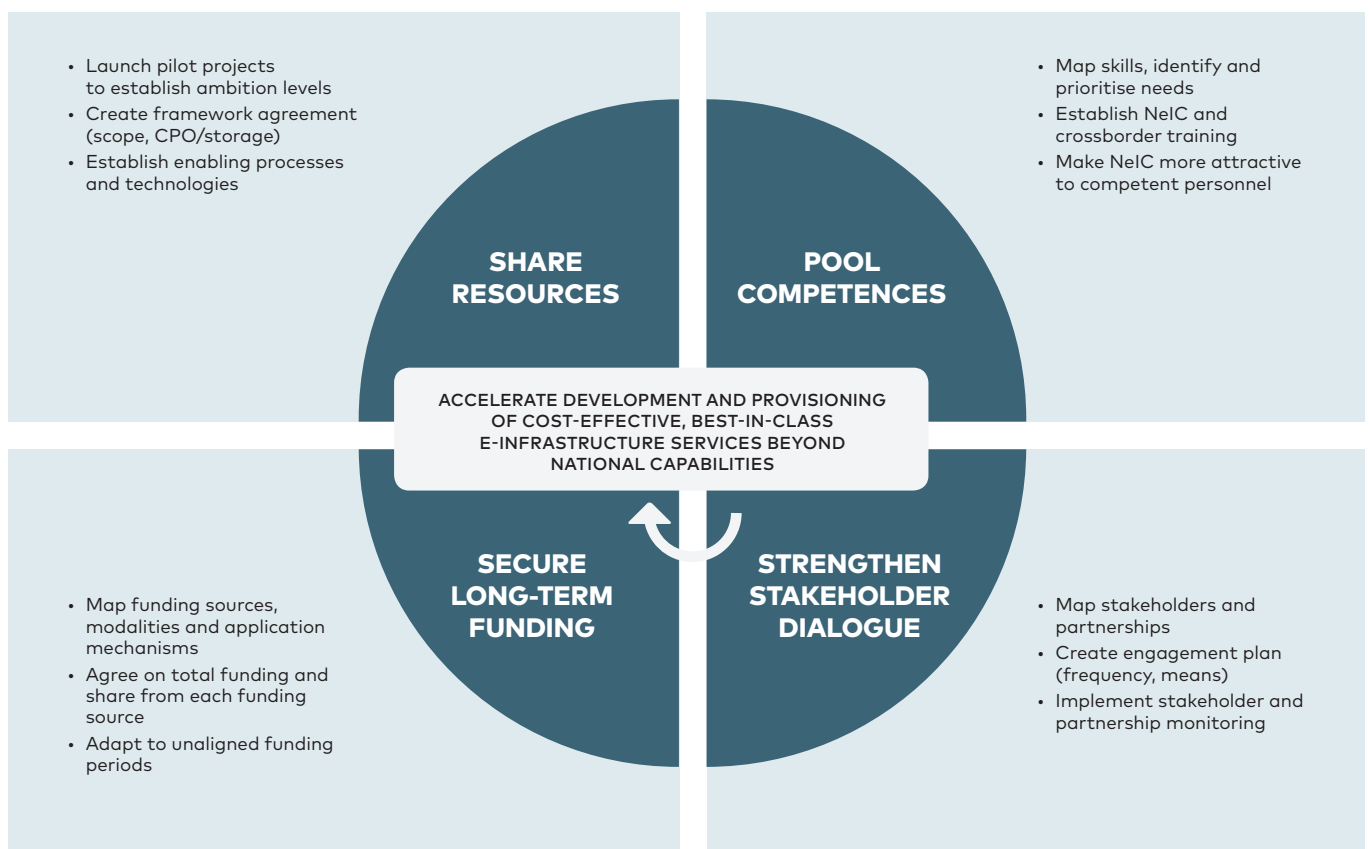
STRATEGY 2020+ PLANNING PROCESS

BACKGROUND

The mission of NeIC is to accelerate development and provisioning of cost-effective, best-in-class e-Infrastructure services beyond national capabilities. After NeIC was established at NordForsk in January 2012, the initial strategy developed included topics such as HPC collaboration, Nordic opportunities in Horizon 2020, how to influ-

ence the Nordic participation, and the wide expectations of the users. The first strategy for NeIC was approved by the NeIC Board in October 2013.

An updated strategy process was initiated in June 2015 after the research council representatives withdrew from the NeIC board. A draft one-page strategy was published on the web and a survey of stakeholders was conducted. A revised version that incorporated the survey results (25 replies) and an implementation plan, was subsequently



approved by the board. The process resulted in a revised strategy¹ for 2016-2020 and a matching implementation plan² based on inputs from the NeIC management, the board and NeIC stakeholders. The NeIC 2016-2020 Strategy is summarised in the figure above.

The strategy was supported through two open “Invitations for Letters of Interest for Nordic e-Infrastructure Collaboration” in 2012³ and 2014⁴ for a community science-driven approach as well as a top-down approach that was informed by national e-Infrastructure programmes or objectives originating from the NeIC Board. As a consequence of these two approaches, the NeIC project portfolio consists of projects that are related to either the science community or the e-Infrastructure community.

STRATEGY 2020+ PLANNING PROCESS

In 2017, a new process started that is to include a strategic plan for 2020-2025, the associated implementation plan and an impact analysis plan as a third component. The timeline for the process is:

- 2017 - inform the relevant stakeholders,
- 2018 - gather and evaluate input, and formulate the updated plan,
- 2019 - approval and initiation of the updated strategic plan, including the implementation plan and impact analysis plan,
- 2020 - fully updated strategy in place

The major effort during 2017 was focused on informing the NeIC stakeholders of the process and gathering early input from the respective groups, including the project steering groups, the national e-Infrastructure providers, NeIC staff and culminating with an extended strategy session by the NeIC Board in December 2017. The range of topics to be considered included:

- interactions with EU projects,
- consideration of possible new member states, new communities, technologies and sectors for collaboration,
- global interactions,
- gap analysis for NeIC,
- potential scope of the impact analysis plan.

The results of the 2017 process will be used in 2018, beginning with NeIC AHM meeting, to start the full strategy development process.

2016-2020 STRATEGIC FOCUS AREAS

The four strategic focus areas for 2016-2020 are:

1. Pool Competencies
2. Share resources
3. Secure long-term funding
4. Strengthen stakeholder dialogue

2017 STRATEGY IMPLEMENTATION

Below is an overview over NeIC strategy implementation in 2017 in each of the four focus areas. The milestones are separated into indicators (executed tasks) and effects (the impact resulting from these tasks).

POOL COMPETENCIES

The major points for the Pool Competencies focus area are to:

- map skills, identify and prioritise needs;
- establish NeIC and cross-border training programmes;
- make NeIC more attractive to competent personnel

The indicators and effects used in 2017 that map onto these three points are given below.

Indicators:

- Human resource policy implementation started as of 2017
- Employer surveys started
- NeIC Culture book created
- A data management specialist was hired as advisor to NeIC XT
- Glenna2:
 - Section about federated cloud access in the Nordic countries for a book on OpenStack for Scientific Research: ["The Crossroads of Cloud and HPC: OpenStack for Scientific Research: Exploring OpenStack cloud computing for scientific workloads"](#).
 - Presentation at 2017 IEEE 13th International Conference on eScience
- Azure Report (Glenna team succeeded in cloudifying Gromacs HPC code on Azure)

1 https://wiki.neic.no/w/ext/img_auth.php/e9/151200-NeIC_Strategy-1Pager-final.pdf

2 https://wiki.neic.no/wiki/NeIC_2016-2020_strategy_implementation_plan

3 <https://www.nordforsk.org/files/NeICInvitationforLettersofInterest.pdf/download>

4 https://wiki.neic.no/w/ext/img_auth.php/a9/14-09-01-Invitation-for-Letters-of-Interest.pdf

- Ratatosk:
 - Training coordinator hired
 - Workshops held on HPC and Applications (Iceland).
 - Nordic Training Portal has been advertised and is functioning as planned.
 - Promotion and subscription to the NeIC Training Newsletter
 - A kick-off workshop was held in Denmark as a first phase of the digital humanities activities.
 - [Training Policy](#) developed
 - Travel grant has been implemented and marketed through National Training Providers.
 - Open Call for Course Mobility started.
- CodeRefinery:
 - 11 workshops were held with altogether 270 participants.
- Tryggve:
 - A successful sensitive data workshop was organised at the NeIC 2017 conference (60+ participants).
 - Tryggve finalised the penetration testing round of all Tryggve systems, followed by a Tryggve security workshop and a summary report.

Effects:

- Increased Nordic competence in containerisation: Containerisation expertise in the Nordic cloud project increased from 1 person to 6.
- New guide on how to set up a personal Kubernetes container orchestration platform within OpenStack.
- Successful deployment of KubeNow on cPouta.
- 270 PhDs and postdocs trained in software development tools.
- 45 participants in the two workshops held as part of the Ratatosk Training Programme.
- Increased Nordic competence on data protection and secure e-Infrastructure.
- 10 development dialogues held with NeIC XT and project managers

SHARE RESOURCES

The major points that are part of the Share Resources focus area are to:

- launch pilot projects to establish ambition levels;
- create a framework agreement;
- establish enabling processes and technologies.

The indicators and effects used in 2017 that map onto these three points are given below.

Indicators:

- Resource-sharing Dellinger pilot assigned approximately 80% of pledged resources to 13 projects.
- Service Level agreement developed within Glenna1. The agreement served as a template for CodeRefinery resource repository hosting contract with DeiC
- EISCAT_3D Support:
 - Presentation at the ISGC 2017 conference in Taipei;
 - Engagement for follow-up project achieved;
- Tryggve:
 - [Scientific article receiving support as Tryggve use case published](#)
 - The work on interoperable distributed data archive for human data resulted in the demonstration of the secure data access to cloud service prototype at European ELIXIR all-hands meeting.
 - Published a list of open code software developed by Tryggve with links to the code repositories.
- NLPL:
 - Common software and data structure on Abel (Norway) and Taito (Finland) for Nordic computational linguistics in place.
 - Swedish computational linguists benefit from computational resources in Finland and Norway.
- DeepDive:
 - Consistent and continuous work routine and information flow for biodiversity e-Infrastructure established across 6 Nordic/Baltic countries (SE, NO, DK, FI, IS, EE).

Effects:

- Cross-border use of HPC and cloud resources for sensitive and non-sensitive data processing was demonstrated.
- Facilitated Nordic research with sensitive data through Tryggve use cases.

SECURE LONG-TERM FUNDING

The major points that are part of the Secure Long-term Funding focus Area are to:

- map funding sources, modalities and application mechanisms;
- agree on total funding and share from each funding source;
- adapt to unaligned funding periods.

The indicators and effects used in 2017 that map onto these three points are given below.

Indicators:

- Funding commitment from Research Council of Norway for 2018-2022.
- Submitted evaluation material to Academy of Finland and white paper to Swedish Research Council.
- Met with Academy of Finland, Research Council of Norway, Swedish Research Council and Ministry of Science, Education and Culture (Iceland).

Effects:

- Funding ratio of 1:1:1 in place with NordForsk, memberships and project partners.
- Two follow-on projects started: Tryggve2 project with ELIXIR nodes and Glenna2 initiated with national providers.

STRENGTHEN STAKEHOLDER DIALOGUE

The major points that are part of the Strengthen Stakeholder Dialogue focus area are to:

- map stakeholders and partnerships;
- create an engagement plan;
- implement stakeholder and partnership monitoring.

The indicators and effects used in 2017 that map onto these three points are given below.

Indicators:

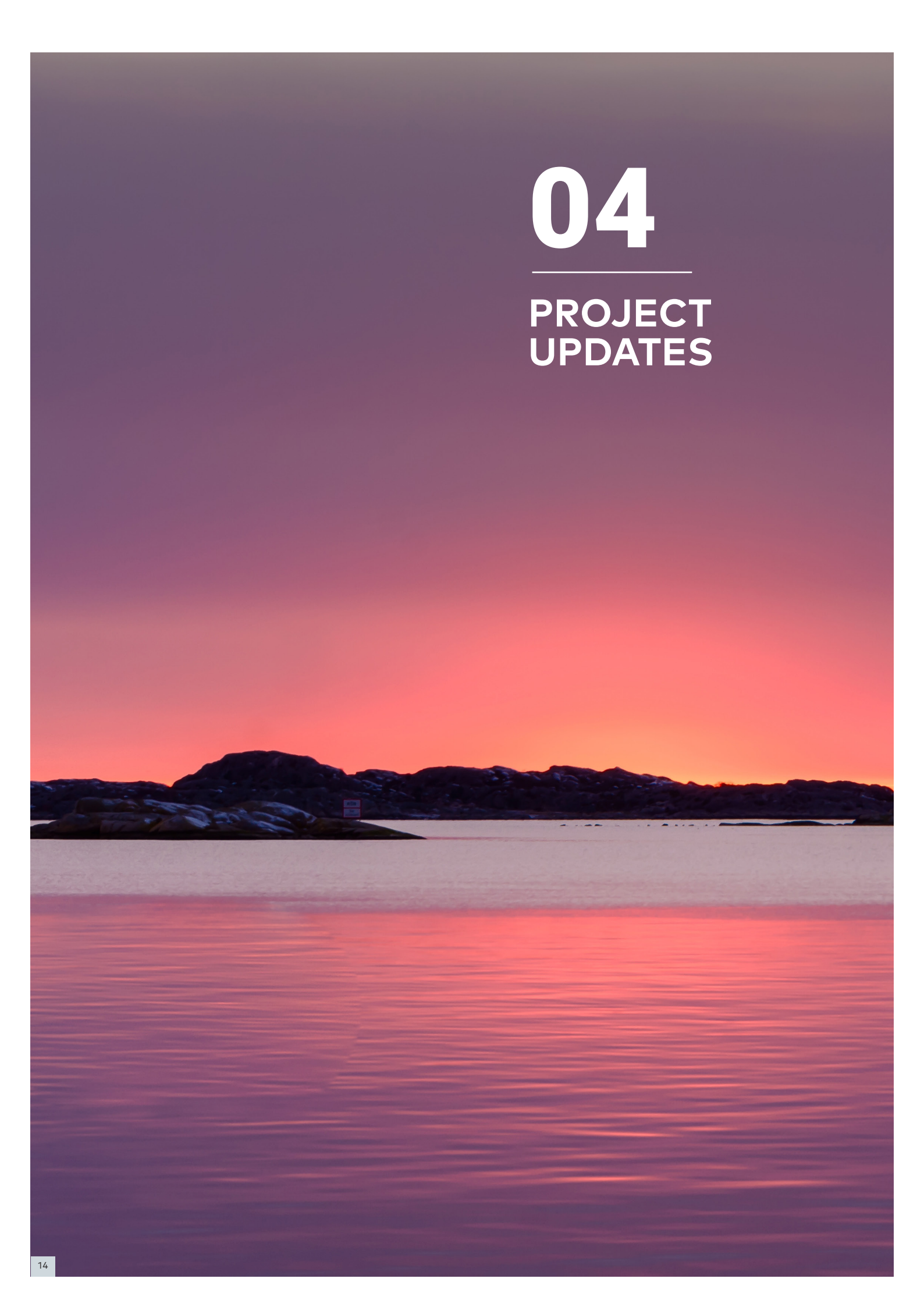
- Two meetings with ETAIS, Estonia.
- Dialogue meetings offered to all NeIC partners; held with Swedish, Finnish, Icelandic and Danish national providers.
- NeIC2017 was organised in Umeå, bringing together 230 stakeholders from across the Nordic region.
- Engagement with NordNWP (Nordic Met Offices) resulted in a proposal for collaboration through Glenna2.
- Participation in NordForsk Interim expert group on Infrastructure for Health Data.

Effects:

- Agreement on information sharing around strategy development with CSC and for research infrastructure roadmap development with Ministry of Education, Research and Culture (Iceland).
- Article (8 pages) on the Nordic Tier 1 (NT1) in [NordForsk magazine](#)

2016-2020 STRATEGIC FOCUS AREAS

1. Pool Competencies
2. Share resources
3. Secure long-term funding
4. Strengthen stakeholder dialogue



04

PROJECT UPDATES

04

CODEREFINERY

INTRODUCTION

The goal of the CodeRefinery project is to teach PhD students and researchers how to write better code and provide research groups with software development e-Infrastructure tools to collaboratively develop, review, discuss, test, and share their codes. The training addresses students and researchers who already write code in all academic disciplines. The project also provides infrastructure for collaborative source code repository hosting and automated testing.

STATUS REPORT 2017

Indicators: During 2017 CodeRefinery held 11 workshops in Stockholm, Copenhagen, Tromsø, Aarhus, Linköping, Espoo, Oslo, Umeå and Manchester. Lesson material for the CodeRefinery workshops is published on <http://coderefinery.org/lessons/>. The workshops received very positive feedback. In addition to these workshops, two meet-ups with researchers were held (April 6 in Oslo and May 19 in Stockholm). It is an encouraging indicator of the success and relevance of the workshops that universities and institutions now approach CodeRefinery and request workshops at their sites. In addition to the training efforts, CodeRefinery set up a source code repository hosting platform which is hosted by DeIC: <http://coderefinery.org/repository/>.

Effects: Research software plays a core role in research and the quality of software has become critical for the advancement of knowledge. The CodeRefinery project is teaching researchers in all disciplines best practices in

software engineering with particular emphasis on reproducible and sustainable research software. A side effect of the project is to pave the way towards a research software engineer career path by attracting computer science students and graduates to work in the science disciplines.

In 2017, 270 people were trained by CodeRefinery, which means increased expertise amongst researchers when it comes to developing sustainable, reusable and reproducible software. The long-term impact of CodeRefinery workshops is measured through a post-workshop survey which is sent out to all former participants 3-6 months after attending a workshop. The survey studies how former participants use software development tools after attending a workshop, and how their code and collaboration with colleagues has changed. The survey results reveal that workshop participants start using or use tools in a better way after attending CodeRefinery workshops. 80% say that their code is 1) more reusable 2) more reproducible and 3) that it is easier to collaborate on software development with collaborators after attending a CodeRefinery workshop. More details on the survey results can be found here: <http://coderefinery.org/>. The data can be accessed at <https://github.com/coderefinery/post-workshop-survey>.

The source code repository presents several useful impacts for researchers. Firstly, researchers no longer have to set up their own repositories at their own institution. Secondly, in the CodeRefinery repository, researchers can work together in a collaborative environment as well as use it for their own internal codes. The service currently has slightly over 100 users, hosts 14 groups and 140 projects.

DEEPDIVE

INTRODUCTION

The vision for the Nordic-Baltic Collaboration on e-Infrastructures for Biodiversity Informatics (DeepDive) is to develop a distributed, user-driven and service-oriented regional e-Infrastructure, where the individual countries host their national e-Infrastructure components and data, but collaborate to provide consistent regional services, tools, virtual laboratories and education. The aim is to enhance the Nordic-Baltic collaboration within biodiversity informatics to coordinate common efforts, reduce redundant investments and efforts and increase the regional scientific achievements and global competitiveness. This will in turn give educational support for e-Science and strengthen the Nordic-Baltic science policy interface.

STATUS REPORT 2017

Indicators: The DeepDive project started on 1 January 2017 and collaboration tools and infrastructure were set up to build a space conducive to cooperation and coordination of common efforts. Since its inception, DeepDive has mapped national strategies, priorities, stakeholders, competence levels and identified gaps within the biodiversity informatics field in the Nordic countries and Estonia. Also, a report explored existing and newly designed training activities. The motivation behind this report was the need for a training programme on biodiversity informatics benefitting both e-Infrastructure providers and their scientific users. The report was the first step in laying the groundwork for the realisation of such a training programme. There are a number of independently developed IT solutions for the management of biodiversity information. A second report was written offering an overview over the documentation available for those systems.

Lastly, DeepDive is working to develop a Linked Open Data tool for publishing taxon concepts in national taxonomic databases in a standardised, machine-readable format on the web. Once this step is completed, identical taxon concepts in national databases can be linked with each other using persistent identifiers. A preliminary infrastructure for the implementation of this has been set up. The website <http://taxonid.org> is up and running and provides both human-readable and machine-readable documentation for the mapping of taxon concepts in national databases.

Effects: The DeepDive project succeeded in creating a collaborative environment within biodiversity informatics.

Since its inception, there have been many technical discussions between the partners and ad-hoc meetings have taken place to coordinate efforts and share expertise. Also, the mapping and research carried out have led to greater knowledge on strategies, needs, opportunities and challenges related to biodiversity informatics in the Nordic countries and Estonia.

DELLINGR

INTRODUCTION

The approach of the Nordic Sharing and Exchange of e-Infrastructure Resources (Dellingr) project is to work with national e-Infrastructure providers to define a functional framework for High Performance Computing resource sharing. The framework recognises and builds upon the unique strengths of each provider to advance research in each of the respective countries as well as within the Nordic region. The Dellingr project is working to create the appropriate mechanisms for researchers to cross national boundaries for access to the full range of computing environments, and for national e-Infrastructure providers to share competencies and capabilities. This should help national researchers to gain access to specialised resources in other countries, as they come online in the future.

STATUS REPORT 2017

Indicators: Dellingr gathered information on the environments and user requirements at the partner sites that would allow for the development of a resource exchange technical analysis. Dellingr then built on the knowledge gained in this first step to create a document describing an acceptable technical framework that enables cross-border resource sharing and includes the identification of technical issues and potential approaches to solving them. A third document also described the regulatory, legal and national resource management framework that an implementation would have to satisfy, along with approaches for operating effectively within the framework. A kick-off meeting for the second phase of Dellingr was held in October 2017.

Effects: Defining ways to share access to resources and competencies across national borders leads to an increased capability to support a broader set of national users with unique requirements. The Dellingr collaboration enables a broader understanding of the capabilities of a wider range of systems and capabilities by sharing information, techniques and skills.

In 2017 Dellinger demonstrated cross-border use of HPC for data processing. A resource sharing pilot was set up with a pool of Nordic compute time available for smaller projects that needed immediate access to a compute resource. Through its Nordic resource sharing pilot, Dellinger was able to provide access to Nordic infrastructure resources for emerging research projects. Research projects apply for a low volume of CPU-time, and Dellinger gave access to the most suitable resource available within the Dellinger pilot. The pilot project received 23 applications in 2017 for access to compute time.

EISCAT_3D SUPPORT (E3DS)

INTRODUCTION

EISCAT_3D is an environmental research infrastructure on the European ESFRI roadmap. It is proposed as an international research infrastructure, using the incoherent scatter technique to study the upper atmosphere above the Arctic to investigate how the earth's atmosphere is coupled to the solar atmosphere. The system will be operated by the EISCAT Scientific Association. The goal of the EISCAT_3D Support project (E3DS) is to support the e-Infrastructure aspects of the preparation of the implementation of EISCAT_3D. The e-Infrastructure challenges for E3DS include finding cost-efficient state-of-the-art solutions for on-site computing and establishing network connections between the different sites and with the data archive. Other goals include developing solutions for locating the data archives within existing national e-Infrastructures and supporting EISCAT in planning the recruitment of e-Science experts.

STATUS REPORT 2017

Indicators: An estimate was made of how much effort is needed from the national providers to run various computing infrastructure configurations for EISCAT_3D. In addition, two reports were finalised in 2017. The first was a report on how EISCAT_3D users can get access to adequate computing facilities in order to perform the scientific analyses on the data produced by the EISCAT_3D system. These are the computing facilities that the EISCAT_3D users can use for performing analyses in real-time and also using archived data from the data centres. The second document summarised the consultations between the EISCAT_3D Preparation for Production (PiP) project and e-Infrastructure providers to aid in the procurement plan. The aim of these consultations was to ensure that the PiP project computing will be compliant with the overall computing architecture of the full EISCAT_3D project.

Effects: Based on E3DS reports and consultations EISCAT received information aiding it in setting up a procurement plan. It also received information on how its users can get access to adequate computing facilities in order to perform the scientific analyses on the data produced by the EISCAT_3D system. The NeIC partners also obtained information on the future requirements of EISCAT_3D computing that will aid in their future collaboration with EISCAT_3D.

GLENN2

INTRODUCTION

The goal of Glenna is to create a Nordic federated cloud service, driven by the needs of the Nordic researchers. Glenna2 builds on the work and successes of the initial Glenna project (2014-2016), and focuses on supporting Nordic national cloud initiatives to sustain affordable IaaS cloud resources, establishing an internationally leading collaboration on data-intensive computing and assessing future hybrid cloud technology. The project also aims at pooling national cloud application expert support to establish a Nordic support channel for cloud and big data. An immediate benefit of Glenna2 is that the project provides an environment that allows “rapid time to market” for scientific software and a flexible set of resources for both developing and delivering software as service.

STATUS REPORT 2017

Indicators: After a successful Glenna project, the NeIC Board decided to fund Glenna2, which held its kick-off in June 2017. As of 2017, two use cases were supported within Glenna2. One of these is with the Pharmaceutical Bioinformatics research group at Uppsala University to facilitate access to Nordic OpenStack cloud IaaS, through ELIXIR AAI, within the EU-funded PhenoMeNa infrastructure. The other is on Nordic weather prediction with the NordNWP project (Collaboration of the Nordic and Baltic National Meteorological Services on Numerical Weather Prediction).

Effects: Introduction of modern cloud orchestration tools and compatible tools, e.g. Jupyter notebooks, make analytics more reproducible and facilitate the presentation and sharing of results. The international dimension is critical due to the scale of resources needed to provide multiple or massive public datasets or offer the computing platforms needed for their analysis. Access by national researchers to Nordic cloud computing infrastructures increases the opportunities for analysing datasets residing in the region.

In 2017, Nordic competence in containerisation (Kubernetes) expertise in Glenna increased from 1 person to 6. A new guide was developed on how to set up the personal Kubernetes container orchestration platform within OpenStack, and successful deployment of KubeNow was executed on cPouta. Within its NordNWP use case, the Glenna2 team succeeded in cloudifying the HARMONIE AROME numerical weather prediction (NWP) code on the Microsoft Azure cloud with MPI parallelisation.

NICEST

INTRODUCTION

An Earth System Model (ESM) refers to a global climate model. An ESM helps us to better understand past, present and future climate changes arising from either natural, unforced variability or in response to changes in radiative forcing. The Nordic Infrastructure Collaboration on Earth System Tools (NICEST) will strengthen the Nordic ESM community by efficiently using various e-Infrastructures through competence building, as well as sharing and exchanging knowledge. The desired results are increased efficiency of ESM teams, and open doors for future scientific and technical collaborations.

STATUS REPORT 2017

Indicators: As part of its competence building activity, the NICEST team did a mapping exercise which resulted in a calendar giving an overview of current and future classes, courses and training as well as an overview over documentation and best practice guides on Earth System Modelling. The goal of the ESM competence-building activity is to spread information to a wider audience about Nordic ESMs and how to use them efficiently. Secondly, the NICEST team produced a report to set out the current status, in preparation for CMIP6 data publication among partners in the NICEST project. Thirdly, NICEST also conducted a survey on Earth System Modelling competence-building needs. Finally, the NICEST team working on distributed Earth System Grid Federation (ESGF) produced a manual for Nordic ESGF data node administrators.

Effects: This project was set up in January 2017, providing the Nordic ESM community with a new platform for cross-border Nordic cooperation.

Thanks to the NICEST gap analysis, skills needs were identified and targeted training is being organised to fill the gaps. The calendar and collection of documentation

and best practice guides help researchers get access to updated information, knowledge and new expertise in the ESM field. The ESGF manual will help Nordic ESGF administrators in setting up ESGF nodes.

NORDIC LANGUAGE PROCESSING LABORATORY (NLPL)

INTRODUCTION

Natural Language Processing (NLP) is the interdisciplinary branch of Computer Science and Linguistics that enables everyday technologies and services, for example, automated translation (e.g. Google or Bing Translate), human-machine interaction in spoken language (e.g. Apple's Siri or Microsoft's Cortana), or content recommendation and contextual advertisement (e.g. on online news sites). As such, language-enabled technologies are rapidly growing in societal and commercial relevance. The goal of the NLPL is to implement a Nordic virtual laboratory for Natural Language Processing. The virtual laboratory will create new ways to enable data- and compute-intensive research in Natural Language Processing by sharing a uniform software and data stack in multiple Nordic HPC centres.

STATUS REPORT 2017

Indicators: The project has taken steps towards providing a software and data stack which is similar across HPC systems. Currently the software environment is tightly coupled to Abel (UiO) and Taito (CSC), and not very portable, which is a long-term goal.

In 2017 software and data have been installed in a similar fashion on both Abel and Taito, establishing duplicate environments consisting of

- Statistical and Neural Machine Translation tools and data;
- Dependency Parsers and data which include large language corpora;
- Tool chains for establishing vector-space representations ("word embeddings") of distributional similarities from large unannotated text corpora;
- Tools for Extrinsic Evaluation, which are tools that enable evaluation of core NLP models across downstream tasks, giving a measurement on how well-behaved the actual model is;
- (very) large collections of textual data for multiple languages.

Other achievements during 2017 are a new “home” for Open Parallel Corpus ([OPUS](#)); that the Extrinsic Evaluation activity contributed to the conference [Extrinsic Parser Evaluation’17](#), IT-University in Copenhagen joined the project as an additional partner.

Effects: This project was set up in January 2017, providing the Nordic NLP community with a new platform for collaboration. It has received some interest from other Nordic computational linguistic groups outside the project.

Compute time on Abel and Taito are consumed by the project members. PhD-students and PostDocs from the different universities are starting to use both systems, and are benefitting from contributions to different tasks.

Swedish computational linguists from Uppsala University benefit from, and have become dependent upon, the computational resources in Finland and Norway.

NORDIC TIER-1 (NT1)

INTRODUCTION

The Nordic Tier-1 (NT1) is one of the 11 Tier -1 regional computing centres of the Worldwide Large Hadron Collider (LHC) Computing Grid – the large international e-Infrastructure built to provide computing and storage for CERN (The European Organisation for Nuclear Research). The NT1 computing centre is unique in its distribution across four countries: Denmark, Finland, Norway and Sweden. The purpose is to coordinate and run a common Nordic Tier-1 site, with funding provided both from national sources (for computing and storage resources) and from NeIC (for the infrastructure in the form of people, network and software needed to support a coherent service). The Nordic Tier-1 activity is an operating production service, which focuses, in addition, on continually improving the software and services important to the user communities served.

STATUS REPORT 2017

Indicators: In 2017 NT1 brought increased disk storage resources into production, and increases for ATLAS tape were under acceptance testing. An improved 24/7 coverage solution went into effect at the end of 2017. Tier-1 networking cost and optimisations presentation was held at HEPIX Autumn 2017 Workshop 16–20 of October at KEK in Tsukuba, Japan. There was a successful poster submission at DI4R conference in Brussels. Two internal All Hands meetings with NT1 staff and site staff from all

participant sites in the Tier-1 activity were held. One new staff member, a distributed storage expert and developer, was added to the team. Thirteen improvement tasks were resolved during the year. Six PMs were delivered to ARC development, and 3 PMs to dCache development. NT1 set up its first Steering Group and the Nordic LHC Computing Grid (NLCG) Committee took on the role of NT1 Reference Group.

Effects: Stable operations of the Tier-1 site, delivering 60 million CPU-hours to ATLAS and ALICE with 99.7% reliability as measured by CERN. In total, 8.7 PB was stored on disk and 6.2 PB stored on tape by the end of the year.

105 ATLAS publications: <https://twiki.cern.ch/twiki/bin/view/AtlasPublic/Publications>

33 ALICE publications: <http://aliceinfo.cern.ch/Art-Submission/publications>

RATATOSK

INTRODUCTION

NeIC has a strategic focus on spreading knowledge, and facilitates cross-border participation in excellent training in e-Science and e-Infrastructure in the Nordic countries. The Ratatosk mobility programme is a NeIC training activity working to achieve this aim. The goal of the programme is to raise competence, and to help the e-Infrastructure community be more productive and work more effectively. The benefits include more efficient operations and use of resources, as well as an improved capability for researchers when conducting research. Ratatosk coordinates a Nordic mobility enhancement programme with the aim of increasing the opportunities for trainees in two ways. Firstly, the mobility travel grants enable trainees to attend Nordic training courses which are not available locally. Secondly, mobility is encouraged for training courses to bring the training closer to the trainees.

STATUS REPORT 2017

Indicators: Ratatosk was set up in 2017 and held its first two workshops on Increasing Digital Competencies, Copenhagen (17 August 2017) and on HPC & Applications, Reykjavik (23–25 August 2017), with 18 and 20 participants, respectively. Ratatosk enhanced researcher and infrastructure staff mobility through travel support - it set up an open call for grants and a course mobility call. Ratatosk has set up a [world-readable calendar](#) to share

information on upcoming training events across the Nordic region and distributes a weekly newsletter showing upcoming Nordic training events from the NeIC training calendar.

Effects: Ratatosk is piloting training workshops for new communities and for those with limited access to training in effectively using e-Infrastructure. Ratatosk is enhancing researcher mobility to attend training events across the Nordic countries, and facilitating the establishment of new courses relevant to Nordic researchers. Thus, Ratatosk is broadening the available training and audience within the region. During 2017, around 40 participants received training, which is helping them carry out more effective and productive work.

TRYGGVE1/TRYGGVE2

INTRODUCTION

Tryggve was set up to establish a Nordic platform for collaboration on sensitive data by utilising and connecting existing capabilities and services in the Nordic countries. The project is funded by NeIC and the ELIXIR nodes in Denmark, Finland, Norway and Sweden. Tryggve develops state-of-the-art scalable infrastructure for safe, efficient, ethical, and legal storage, analysis and sharing of sensitive personal data for biomedical research between countries. The outcomes of the Tryggve project will enable researchers to conduct their research utilising sensitive data in secure settings and facilitate Nordic collaboration in biomedical research. The work is conducted in close collaboration with the user communities and Nordic e-Infrastructure providers. Tryggve operates a use case programme for supporting the use of the secure e-Infrastructure and to maintain a close connection to concrete user requirements in the development. [Use cases get support](#) from Tryggve in accessing and moving research data, meeting legal and ethical requirements, access to secure data analysis platforms, sharing data with colleagues, software installations and access to data archives.

STATUS REPORT 2017

Indicators: Tryggve has produced results on several areas: technical development, support to user communities, data protection procedures and expert community building. On the technical side work on the interoperable distributed

data archive for human data resulted in the secure data access to cloud service prototype demonstrated at European ELIXIR all-hands meeting. Tryggve also published [a list](#) of open code software with links to the code repositories. Support to user communities resulted in [a scientific article](#) about a Tryggve use case, with acknowledgement to Tryggve. In 2017 Tryggve worked on 3 use cases, and had interactions for new use cases with several others.

On the data security topic Tryggve finalised the penetration testing round of all Tryggve systems, followed by a Tryggve security workshop and a summary report. The Tryggve Code of Conduct for secure service providers was also completed and published on all of the Tryggve partners' webpages. Tryggve organised a sensitive data workshop during the NeIC2017 conference in Umeå (May 2017) with over 60 participants.

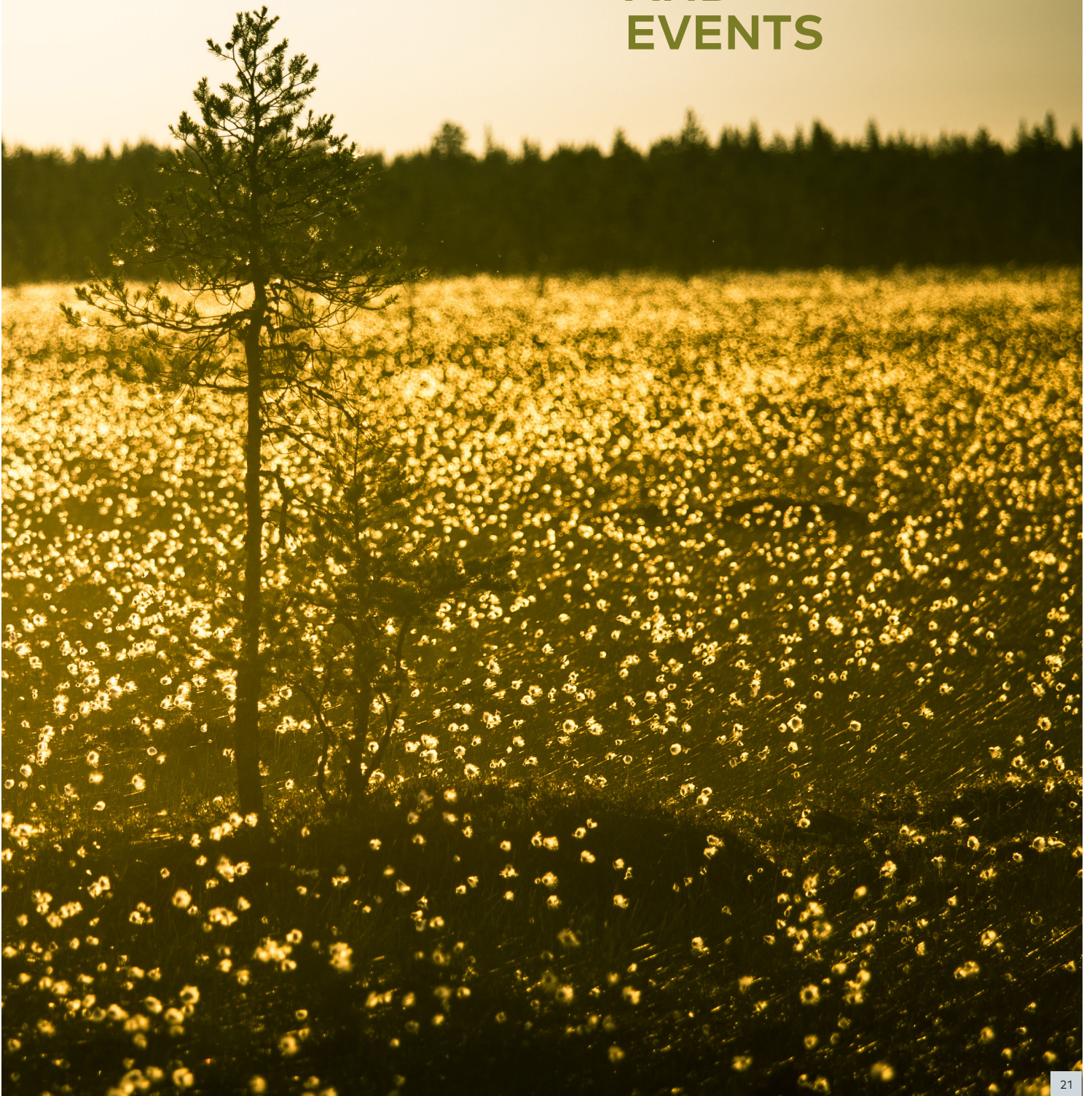
In 2017, the first Tryggve project was completed. The project final report concludes that the project was successful. At the same time the Tryggve2 project was launched with increased commitment levels and wider objectives. The Tryggve2 kick-off was organised and the [project plan](#) was approved.

Effects: Tryggve has facilitated scientific research in Nordic countries through direct support of use cases. The many technical reports (33) as well as developed software code were made publicly available meaning that the project outcomes can benefit a much wider community. Tryggve has published a monthly newsletter highlighting activities and publishing outcomes in an effort to widen outreach.

The Nordic ELIXIR nodes (the project partners in the project) have been able to accelerate their service development, which has also had an impact on their opportunity to collaborate within the other European ELIXIR nodes and European research communities. Also, the Tryggve collaboration has increased the collaboration and trust within Nordic service providers to the level where they can even discuss sensitive topics such as security of the services in confidence. The project forms a network of experts that can collaborate on service development and technical user support, making these activities more efficient and productive.

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ACTIVITIES AND EVENTS



NEIC2017 CONFERENCE: CROSSING BOUNDARIES - CHANGING THE WORLD

230 technical experts, researchers, and decision-makers in computing and storage joined forces at the NeIC 2017 conference. The event took place in Umeå, Sweden, from 29 May – 1 June and included both workshops and conference sessions with high-profile speakers from academia and industry. NeIC has hosted the large bi-annual conference twice before, in 2013 in Trondheim and 2015 in Espoo, bringing together the Nordic e-Infrastructure community to discuss, develop ideas and prepare for the future.

During the first two days, attendees could participate in a wide variety of workshops. The participants had the opportunity to choose between in total 16 different workshops, and the sessions this year included containers, data management, dCache, offensive security, sensitive data and bioethics of databanks and data sharing to name a few. [See all the workshop presentations here](#). The two subsequent days were dedicated to the official NeIC 2017 conference, with sessions on society, science and technology on the first day, and industry and online computing as the concluding part of the final day. [See the complete programme and more information about NeIC2017 here](#).

ALL HANDS MEETING 2017

NeIC organised its annual All Hands Meeting, where NeIC staff gathered at Skeikampen, Norway, for four days to collaborate within and across NeIC's ten projects. The event brought together 43 NeIC staff from the Nordic countries. The keynote speaker for the event was Michael Grønager who gave a speech on "Towards the stateful internet: the Blockchain as a ubiquitous compute resource for research". The participants had several opportunities for cross-team sharing of ideas, expertise and experiences in workshops and hands-on sessions throughout the event.

TOPICAL WORKSHOPS

CodeRefinery workshops:

Fully fledged 3-day workshops held:

- [Espoo, 14-16 December 2016](#)
- [Stockholm, 20-22 February 2017](#)
- [Copenhagen, 9-11 May 2017](#)
- [Tromsø, 19-21 June 2017](#)
- [Aarhus, 24-26 October 2017](#)
- [Linköping, 7-9, November 2017](#)
- [Espoo, 12-14 December 2017](#)

Further CodeRefinery workshops and smaller events held:

- [Oslo, 6 April 2017](#)
- [Stockholm, 19 May 2017](#)
- [Umeå, 29 May 2017](#)
- [Manchester, 8 September 2017](#)
- [Umeå, 16 October 2017](#)

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SOCIAL RESPONSIBILITY



OPENNESS AND TRANSPARENCY

One of the key tasks of NeIC is to remove friction from distributed work and cross-border collaborations. We do so in many different ways. One of them is by striving to be as open and transparent as possible. This means that most information produced by NeIC is freely available on the [NeIC wiki](#). Here you can find all minutes from project team meetings, steering group meetings, reference group meetings, board meetings and provider forum meetings. You can also stay updated on project progress, achieved milestones or read NeIC policy documents, annual accounts and self-assessment reports. The NeIC policy is to openly share as much information as possible.

EQUALITY AND DIVERSITY

Utilising a wide range of experiences and perspectives is of great value to NeIC. The NeIC HR Policy sets out a firm belief in equal opportunity in employment practices without discrimination on the grounds of race, religious beliefs, colour, gender, sexual orientation, disability, place of origin, age, marital status, or family status. NeIC promotes equality, equal terms and diversity and strives for gender balance amongst its staff, management team and steering groups. A new policy was adopted in 2017 (for implementation in 2018) stating that NeIC will annually collect and publish statistics showing the gender ratio within NeIC projects, project leadership, project steering

and additional advisory or reference groups. We will use these statistics to assess and shape procedures for encouraging gender diversity. Alongside this, we also encourage diversity in skills, background and gender in our governance structure, including the composition of advisory groups, steering groups, and board.

ENVIRONMENTAL SUSTAINABILITY

NeIC is an organisation distributed across various locations within the five Nordic countries. Several considerations are associated with this way of working that are not relevant for the more traditional face-to-face type project teams. Perhaps most important is the need for good communication and collaboration within the regional teams. We therefore place great emphasis on regular meetings at all levels of the organisation. We have invested in environmentally friendly technological communication tools to increase the quantity and quality of NeIC collaboration, without causing harm to the environment. In 2017, NeIC management participated in more than 450 video meetings in order to reduce travel. In addition to this, NeIC internal communication takes place through e-mails, video conferences and a community chat tool. The NeIC community chat has 208 users that sent a total of 213 330 messages in 2017. Utilising these technological tools helps to reduce our environmental footprint while still facilitating a good collaborative environment.

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2017 ACCOUNTS

INCOME:

	BUDGET 2017 (NOK)	ACCOUNTS 2017 (NOK)		
NordForsk	15,000,000	FTE 2.50	15,000,000	FTE 2.25
NordForsk-Other (ARC)	666,667		666,667	
DK-DeiC/DASTI	3,293,337	FTE 1.75	3,293,337	FTE 1.75
DK-Other		FTE 2.61		FTE 2.61
FI-CSC/AKA	3,293,337	FTE 3.41	3,293,337	FTE 3.41
FI-Other		FTE 0.94		FTE 0.94
NO-Sigma2/RCN	3,293,337	FTE 1.75	3,293,337	FTE 1.75
NO-Other		FTE 4.22		FTE 4.22
SE-SNIC/SRC	3,293,337	FTE 0.75	3,131,088	FTE 0.75
SE-Other		FTE 4.18		FTE 4.18
IS-Rhnet	198,272	FTE 0.20	198,272	FTE 0.20
IS-Other		FTE 0.08		FTE 0.08
Provisions ⁵			-4,730,954	
Other Partners/Unallocated		FTE 0.71		
Transferred from last year ⁶	16,199,268		16,199,268	
Total income	45,237,555	FTE 23.10	40,344,352	

EXPENCES:

	BUDGET 2017 (NOK)		ACCOUNTS 2017 (NOK)	
NeIC Executive Activities	4,767,646	FTE 2.50	6,484,360	FTE 2.25
NeIC XT	2,312,646	FTE 2.50	3,626,880	FTE 2.25
Travel	500,000		681,508	
Communication	250,000		375,638	
Representation, meetings	100,000		6,117	
NeIC Board Meetings	75,000		65,905	
NeIC XT meeting costs	60,000		67,583	
Miscellaneous	20,000		24,013	
NeIC Events	1,300,000		1,298,232	
Project Mgmt Training	150,000		338,484	
Community Engagement				
Operations and Development	36,205,524	FTE 20.60	25,873,581	FTE 20.83
Nordic Tier-1	11,596,951	FTE 6.11	12,151,703	FTE 6.11
Operations (staff)	6,430,284	FTE 6.11	6,637,099	FTE 6.11
Travel and Meeting Costs	600,000		771,278	
WLCG NORDUnet cost	3,900,000		4,076,659	
ARC4eInfrastructures	666,667		666,667	
Sensitive Data	5,389,352	FTE 4.00	5,416,090	FTE 4.00
Tryggve	5,189,352	FTE 4.00	4,935,141	FTE 4.00
Travel and Meeting Costs	200,000		480,949	
Federated Cloud	6,968,720	FTE 3.20	3,918,421	FTE 4.30
Travel and Meeting Costs	200,000		189,739	
Glenna2	6,768,720	FTE 3.20	3,728,682	FTE 4.30
Software	2,124,210	FTE 1.00	943,210	FTE 1.13
CodeRefinery	1,974,210	FTE 1.00	827,273	FTE 1.13
Travel and Meeting Costs	150,000		115,937	
Sharing and Exchange	4,818,886	FTE 3.00	1,221,249	FTE 2.00
Dellinger	3,158,736	FTE 2.00	783,560	FTE 1.00
Travel and Meeting Costs, services	150,000		40,807	
NLPL	1,410,150	FTE 1.00	355,717	FTE 1.00
NLPL Travel and Meeting Costs	100,000		41,165	
Stakeholder Engagement	4,309,360	FTE 3.29	2,074,809	FTE 3.29
E3DS staff	564,060	FTE 0.50	681,114	FTE 0.50
Travel and Meeting Costs	150,000		120,868	
NICEST staff	1,410,150	FTE 1.79	540,822	FTE 1.79
Travel and Meeting Costs	100,000		15,895	
DeepDive staff	1,410,150	FTE 1.00	442,461	FTE 1.00
Travel and Meeting Costs	100,000		68,951	
Provider Forum	75,000		27,761	
Community Engagement	500,000		176,937	
Pool Competencies	998,045		148,099	
Training Coordinator	423,045		93,960	
Training Events	500,000		53,332	
Working Groups	75,000		807	
NeIC Total	40,973,170	FTE 23.10	32,357,941	FTE 23.08
Transfer to next year	NOK 4,264,385.00		NOK 7,986,411	

5 Provisions are funds set aside for a project, but which has not yet been invoiced for by the partner.

6 NeIC projects run over several years, which means that funds are sometimes transferred from one year to the next.

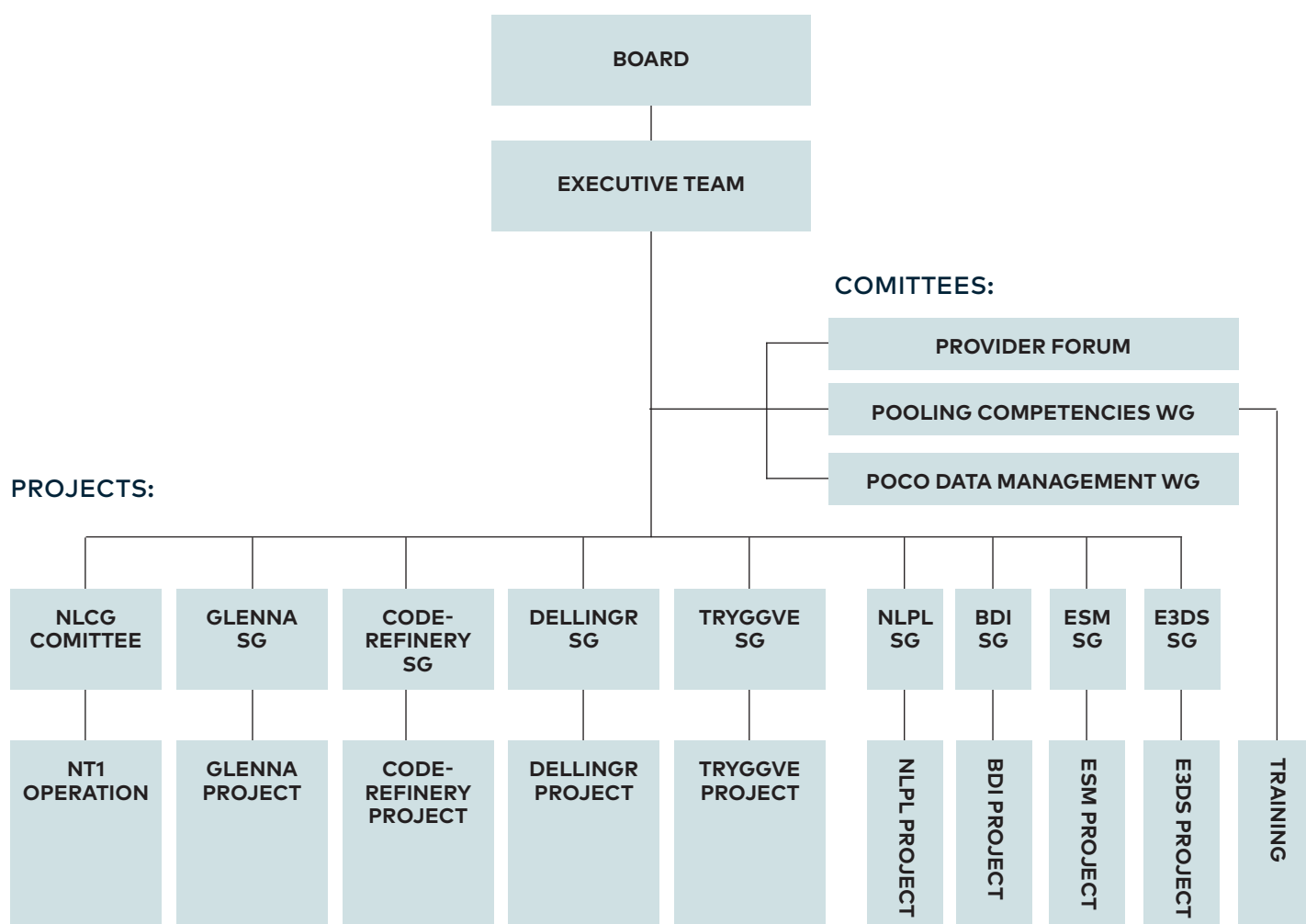


08

ORGANISATION

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NEIC ORGANISATIONAL CHART



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DeiC
University of Southern Denmark (SDU)
Niels Bohr Institute (NBI)
Statens Serum Institut
University of Copenhagen (UoC)
IT University of Copenhagen
Aarhus University (AU)
Danish Meteorological Institute (DMI)

FINLAND

CSC
Institute for Molecular Medicine Finland (FIMM)
Sareco
Finnish Museum of Natural History (FMNH)
Finnish Meteorological Institute (FMI)
University of Helsinki
University of Turku

ICELAND

University of Iceland
RHNet
Icelandic Institute of Natural History (IINH)

NORWAY

UNINETT Sigma2
University of Oslo (UiO)
University of Bergen (UiB)
NordForsk
Norwegian Institute for Nature Research (NINA)
Uni Research Klima (URK)
Nansen Environmental and Remote Sensing Center (NERSC)
Meteorologisk Institutt Norge

SWEDEN

ArtDatabanken, Swedish University of
Agriculture (SLU)
Göteborg University
University of Umeå
Royal Institute of Technology (KTH)
Lund University
Linköping University (LiU)
National Bioinformatics Infrastructure Sweden (NBIS)
SNIC
Swedish Meteorological and Hydrological Institute (SMHI)
Uppsala University (UU)

OTHER

Tartu University (ETAIS)
ETAIS (Estonia)
SixSq (Switzerland)
National Institute of Polar Research (Japan)
EISCAT

PEOPLE

are at the core of NeIC and are central to everything we do. This chapter is therefore dedicated to all the people who have worked for NeIC in 2017. This includes staff, steering group members, reference group members, the executive team, the provider forum and board members. In this way we would like to acknowledge all the people who helped NeIC achieve all that it did in 2017.

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