Strategic Plan 2018–2022

Including Work Plan for 2018

version 28 May 2018

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Introduction

NBIS (National Bioinformatics Infrastructure Sweden) is a distributed national research infrastructure with support from Science for Life Laboratory (SciLifeLab), the Swedish Research Council, Knut and Alice Wallenberg Foundation, and Swedish universities. NBIS is hosted by Uppsala University. NBIS constitutes the SciLifeLab Bioinformatics Platform.

NBIS is formed by 11 partners: Uppsala universitet (hosting NBIS), Chalmers tekniska högskola AB, Göteborgs universitet, Karolinska Institutet, Kungl. Tekniska högskolan, Linköpings universitet, Lunds universitet, Naturhistoriska riksmuseet, Stockholms universitet, Sveriges lantbruksuniversitet, and Umeå universitet

NBIS is a continuation of BILS (Bioinformatics Infrastructure for Life Sciences) now also including WABI (Wallenberg Advanced Bioinformatics Infrastructure), SILS (Systems Biology Infrastructure for Life Sciences) and the SciLifeLab Bioinformatics Platform in a coordinated manner, forming a single point of contact for all users needing bioinformatics support.

NBIS includes the following four SciLifeLab facilities:
- Short- and Medium-term Support (SMS) and Infrastructure
- Long-term Support (LTS)
- Systems Biology
- Compute and Storage

The NBIS Strategic Plan serves to formulate the long-term general goals for NBIS. It is discussed and decided by the NBIS Steering Group. The current version is covering the period from 2018 to 2022 and was approved by the Steering Group on 28 May 2018. The strategic plan will be revised at least annually, considering input from NBIS partners, the International Advisory Board and the Reference Group. The plan describes the major activities foreseen within the areas of Infrastructure, Support, Outreach, Training, Organisation and International.

The detailed goals to be achieved during 2018 are highlighted in green boxes.

Aim

NBIS provides excellence in bioinformatics support to researchers in Sweden, enabling world-class life science by offering expertise, tools and training. Furthermore, NBIS forms the Swedish contact point to Elixir (the European infrastructure for biological information) and ISBE (Infrastructure for Systems Biology in Europe). The organisational structure should allow for changes in support needs over time as new techniques are developed and utilised.

NBIS supports both research groups not having their own bioinformatics resources and large established research groups having their own bioinformaticians needing specialised expertise. As life scientists get successively more educated in bioinformatics, the scope of NBIS will be shifted towards a focus on more advanced expertise, and on provisioning of tools and infrastructure.

Vision

NBIS should enable world-class life science by providing expert knowledge, creative data integration, advanced training, efficient data publication and access to high-performance data and analysis methods. NBIS will continue coordinating bioinformatics support within Sweden and making bioinformatics easily accessible for life science researchers.

Background

There is need for a coordinated national bioinformatics infrastructure for life sciences for several reasons:

- to match international efforts, of which Elixir is the most prominent, and make it possible for Swedish researchers to efficiently utilise these resources, including coordination of Swedish contributions within Elixir.
- to coordinate the activities at various sites in order to provide efficient and front-line research-based support to Swedish life science groups.
- to organise and provide sustainable large-scale storage of data from high-throughput sequencing, genomics, proteomics analyses, in close collaboration with universities, SUNET and SNIC.
- to provide computational resources within bioinformatics and neighbouring disciplines for large-scale data processing, in close collaboration with universities, SUNET and SNIC.
- to provide a network between bioinformatics sites in Sweden

NBIS is organised as a distributed national research infrastructure, with a number of well-defined national services. Our staff is, where possible, co-located at the participating universities in order to facilitate collaborations. Staff members are encouraged to build up local networks, contribute to training events in bioinformatics, and to represent NBIS as a whole in contacts with local research groups and administration.

Overall strategy

NBIS provides expertise and infrastructure to facilitate bioinformatics analyses including necessary computational and storage resources. NBIS focuses on life science researchers including bioinformatics researchers. Furthermore, NBIS provides routes for data publishing. NBIS also provides expertise in a number of areas (detailed below) at universities with large life science activities. Finally, NBIS engages in training activities in order to inform life science researchers about the possibilities of bioinformatics.

Out of the NBIS activities, infrastructure including systems development, data publishing and training will amount to about a third of the expenses, while consultancy and project support will amount to about two thirds. The planned activities are detailed below.

NBIS coordinates its activities with other relevant infrastructures, such as other platforms at SciLifeLab, SNIC, and all BMS infrastructures. NBIS main user groups are at academic institutions, but NBIS will also interface with hospitals, governmental agencies, and commercial companies for mutual benefits. Internationally, NBIS coordinates the Swedish Elixir node and engages in Nordic and European collaborations.

Infrastructure

A fundamental part of NBIS is the formation of a sustainable bioinformatics infrastructure for life sciences, consisting of access to tools and data. The NBIS infrastructure is typically constructed as domain-specific supporting layers utilising resources from e-infrastructure providers such as SNIC for the computational needs. These computational and storage needs are set up in close collaboration with SNIC, in order to avoid duplication of efforts and to benefit from the competences within SNIC.

Data publishing and long-term storage

As science in general and life sciences in particular is facing an unprecedented growth of data output due to technological advances in instrumentation, NBIS will strive to be positioned to be able to handle this so-called data tsunami for Swedish life science. This entails investing in and building up of know-how in data storage, data management and data publication, but also to convey this knowledge to Swedish life science researchers and to follow the development on a European and international level. NBIS will be able to assist Swedish scientists in all parts of the data management life cycle, from plan, collection and analysis to archiving and data publication.

For the long-term storage of high-throughput sequencing data (NGS data) and other types of data, NBIS collaborates with SUNET and SNIC. We see that this area develops fast and the needs are increasing considerably every year. NBIS will in its role as national infrastructure coordinate the Swedish bioinformatics-related storage needs, which will be especially important for small research groups, where NBIS can assure that they get access to storage. Large user groups (e.g. SciLifeLab) typically have their own staff handling storage issues and thereby have their own momentum, leaving mainly the coordination to be performed by NBIS in close contact with the respective user group.

There is an increasing need also for storage of sensitive data. Within Elixir financed by the Elixir-Excelerate project, NBIS is contributing to the development of local/federated EGA (European Genotype/phenotype Archive) nodes enabling storage of sensitive data that should be stored in the respective country. NBIS aims to set up a local EGA node in Sweden during late 2018 or early 2019.

NBIS is also maintaining a data repository for mass-spectrometry proteomics data for long-term storage, set up in collaboration with SNIC. The data storage enables voluntary sharing of the raw data with the scientific community through the global ProteomeXchange initiative upon publication of results, as this is becoming a requirement for publication of proteomics results. Additionally, NBIS is engaged in a new Elixir proteomics community pilot effort to facilitate reprocessing of data deposited to ProteomeXchange. These first efforts of the Elixir proteomics community will provide better annotation of published data and adaptation of data processing pipelines to allow for automated reprocessing based on the published dataset annotations.

NBIS provides services to facilitate data publication. Since 2012, NBIS has the authorisation to mint so-called doi:s, Digital Object Identifiers, which are persistent pointers to data sets. Persistent identifiers are a prerequisite for data publication, as they enable data sets to be found even if there is a change of storage location. Using doi:s, it is also possible to cite data sets, and to search for data using metadata queries. NBIS supports the FAIR principles (i.e. making data Findable, Accessible, Interoperable and Reusable) and guides Swedish scientists in publishing data on the international arena. We will continue to develop best practices and web services to enable data

publication with a minimal administrative effort. NBIS will also assist researchers in creating data publication plans for funding applications. We collaborate with the recently launched Data Centre at SciLifeLab. NBIS also follows the international development in this area and engages in relevant international collaborations.

Work plan for 2018:
- The data manager will continue to establish routines to help Swedish scientists depositing data. Continue with the system for providing doi's for data sets deposited by Swedish scientists.
- Continue to coordinate the NBIS activities with those of the recently launched SciLifeLab data centre.
- Provide assistance to researchers in creating data publication plans, including provision of suitable template documents.
- Collaborate with SND on data publishing issues.
- Set up a Swedish local EGA node within the framework of Elixir-Excelerate project during late 2018 or early 2019.
- Continue our engagement in the Nordic NeIC-supported project Tryggve2 aiming at providing secure handling of sensitive data in a federated manner across countries.
- Follow and engage in the European developments in this area, including developments in Elixir efforts in interoperability, FAIRification of data, and activities in the RDA (Research Data Alliance).

Systems Development

Access to professional and usable software tools is a cornerstone in current day research projects. This is particularly the case in fast-changing, data-intensive fields like next generation sequencing and proteomics. Easy-to-use tools that enable researchers to carry out more of the data analysis themselves will also help to alleviate the demands for bioinformatics support in the form of consultancy.

While the development of new methods and algorithms is typically carried out in research projects, making these tools usable to the research community and keeping them maintained is often neglected due to lack of resources, expertise or incentives.

The NBIS systems development team creates user interfaces and provides support in deploying tools so that they can be used by the entire life science community, and not just by bioinformaticians. The combination of bioinformatics experts, who can appraise the scientific value and usefulness of tools, with developers who have the capability of making tools stable and accessible, allows for development projects driven by user needs.

The development efforts will entail creating user interfaces (*e.g.* web interfaces), providing assistance in programming best practices (documentation, source code management, bug tracking), and deployment. The development team will also assist in internal development projects, *e.g.* for integrating data services with other initiatives.

Prioritisation of new systems development projects proposed by staff or the user community are done regularly (typically every 2–3 months) by the management, according to the general principles:

- Highest prioritised are international agreements and national services of large interest.
- Next level are projects of large impact for Swedish users and of central importance for NBIS functions.
- Medium-prioritised are individual support projects for systems development that are treated as other support cases, including charging user fees.

Methods and software developed within NBIS are made publically available to the scientific community.

Computational resources to our users will predominantly be provided by SNIC, but other research e-infrastructures, such as EGI (European Grid Infrastructure), and emerging computational services within Elixir will also be utilised.

Tools

NBIS maintains a software repository for internal purposes and also public repositories for codes and scripts that are developed by NBIS staff in order to get them spread to the scientific community. For the latter, NBIS has an account on GitHub. We also facilitate publication of Open Access Data, which will be one of our contributions within Elixir.

Within the Systems Biology facility, NBIS will implement tools for analysis of high-throughput data and visualisation of results, adhering to established standards in order to enable integrative data analysis, thus providing a comprehensive set of tools sufficient to perform the complete analysis of data.

NBIS continuously enters relevant Swedish tools in the Elixir Tools Registry.

Work plan for 2018:
- Maintain prediction servers and bioinformatics tools of importance for the Swedish life science community, of which several are expected to also be of interest for Elixir.
- Engage in the development of tools for genome analyses.
- The management makes regular prioritisations on new systems development projects.
- Enter relevant Swedish tools in the Elixir Tools Registry.
- Participate in European collaborations on systems development to enable efficient bioinformatics tools for large-scale analyses of data – both human and non-human.

Compute and Storage

High throughput biomedical science nowadays depends on high-performance computers for bioinformatics analysis. The hardware is maintained by SNIC but NBIS provides expertise needed to efficiently access the computational and storage resources. With growing numbers of project, increasing sample and data sizes, we will develop plans for how to accommodate for this scenario in the best way. We will explore the benefits of cloud computing and data analytics frameworks such as MapReduce, Hadoop, and Spark. We will also investigate how scientists can improve the automation of bioinformatics analysis using scientific workflow tools. In addition, we will investigate more efficient methods for storage of biological data.

Work plan for 2018:
- Provide user support within compute and storage.
- Follow usage patterns and facilitate efficient utilisation of the computational and storage resources.
- Coordinate with NGI.
- Follow the development in the compute and storage area and make suitable pilot studies

Interactions with other research infrastructures

NBIS constitutes the Bioinformatics Platform at Science for Life Laboratory, which is a national infrastructure for high-throughput techniques. NBIS has close contacts with other SciLifeLab platforms. Of special relevance is the National Genomics Infrastructure (NGI) and Clinical Genomics. NBIS also has regular contacts with relevant core facilities in Sweden. In order to increase the contacts between our platforms, NGI and Clinical were invited to the NBIS retreat in March 2018. Additional contacts will be taken during 2018.

NBIS has regular contacts with SNIC and its centres in order to get optimal provision of computational and storage resources. Also coordination with the application experts in bioinformatics will be important.

On the data publishing side, NBIS has ongoing collaboration with the SciLifeLab Data Centre and SND, Swedish National Data Service.

On the international side, NBIS follows the work in Corbel, coordinated by Elixir, and in which all European BMS infrastructures are partners. NBIS is also actively engaged in RDA (Research Data Alliance).

Work plan for 2018:
- Regular meetings with SNIC to coordinate storage and computational issues.
- Regularly coordinate NBIS activities with relevant platforms at SciLifeLab and relevant national infrastructures.
- Participate in relevant European infrastructure meetings.

Support

NBIS supports excellence in research. One of our major areas is support, where NBIS staff helps researchers with bioinformatics tasks in various projects. The time spent in each project varies from short (days) to long (weeks/months). The topics for NBIS experts are decided by the NBIS Steering Group, following suggestions from open NBIS calls, NBIS partners, the International Advisory board, the Reference Group, evaluations, or the Steering Group itself. In order to be flexible and to test the needs for new topics, the Steering Group can decide upon launching short-term (1–2 years) project-type activities. This will enable NBIS to provide expertise in the areas needed by the life science researchers.

Currently, NBIS provides expertise in many areas within bioinformatics: NGS (Next Generation Sequencing), Metagenomics, Genome assembly and annotation, Biostatistics, Phylogenomics, Metabolomics, Systems biology, Integrative bioinformatics, Protein bioinformatics, and Mass-spectrometry proteomics.

In the new funding landscape since 2016, the universities need to take a larger part of infrastructure funding. Furthermore, the user fees, which are decided by the Steering Group, have increased, so that large users of NBIS also make a large economic contribution.

Projects at Long-term support (WABI) follow the conditions from the KAW funding.

In order to facilitate contacts with NBIS experts, we have staff at all major university towns. They constitute easy-to-find local entry points into the NBIS infrastructure. These local contact points will have good knowledge about the NBIS staff at other sites.

NBIS staff has a national responsibility and should serve the users' needs regardless of their affiliation.

Assembly and Annotation Service

Genome assembly and annotation are complex and demanding processes, both when it comes to man- and compute-power. To help Swedish researchers pass this barrier of entry to genomic studies, a centre of competence for genome assembly and annotation was created in 2013. The activities of the team, which consists of bioinformaticians (PhDs) with expertise in genome assembly and gene structure annotation, focus on providing assembled and annotated genomes of the highest quality. The projects are carried out in close collaboration with the research groups applying for support to ensure a result specifically tailored to the user's need and data. Data can be shared with researchers through dedicated web services, including a genome portal and online annotation tools for the groups to use.

> **Work plan for 2018:**
> - Continue providing support within genome annotation and assembly.
> - Continue our engagement in the Elixir-Excelerate project by providing high-level international courses within genome annotation and assembly.

Prioritisation

As a national infrastructure NBIS aims at providing bioinformatics support in all projects where our competence is asked for. However, when the available resources are not sufficient to match the total needs, a prioritisation has to be made according to the principles listed below.

Short- and Medium-term Support has application rounds at least every 2 weeks, where projects are prioritised according to the principles listed below. New support projects are assigned to the appropriate staff member(s) by a manager, in some cases together with a project coordinator. The managers and project coordinators follow up that each project proceeds according to plan.

Long-term support (WABI) has application rounds 3 times per year, where projects are scientifically ranked by the Proposals Evaluation Committee. The managers prioritise the projects according to technical feasibility in agreement with this ranking

NBIS also provides consultations at the early stage of a project, preferably before data is collected. A consultation session is typically 3–4 hours and is provided for free. No data is analysed during the consultation sessions.

Below are the current prioritisation principles, as decided by the NBIS Steering Group and supported by the International Advisory Board. The prioritisation is done by the NBIS managers, based upon information from the NBIS staff.

- Technical feasibility
- Availability of data
- Projects which are judged excellent by VR or our external prioritisation committee are prioritised.
- Projects where the NBIS staff has appropriate competence are prioritised.
- Projects where the NBIS efforts make a large impact are prioritised.

In order to more efficiently be able to help more users, NBIS will provide guidance so that the users become able to do part of the bioinformatics analyses on their own. In line with this, NBIS staff also devotes part of their time to training activities. Furthermore, NBIS maintains a useful infrastructure, including tools and data handling, available for the users (cf. Infrastructure, above).

Work plan for 2018:
- Continue to provide expertise in the following areas: large scale sequencing, genome assembly and annotation, proteomics, protein bioinformatics, databases, metabolomics, systems biology, and biostatistics.
- NBIS will closely follow the trends in life science research in order to be prepared for emerging technologies and new bioinformatics approaches.
- For 2018, the Steering Group has set the academic user fee for NBIS support to 800 SEK per hour.
- Encourage researchers to include bioinformatics costs in project grant proposals. NBIS will assist in estimating these costs.

Information and Outreach

NBIS has a web site (https://nbis.se) for providing up-to-date information both to our users and for internal purposes. NBIS also has a project management system facilitating tracking of projects and allowing for NBIS staff to easily share data and information with their customers.

Outreach activities have proven important to inform the scientific community about the support that NBIS can provide and to increase the number of NBIS customers. These consist of:
- Annual symposium and user meeting.
- Presentations at different universities, providing the possibility to meet NBIS staff representing our wide variety of competences.
- Additional presentations at various symposia and conferences.
- Weekly Bioinformatics Drop-in sessions enabling face-to-face contacts between researchers and NBIS experts, which many times is the first contact in a support case. These sessions are arranged at all sites (Uppsala, Stockholm, Göteborg, Linköping, Lund and Umeå).
- Training, cf. below.

Presentation material, e.g. flyers, roll-up, has been produced and will be continuously updated.

Work plan for 2018:
- Continue to keep the NBIS web site up-to-date and informative – both for our users and for our staff.
- Weekly Drop-in sessions at the sites where NBIS personnel are located.
- Give presentations at the six sites (Umeå, Uppsala, Stockholm, Linköping, Göteborg and Lund).
- Annual symposium and user meeting will be held in spring 2018.
- Continuous updates of information material, both web and print.

Training

NBIS staff is involved in a wide range of training activities targeted towards the Swedish Life Science community, both in our own workshops and as invited teachers/speakers in courses arranged by others. Training offered by NBIS ranges from participation in advanced bioinformatics courses, graduate student courses and similar to individual training of researchers in order to teach them new bioinformatics tools and to help them utilise bioinformatics tools more efficiently. The training activities are also an efficient way to increase the flow of projects through the NBIS organisation by helping scientists to be able to perform parts of the bioinformatics analyses themselves. There is an increasing need of training, both at an introductory level and at an advanced level. NBIS will also sponsor and co-organise workshops. At our web site we will announce available courses, facilitating users to take courses at different universities.

NBIS workshops and training events are spread over all SciLifeLab sites in Sweden with the aim to reach as many national life scientists as possible. In 2018, NBIS is launching a 10 days international summer school in R, the course ranging from introductory level to advanced, at

Campus Gotland in Visby. This course is planned to run annually and aims to attract international participants as well as national students.

In order to increase our training capacity, we will offer "course packages", where NBIS staff is responsible for lectures and exercises, and where the host university is taking care of the administration of the course, including admittance and registration of participants, booking of rooms, lunches, coffee breaks. Another focus will be to expand our already implemented e-learning course efforts to have more on-line access to training, providing courses beyond the physical classical classroom. The e-learning platform used by NBIS is the Elixir built tool and the courses using the e-learning platform are events in collaboration with Elixir-SI.

NBIS leads a national advisory mentorship programme in bioinformatics, enabling expert advice to Ph.D. students in bioinformatics-related research projects. Within this programme, we also organise meetings for all enrolled Ph.D. students and their supervisors. NBIS is also engaged in the new National Research School in Medical Bioinformatics that started 2017.

NBIS aims to increase the collaboration with other platforms within SciLifeLab. This work for increasing contact surfaces for bioinformaticians within the SciLifeLab community started in 2018 with a newly launched Seminar series, *BiG Talks!* (Bioinformatics and Genomics seminar series arranged in collaboration between NBIS, NGI and CG). The seminar series aims to increase the interaction between bioinformaticians and researchers within the SciLifeLab community. The BiG Talks will be broadcasted so to reach a wider audience with possibilities for participants to ask questions and comment in real time. The idea is that the seminar series will rotate at different SciLifeLab sites during the four times per year these take place.

Regarding international training efforts, NBIS is planning collaboration with SIB, the Swiss Institute of Bioinformatics, launching the seasonal school with the topic single cell, an area of which we see an increasing demand for knowledge. The seasonal school is scheduled for 2019.

As the Swedish node in Elixir, NBIS coordinates the Swedish efforts in training. Collaborations e.g. between NBIS and Elixir-IT is taking place in 2018 in terms of a Train-the-Trainer course in Stockholm, increasing the pedagogical skills and knowledge to Swedish Life Scientists. We will make use of the Elixir e-learning platform in our courses where applicable, making the training accessible to students unable to be physically present.

Training is also one important area of future collaborations between NBIS and industry, where we can enable companies to attend NBIS training events.

Work plan for 2018:
- During 2018, we will arrange several training events on at least the following topics:
  - next generation sequencing data analysis
  - statistics
  - genome annotation
  - programming courses, *e.g.* in Python and R
- During 2018, we will increase the number of training events in order to meet the increased demand.
- Apply an e-learning approach to courses where applicable.
- Provision of "course packages" to increase the efficiency of our training activities.
- Continue with our National Advisory Mentor Programme in Bioinformatics.
- Engage in the new National Research School in Medical Bioinformatics.
- Provision of information on bioinformatics courses available in Sweden and within Elixir.
- Provide self-study material and lecture notes in relevant bioinformatics courses on the NBIS website.
- Increase collaboration with other SciLifeLab platforms within Training events such as courses and Seminar Series.
- Increase collaboration with other Elixir nodes for advanced courses and training events.

Collaboration with industry

NBIS will continue our efforts to increase contacts with life science companies to enable them access to NBIS-provided tools, databases, expertise, and training. During 2017, we have increased the number of industry projects.

Work plan for 2018:
- Discuss with pharma companies possible models for co-funding and providing support to them.
- Provide support to companies at a full-cost rate when we have appropriate expertise and capacity.
- Invite scientists at companies to NBIS training activities, to the annual symposium and user meeting, and to NBIS site visits.
- Participate in/organise at least one outreach meeting targeting companies.

Organisation

The organisational governance is regulated in the NBIS consortium agreement, signed by all parties in 2016.

The organisational scheme as envisioned in the applications to VR in 2015 and 2017 is generally followed.

The Steering Group is assigned by Uppsala University together with SciLifeLab after consultation with VR. The Steering Group meets 4 times per year, often via teleconference. The SciLifeLab infrastructure director participates in the Steering Group meetings.
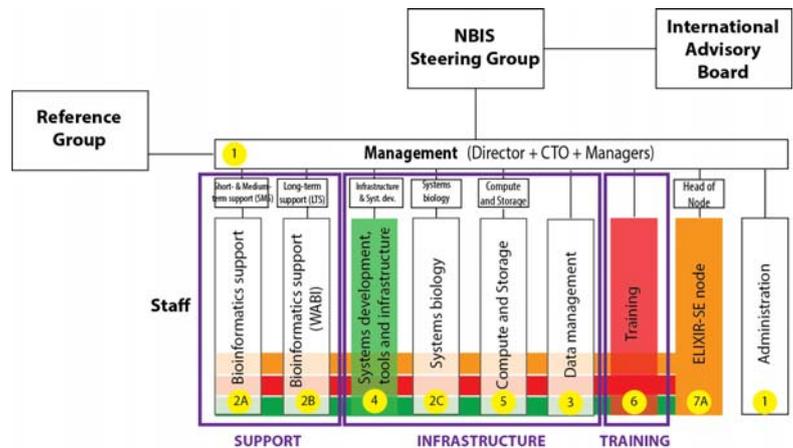
An International Advisory Board is established since 2012.

A reference group with representatives from participating universities and other organisations is formed but has not been active the recent years.

For the coordination and leading the daily management of the infrastructure, a director is appointed by the Steering Group. This is a 50% position, typically a professor in bioinformatics or other relevant field. The director has the executive responsibility for running the infrastructure, delegated from the Steering Group. In addition, a technical manager (CTO; 100%) is appointed leading and coordinating the technical management of the infrastructure.

The activities of NBIS are divided into organisational units, as depicted in the figure above. The managers together with the director form the management team that meet using video conference system at least monthly to coordinate activities and discuss operational matters. Important questions of policy, strategy and economy are put forward to the Steering Group for decision. When time-wise suitable these meetings will be physical.

> **Work plan for 2018:**
> - Update the NBIS consortium agreement.
> - Reactivate the reference group.

Electronic Meetings and Retreats

In a distributed infrastructure like NBIS, it is important that all staff members are aware of the special competences of their colleagues at other sites. In order to achieve this, we have a weekly text-based chat, where current NBIS activities are discussed in an informal manner. Shortly before the meeting, an automatic e-mail reminder is sent to all staff, containing information about open support requests, unanswered questions on biosupport.se, and new pages on the NBIS wiki. The NBIS chats also provide opportunities for staff members to ask general questions, exchange ideas and socialize.

In addition, we have annual retreat(s) for all staff to increase interactions and give ample time for long-term planning and strategy discussions, bringing up new ideas, and develop the activities.

Topical meetings

NBIS organises internal topical meetings, focused on a particular bioinformatics sub-discipline, *e. g.* Next Generation Sequencing, proteomics, large-scale data management, training. The purpose of these meetings is to facilitate internal networking and knowledge transfer. The topical meetings will allow for more in-depth discussions on new papers or methods, and of current NBIS projects. In order to minimise travelling time, the topical meetings will predominately be held on-line. At these meetings, relevant NBIS-affiliated persons are invited.

Development of staff

In order to assure a continuous competence development of the NBIS staff, they should ideally have their basis in a bioinformatics research environment, giving them opportunities to keep up with progress at the research frontiers and attending lectures and seminars. Furthermore, they should be given time for own education and development, e.g. when involving in support tasks needing additional competence. Some NBIS staff might want to spend this development time within a research project. The time available for competence development is up to 20% (including the above mentioned own education associated with support tasks). As bioinformatics is a rapidly evolving discipline and new areas emerge, over time NBIS staff might move between different areas, depending on user needs and their own interests. NBIS is engaged in creating career development for staff scientists.

> **Work plan for 2018:**
> - Continue with weekly chats.
> - Continue and further develop topical meetings.
> - Organise at least one internal course for competence building within NBIS.
> - Arrange two retreats.
> - Participate in SciLifeLab working group on career development for staff scientists.

NBIS staff categories

To make financial agreements with the co-funding universities easier and to have clear guidelines for project steering, the NBIS staff is divided into four categories:

Category A – national support – consists of experts that provide project support in various areas, e.g. genomics, proteomics, systems biology, biostatistics. For this category, the personnel costs are typically divided 50/50 between NBIS and the co-funding university. Projects are nationally prioritised by NBIS.

Category B – local support – consists of experts that mostly provide local support, often in connection with a core facility. For this category, the personnel costs are typically divided 20/80 between NBIS and the co-funding university. The university prioritises projects within their 80% share, while NBIS prioritises projects within their 20% share.

Category C – central support – consists of experts that work with common NBIS infrastructure functions, such as application expertise for compute and storage, systems development, data management, national platforms in genome assembly and annotation, project steering. Funding and prioritisation is 100% NBIS.

Category W – WABI support – consists of experts that provide project support according to the rules agreed with the Knut and Alice Wallenberg Foundation for funding of the WABI part of NBIS. Project prioritisation is according to these rules.

Affiliated NBIS persons

In order to increase the national bioinformatics networking, NBIS enables affiliation of bioinformaticians at other SciLifeLab platforms and at core facilities. This will give them access to NBIS knowledge exchange meetings, provide valuable contacts with NBIS staff performing similar work and thereby increase the their network. NBIS affiliations are decided by the NBIS management.

Work plan for 2018:
- Affiliate relevant bioinformaticians to NBIS.
- Invite affiliated NBIS persons to knowledge exchange meetings.

Funding

The major funding sources of national NBIS activities are the Science for Life Laboratory, the Knut and Alice Wallenberg Foundation and the Swedish Research Council (VR). NBIS also has financial support from the participating universities. In addition, users are contributing with user fees. These combined funding streams enable NBIS to grow successively as the demands for bioinformatics support increase. When suitable, NBIS will participate in national and international grant applications, predominantly in the infrastructure area.

Work plan for 2018:
- Increase user fee contributions.
- Continue expansion to meet the increased demands.
- Participate in relevant grant applications.

International

Elixir node

The European infrastructure for biological information – Elixir – is constructed as a distributed infrastructure with several nodes throughout Europe and a central hub. Sweden contributes with a node in Elixir providing access to data and methods/tools originating from Sweden and to give Swedish researchers access to the European databases, tools, and biocomputational resources. The Swedish Elixir node is coordinated by NBIS.

Since 2013, Sweden contributes with the Human Protein Atlas (HPA) and its integration into the Elixir landscape. HPA was named Elixir Core Data Resource in 2017. With EU-support through the Elixir-Excelerate project, Sweden has made additional contributions within areas of sensitive data, genome annotation and assembly, capacity building, advanced training, and large-scale data transport.

Work plan for 2018:
- Continue the work on integration of Human Protein Atlas into the Elixir landscape and provide seamless integration with other important data sources.
- Participate in Elixir-Excelerate project activities according to the plans in the application.
- Participate in relevant Elixir implementation studies and other Elixir-related activities.
- Contribute to Elixir 2019–2023 programme.
- Establish contacts between new Elixir user communities and relevant groups in Sweden

Nordic collaboration

NBIS aims at strengthening the Nordic collaborations with Norway, Denmark and Finland on computing, storage, training and on Elixir node activities. Since 2011, we have regular meetings between the Nordic Elixir heads of nodes. Travel costs for these meetings are kindly supported by a NordForsk grant. Since 2013, NeIC (Nordic eInfrastructure Collaboration) engages in supporting biomedical sciences, initiated by letters of interest from NBIS together with the Nordic Elixir nodes. The project Tryggve aims at constructing a federated solution across the Nordic countries for secure data handling and analysis, allowing for exchange of data when the ethical permits so allows. The first phase was very successful, and a second phase (Tryggve2) is granted 2017–2020.

Work plan for 2018:
- Collaborate in relevant areas with the Nordic Elixir nodes.
- Plan for joint advanced training activities with the Nordic Elixir nodes.
- Engage and collaborate with NeIC concerning their activities on the biomedical arena.

Appendix 1 – Abbreviations

BILS – Bioinformatics Infrastructure for Life Sciences
EBI – European Bioinformatics Institute
ECDS – Environment and Climate Data Sweden
Elixir – European Infrastructure for Biological Information
EMBL – European Molecular Biology Laboratory
FTE – Full time equivalent
GU – Göteborgs Universitet, University of Gothenburg
HPA – Human Protein Atlas
IAB – International Advisory Board
iRODS – Integrated Rule Oriented Data System
KI – Karolinska Institutet, Stockholm
KTH – Kungliga Tekniska Högskolan, Royal Institute of Technology, Stockholm
LiU – Linköping University
LU – Lund University
NBIS – National Bioinformatics Infrastructure Sweden
NeIC – Nordic eScience Infrastructure Collaboration
NGI – National Genomics Infrastructure
NGS – Next Generation Sequencing
NRM – Naturhistoriska Riksmuseet, Swedish Museum of Natural History, Stockholm
NSC – National Supercomputer Centre at Linköping University
PDC – PDC Centre for High Performance Computing at KTH
PI – Primary investigator
RDA – Research Data Alliance
SciLifeLab – Science for Life Laboratory
SILS – Systems Biology Infrastructure for Life Sciences
SLU – Sveriges Lantbruksuniversitet, Swedish University for Agricultural Sciences
SND – Svensk Nationell Datatjänst
SNIC – Swedish National Infrastructure for Computing
SU – Stockholm University
UmU – Umeå University
UPPMAX – Uppsala Multidisciplinary Center for Advanced Computational Science
UU – Uppsala University
VR – Vetenskapsrådet, Swedish Research Council
WABI – Wallenberg Advanced Bioinformatics Infrastructure