

Healthcare industry BW

Expansion of the de.NBI, the German Network for Bioinformatics Infrastructure

The German Network for Bioinformatics Infrastructure, de.NBI for short, is a successful model for infrastructures in the life sciences and biomedicine that is currently being expanded. The network, which was established in 2015, will benefit from more hardware, more staff, more projects and its own cloud. It has also joined the European ELIXIR network.



Prof. Dr.-Ing. Oliver Kohlbacher established a work group for applied bioinformatics back in 2003.
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The de.NBI is of benefit to all life scientists who use bioinformatics for their research. These days this applies to many, if not most scientists. None of the modern high-throughput methods used for analysing DNA or proteins works without information technology. Bioinformatics services range from advice for planning projects and experiments, generating and analysing data to visualising results and archiving data. As it is neither economical nor practicable to establish a bioinformatics department at every single institute, universities and research institutes have central institutions specifically focused on this type of work. These units generally have specific thematic priorities and areas of scientific expertise.

The German Ministry of Education and Research (BMBF) established the de.NBI in 2015 with the aim of interconnecting bioinformatics centres and offering access to high-quality and comprehensive services with state-of-the-art technology to as many researchers as possible. It all began with eight centres with high bioinformatics profiles. One of the original centres was the University of Tübingen, where Prof. Dr.-Ing. Oliver Kohlbacher heads up the Quantitative Biology Center (QBIC) and coordinates de.NBI activities.

Kohlbacher also coordinates the Center for Integrative Bioinformatics (CIBI), which was established in 2015 and which is also part of the de.NBI network. The CIBI brings together special expertise in omics technologies, providing support in research projects that involve the analysis of genomics, proteomics, transcriptomics and metabolomics data, i.e. data related to all metabolic areas from the cellular to the organismic level. In addition to the University of Tübingen, the network also pools the expertise of the Free University of Berlin and the University of Konstanz.

With the expansion of the de.NBI in November 2016, the Max Planck Institute of Molecular Cell Biology and Genetics in Dresden and the Leibniz Institute of Plant Biochemistry in Halle have also joined the CIBI. These two institutes close thematic gaps in the field of metabolomics (Halle) and microscopic imaging (Dresden). In total, eight new partner projects were added to the de.NBI, bringing with them 17 subprojects from the fields of epigenetics, metaproteomics, systems biology modelling, protein structure data, RNA sequencing and lipidomics.

The integration of bioinformatics throughout Germany has a high synergistic effect

Around two years after the de.NBI was established, Kohlbacher reports a positive interim balance: "The de.NBI is well established and has proved to be an excellent provider of bioinformatics services. The network is present at major scientific conferences and has already achieved a great deal in the field of education. Thanks to the de.NBI we were able to train a significantly larger number of life scientists in bioinformatics in Germany. In 2016, we offered 40 additional training programmes with different formats over a total of 131 days. Around 800 people participated in these programmes."

As bioinformatics continues to suffer from a shortage of up-and-coming scientists, the de.NBI places great importance on the education and training of young people in this field. Kohlbacher believes that the network will focus even more on education and training in the future. He comments: "We are confident that we will be able to offer many more courses in 2017. In December 2016, the de.NBI announced 44 different courses for 2017." Most course participants are not bioinformaticians. They come from different life sciences areas. Half of the participants are students. "We adapt each course to different levels of knowledge and also develop special online training courses. Our aim is to provide as many students and scientists with the necessary knowledge on bioinformatics methods and tools to enable them to solve bioinformatic issues largely on their own. For example, we offer researchers the possibility to develop their own bioinformatics tools using our software libraries," says Kohlbacher.

The BMBF has granted five million euros for the hardware required to establish a de.NBI-owned cloud by 2020 in order to enable the de.NBI to work even more efficiently. The BMBF will also provide the money needed to pay for six posts for staff involved in the establishment and operation of the cloud. The cloud will be operated by the institutes in Heidelberg, Bielefeld, Gießen, Freiburg and Tübingen. "The idea is to set up a similar software environment at these five institutes. This will enable users to log in anywhere and work where capacities are available," says Kohlbacher. Kohlbacher's institute has purchased high-performance computers costing around 500,000 euros. These computers have several hundred processor cores that can work in parallel. This computing power is complemented by BinAC, a supercomputer financed by the Baden-Württemberg government. BinAC was installed in Tübingen in 2016 and is designed for bioinformatics and astrophysics work by researchers from all over Baden-Württemberg. "We can use five to 20 percent of BinAC's computing capacity for the de.NBI," says Kohlbacher.



Five million euros will be invested in the construction of a de.NBI cloud, which will facilitate networking in the field of bioinformatics.

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Short research pathways through the de.NBI cloud

In principle, the de.NBI cloud will also be available to companies. However, the necessary conditions still have to be created. One thing that is sure is that only companies active in research will be provided with a login. "In contrast to commercial clouds, we always know where the data are stored and who is using them. This prevents abuse. Of course, different conditions will apply for yeast researchers and those who work with patient data. This has to be clarified on a case-by-case basis," says Kohlbacher about data security. The future will show whether additional security mechanisms need to be implemented.

With the further expansion of the de.NBI, the network will in future be integrated into a larger European framework. In August 2016, Germany became one of 19 partners of the European infrastructure initiative ELIXIR (European Life Sciences Infrastructure for Biological Information). The de.NBI will form the German node in this network. "The establishment of a powerful ELIXIR network is a complex process. At the moment, we are still in an intermediate state. Our advantage is that the de.NBI is a functioning structure, something that has yet to be established in some other European countries," says Kohlbacher. Once everything is up and running, the researchers from Baden-Württemberg and Germany will be able to exchange resources and expertise in an international context better than they can at present.