

A pre-study

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A pre-study on how to coordinate actions in support of RIs

Background

Lund has become one of the main nodes of accelerator-based Research Infrastructures (RIs) in Europe. Lund University (LU) hosts the MAX IV synchrotron facility, in which electrons are accelerated to produce x-ray beams used by a large range of researchers. Right next to MAX IV, the European Spallation source (ESS), is being constructed to provide neutron beams for a large range of scientific fields. In northern Germany, Hamburg has manifested its position as a hub for accelerator-based photon RIs, and its university is well-connected to the supercluster of facilities in Northern Europe. Apart from collaborations with light sources and neutron sources worldwide, Lund also has strong scientific collaborations with accelerator and experimental RIs, for example the CERN laboratory in Geneva with the Large Hadron Collider, the Relativistic Heavy Ion Collider at the Brookhaven National Lab and the future FAIR at GSI in Darmstadt.

Lund University has a long tradition in using these kinds of facilities and programs are being set-up, both in Lund and nationally, to further develop the use of RIs within academia and in industry. However, the field of research and technology which supports and develops the facilities themselves, their instruments, sample environments and methods has a weaker position. These "*non-users*", or *developers* of new and current RIs, complement the traditional "users" of the facilities. The "users" community is highly dependent on the disciplines involved in infrastructure development research.

Academic groups have contributed to the build-up of the MAX IV facility and researchers are continuously contributing to the ESS as well as to some of the international RIs such as CERN, but the university does not fully profit from this competence and its visibility and strength could be increased. Traditional in-kind contributions to other RIs as performed internationally are currently almost non-existent at LU (and in Sweden), including most of the core of the ESS facility.

A national project by VINNOVA - linking upstream and downstream contributions and functions at all universities, including LU, and major national actors - will start in 2022 and the prestudy will liaise with this.

Challenges and opportunities

Lund University's close scientific relations and physical proximity to these so called "Big Science" facilities means that the university must decide on a long-term strategy how it should interact in this area and support the kind of advanced development necessary to maintain a competitive advantage for LU. This is not only important for building, maintaining and further increasing the facilities performance in the decades to come, but also to foster an active environment, funding and career opportunities for technicians and researchers, here or elsewhere, working to develop these state-of-the-art technologies. Such groups and researchers are an essential part in the possibility to deliver traditional in-kind contributions to international Big Science projects, and a goal should be to support research groups, divisions, departments at Lund University with:

- interest/ambition to contribute to the development of Swedish RIs,
- interest/ambition to contribute to international RIs (in-kind),
- interest in helping and collaborating with Swedish companies in inkind and procurements towards Swedish and International RIs.

Areas that need to be addressed are, among others:

- How can LU contribute more efficiently to the development of Swedish RIs?
- How can the in-kind processes to non-LU RIs be developed?
- How can competence be developed and retained over the long lead times of RI construction?
- How can research groups at LU enhance their collaboration and visibility?
- How can this be achieved in the Swedish funding system?

Researchers active in BigScience@LU have concluded that to perform the task effectively, the initiative needs a mandate and some resources from the main faculties involved at Lund University, the Faculty of Engineering, and the Faculty of Science, as well as LU centrally. The proper way to do this would be to define a pre-study sponsored by LU centrally.

The initiative

We believe that Lund University must form a node for collaboration, actions and support among infrastructure *developers* to work towards the RIs. This could be in the form of a network, collaboration(s), centre, or an institute yet to be defined.

To further analyse the needs, identify the partners within Lund, define the critical questions and identify actions we propose a pre-study. This study should deliver a concrete suggestion on how this node can be formed.

The pre-study will initially focus on three major fields where research towards RI is already on-going, namely

- Accelerator physics and technologies
- Big data and AI
- Detectors, instrumentation & sample environments

The scope will be extended as appropriate during the study. The pre-study starts at Lund University. However, we see that the questions are relevant for

all Swedish Universities and believe that synergy effects could be reached by later following this template on a national scale.

The needs that we believe could be addressed by such a node and should be addressed in the pre-study include, but are not limited to:

- Provide a node for actions towards RIs
- Increase visibility of the issues, and capabilities of LU
- Enabling long-term strategies to address extensive lead times and projects
- A voice for the needs of the *developers* (internally, internationally and political)
- Technology & Competence development for the infrastructures connected to LU and the active scientists & staff
- Retention of long-term competence and keeping it connected to LU
- Meet international competition
- Mobilising the Swedish funding system
- Sharing of resources, including workshops and construction hubs
- Solutions for in-kind contributions
- Cross-disciplinary collaborations
- Recruitment of strategic competence
- Complement and relate to the functions and ideas in the proposed "teknikparksfunktion" at Science Village.

Action plan

The action plan is divided in the following Actions.

1. – Mapping

This Action will identify relevant research groups at LU and collect experiences. Expanding the network at LU.

2. - Analysis

This Action will analyse the needs and issues for the communities at LU. This starts at the LU researcher level, but also including the LU leadership and administration, Big Science facilities in Lund, other Swedish universities, the research councils and relevant ministries.

3. - Benchmarking

This Action will compare with national and international examples, e.g. The FREIA Laboratory and UU, DESY-Hamburg University-CFEL, The Cockroft and John Adams Institutes, the Rutherford Appleton Laboratory and Harwell Campus in the UK, and the corresponding areas in Grenoble and Barcelona.

4. – Collaboration frameworks

This Action will analyse of possible collaboration frameworks, internally, nationally and internationally. This covers legal, governance and operational structures.

5. – Recommendations

Finally in this Action we will formulate actions needed and how/if a collaboration/center/institute should be set-up, and define how the needs and problems are solved by the proposed plan in a report.

Timeplan and budget

- 2022.03.31	Actions 1-4	First iteration results
- 2022.06.30	Actions 1-4	Draft report
- 2022.10.31	Actions 5	Report finalised

Possible travel for task force members visiting Swedish Universities and a small selection of European nodes, and to organize workshops/meetings: 100 kSEK.

People

Researchers in BigScience@LU have formed a task force:

- Anders J Johansson
- (Electrical and Information Technology)
- Sverker Werin
- (Synchrotron radiation research and MAX IV)
- Hanno Perrey
- (Nuclear physics)
- David Silvermyr, Caterina Doglioni (limited time) (Particle Physics)
- Per Runeson
- (Computer Science) Carlos de Almeida Martins
- (Industrial Electrical Engineering and Automation, and the ESS)
- Tommy Nylander
 - (Physical Chemistry)

With the support of:

- Lennart Gisselsson (Coordinating)
- (Cooperation office and Big Science Sweden)
- Martin Stankovski (Advisory, LU)
- (Cooperation office),
- Anna Hall (Advisory BiSS) (Big Science Sweden)

Within this group Sverker Werin and Anders J Johansson will initially lead the project with the support of the taskforce members.

Summary

We suggest a financed pre-study starting fall 2021. This study should deliver a proposal for the construction of a node for collaboration, actions, and support among scientists (*developers*) contributing to the development of Research Infrastructures.

The scientific leaders of the project will be **Sverker Werin** and **Anders J Johansson** will with the support of the BigScience@LU taskforce members and with support by Lennart Gisselsson and Martin Stankovski at the Collaboration office and Anna Hall at Big Science Sweden.

The resources needed are (minor) possible travel expenses.

The result of the pre-study will be presented in a written report intended recipients: **Viktor Öwall** (Pro Vice-Chancellor for infrastructure),

Heiner Linke (Deputy Dean, Faculty of Engineering) and Sven Lidin (Dean, Faculty of Science)

There will be a checkpoint by 31 March 2022, with the preliminary results presented to the Vice-Chancellors Council (Rektors Ledningsråd)

On behalf of the BigScience@LU taskforce

Sul -Sverker Werin _

Anders J Johansson _____



Pre-study Workflow

final report

first analysis