# ESS Network, Copenhagen and Lund

*DRAFT*

This document outlines a proposal for network connections for ESS in Copenhagen and Lund, prepared jointly by SUNET, DeIC, and NORDUnet.

## Requirements

ESS has two main sites: the accelerator site near Lund, Sweden, and the Data Management & Software Centre, Copenhagen. The requirement is for

* Internet uplink, with emphasis on connectivity to research and education users.
* Inter-site link, engineered so that ESS may treat both sites as a single production network

Reliability is essential, in particular for the inter-site link. For this reason, dual, resilient connections at both sites are required.

ESS has outline a traffic projection for both inter-site link and internet connection. In both cases, the projection is that traffic will ramp up slowly starting from 2020, reaching 8-9 Gbps on both connections (i.e., an aggregate of 17 Gbps) by 2026.

The ESS network requirements document notes especially that

* “In the early years of ESS the data volumes and rates are lower (fewer instruments and lower accelerator power) and easily satisfied by 10 Gbit/s connections. The experience that will be gained in those early years of ESS operation will allow much better estimates of data volumes and data rates to be made”, and
* “the prudent course is to implement now solutions for the DMSC network connections and data storage that are consistent [the projection] but which are scalable and can be expanded in the 2023 –2025 era if early results indicate that this is necessary”, and
* “While network data rates are important what is also equally important to ESS, especially for the connection between ESS in Lund and DMSC in Copenhagen, is reliability and robustness. Since this connection is, in many respects, a piece of the ESS instrument “hardware” it must be available “all” of the time that the ESS instruments are operating”

The proposal below has been prepared with the above in mind.

## Assumptions

For the proposal, we have made a couple of assumptions

* The ideal internet uplink for ESS is a connection to an national research and education network (NREN), connecting ESS to the global R&E network infrastructure, as the majority of off-site users will be connected to a NREN network.
* A 10Gbps, resilient connection is today standard for (Nordic) NRENs. Both DeIC (Denmark) and SUNET (Sweden) can offer this for the ESS sites.
* The requirements for a resilient, 10Gbps inter-site link can be met with standard NREN products, delivering L2VPN connectivity with full resilient and 10Gbps capacity over a 100Gbps backbone.
* It is in the interest of ESS to use standard NREN services as much as possible, as this will keep cost down and ensure long-term stability.
* ESS is best served with a managed router and link solution, where NORDUnet takes responsibility for site routers for both uplink and inter-site link, and where routers are provided as part of the connectivity package. This ensures stability and long-term economy in case of upgrades.

Hence, we are proposing a solution based on 10Gbps uplinks and 10Gbps inter-site links delivered with L2VPN products already available on NORDUnet and the Nordic NRENs. We realise that this is different than the potential 100Gbps inter-site link discussed at the 1 November meeting. However, given the traffic projections, we do not see a cost-benefit justification for such a solution, both in terms of equipment cost and engineering complexity.

We point out that the network connectivity solution proposed, based on L2VPN and 10Gbps connectivity, has been adopted by other demanding applications. For example, the network for the European HPC collaboration PRACE is being deploying using this product.

Furthermore, as the ESS traffic ramp-up is several years into the future, it is our firm belief that, should the capacity requirements exceed the projections, upgrading will not be a problem. By 2023, 100Gbps connections will be a standard product for both SUNET and DeIC, as will a 100Gbps inter-site link based on L2VPN. This is a good reason for ESS to adopt the managed router solution. Should an upgrade to 100Gbps be required in the future, ESS will not have to upgrade routers to accommodate the new requirements.

## Design

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## Delivery

For simplicity, we propose three elements to the delivery, and hence three contractual relations:

* SUNET to deliver routers, IP uplink, inter-site link in Lund
* DeIC to deliver routers, IP uplink, inter-site link in Lund
* NORDUnet to deliver router management, inter-site link configuration, maintenance, monitoring

We provide an aggregate cost below, but in terms of contracts and invoicing, we propose for simplicity and in order to stay with standard products to have three relations.

## Cost

SUNET Connectivity:

DeIC Connectivity:

NORDUnet managed router and inter-site link: