

EISCAT_3D Support (E3DS) Project.

John White (for E3DS project) *NeIC*

Introduction

- NeIC EISCAT_3D Support Project
- EISCAT_3D e-infrastructure
- EISCAT_3D Conclusions



Nordic e-Infrastructure Collaboration (NeIC)

“The NeIC facilitates the development and operation of advanced IT tools and services in areas of importance to Nordic researchers.”

- **Pool Competencies**
 - Map skills, identify and prioritise needs.
- **Share Resources**
 - Launch pilot projects to establish ambition levels
- **Secure Long-Term Funding**
 - Map funding sources, adapt to unaligned funding periods
- **Strengthen Stakeholder Dialogue**
 - Map stakeholders and partnerships

Nordic e-Infrastructure Collaboration (NeIC)

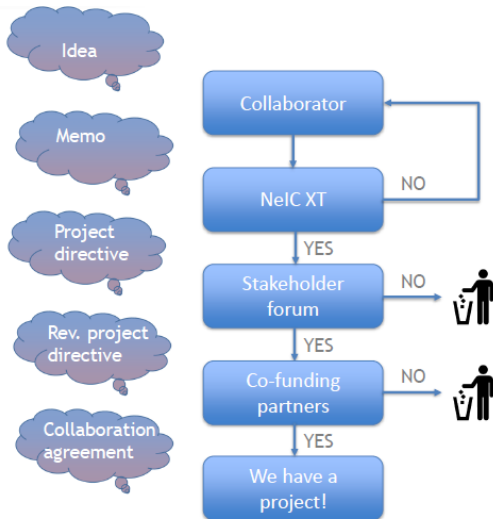
NeIC 'Owners'



MINISTRY OF EDUCATION,
SCIENCE AND CULTURE



Nordic e-Infrastructure Collaboration (NeIC)





Nordic e-Infrastructure Collaboration (NeIC)

- 2001: Nordic Data Grid Facility (NDGF) launched as common Nordic e-Science infrastructure.
- 2001: NorduGrid was launched as a NORDUnet project to build a Grid-based computing infrastructure in the Nordic countries: 1st Nordic IT infrastructure
- 2002: NDGF funded in 2002 to complement computing resources with Nordic distributed storage.
- 2003: NDGF commits to providing a regional computing centre for the CERN Worldwide LHC Computing Grid. After pilot phase, full operation starts in April 2006 (hosted by NORDUnet).
- 2012: NeIC formally established as a unit under NordForsk. Provides NDGF and its staff with more stable governmental structure. NordForsk provides legal advice, communication, secretary and admin services.
- <https://neic.no/nt1/>

NeIC EISCAT_3D Support Project (E3DS)

- Project started January 15th 2015.
 - Basis: Letters of Interest to NeIC from EISCAT (2012, 2014)
 - Decision to launch project by NeIC Board (2014)
- Resources committed to project: EISCAT and NeIC
Also, CSC, Tromsø and Umeå
- Steering group (representing partners that have committed resources):
 - Yasunobu Ogawa, EISCAT-Japan, (NIPR)
 - Craig Heinselman, EISCAT
 - Tomasz Malkiewicz, NeIC (CSC)

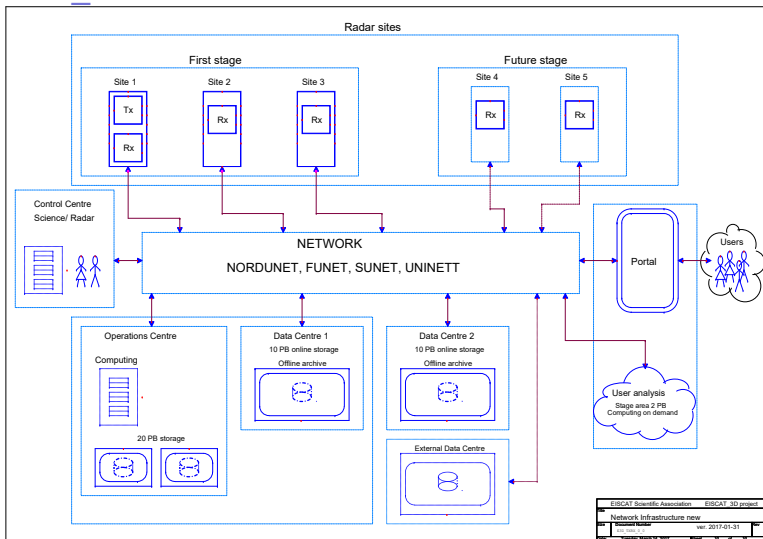
NeIC EISCAT_3D Support Project (E3DS)

- Project participants:
 - **Project manager (0.5 FTE):** John White, NeIC.
 - Ingemar Häggström, EISCAT, Kiruna
 - Anders Tjulin, EISCAT, Kiruna
 - Assar Westman, EISCAT, Kiruna
 - Carl-Fredrik Enell, EISCAT, Kiruna
 - Sathyaveer Prasad, EISCAT, Kiruna
 - Tor Johansen, University of Tromsø
 - Harri Hellgren, EISCAT, Kiruna
 - Ari Lukkarinen, CSC
 - Sari Lasanen, University of Oulu
 - Mattias Wadenstein, University of Umeå
 - Åke Sandgren, University of Umeå
 - Juha Vierinen, University of Tromsø
 - Ilkka Virtanen, University of Oulu
 - Ulf Tigerstedt, CSC

- Project public wiki page

https://wiki.neic.no/wiki/EISCAT_3D_Support

EISCAT_3D e-infrastructure Wide-Area Schematic



Site, Operations Centre and user computing

- **Site computing:**

- 2nd beam former: ≈ 22 TFLOPS.
- Beam forming performed in “software”.
- Process computer: ≈ 55 TFLOPS.
- Discussions so far: no need for specialized HW (FPGA,GPU etc).

- **Operations Centre computing:**

- Estimated at finally: ≤ 500 TFLOPS.
- 3-D operations: tightly coupled cluster.
- Discussions so far: no need for specialized HW (FPGA,GPU etc).

- **Data handling:**

- Disk buffer from remote sites: ≤ 20 PB.
- Two redundant data centres: 5 y of data online.
- Data (all levels) served to users for analysis.

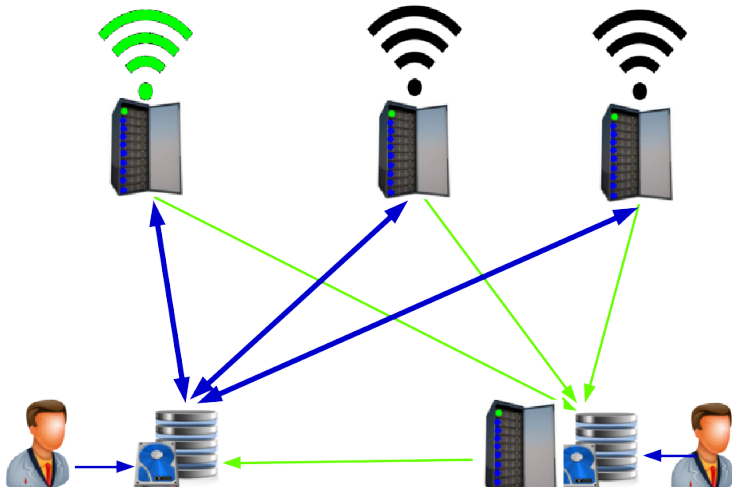
- **Network(s):**

- 100 Gb/s fibre connections assumed.

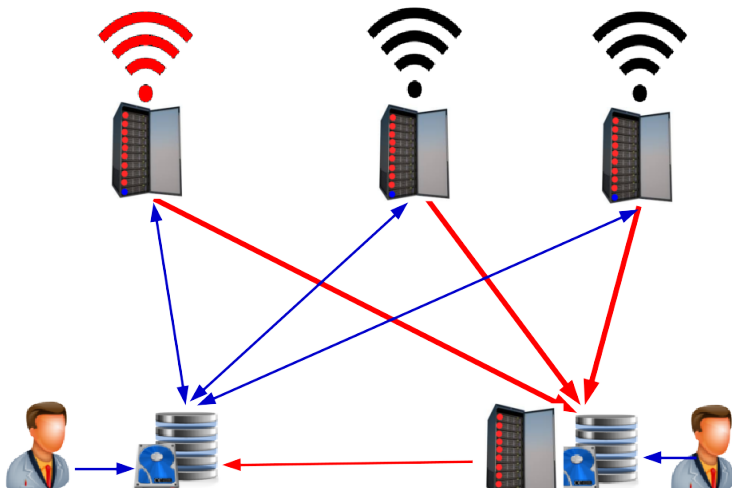
Integrated computing

- **Site computing:**
 - Virtualized cluster: ≈ 80 TFLOPS
 - Beam forming containers/VMs.
 - Process computing containers/VMs.
 - User analysis computing containers/VMs.
- **Operations Centre computing:**
 - **Virtualized cluster: ≤ 500 TFLOPS**
 - 3D operations containers/VMs.
 - User analysis computing containers/VMs.
- **User analysis computing:**
 - User analysis containers/VMs distributed through Operations Centre and sites.
 - Analysis computing profiles matched by container/VM.
 - **User analysis jobs interruptible by radar state.**
- **Underlying virtualized e-infrastructure run by national provider(s).**

e-infrastructure 3-D Operations: Low power



e-infrastructure 3-D Operations: High power



Future Directions

- **Operations Centre**

- Some location for “operations” needed at startup.
- The disk buffer (20 PB?) must be accommodated.
- Increase cluster for 3-D operations incrementally.

- **Data Centres**

- Data Centre locations required at EISCAT_3D startup. Data must not be lost.
- Data Centre locations important.

- **User Analysis**

- Use the EISCAT_3D e-infrastructure!

Future Directions

- **Data chain simulation.**
 - Simulation of the 2nd beam-former.
 - Output used to test data flow from/between sites.
 - Build a prototype of EISCAT_3D Operations Centre and Data Centres.
 - Serve simulated data to user analyses.
 - Discover and remove bottlenecks from the e-infrastructure.
 - Discover cost savings.
- Use existing e-infrastructure and expertise (NeIC) to test proposed e-infrastructure.
- Strengthen the links between the EISCAT_3D e-infrastructure sites.
- Similar philosophy to LHC data challenges.
- **EISCAT_3D e-infrastructure up and running when radar switched on.**

Thank you



Questions?

Written in \LaTeX