



UiO • Universitetet i Oslo

Local, national, and international computational resources for researchers



17 November 2011

USITs service for research support

- **WHO** are we?
- **WHAT** do we do?
- **HOW** does one get help and access to the resources?

- WHO



USIT Section for education and research support (SUF)

<https://wiki.uio.no/usit/suf/vd/hpc/index.php/VD>

USIT section for education and research support (SUF)

Goal: support the primary production of the University: research and education

Offers resources, solutions, tools, advice and support functions

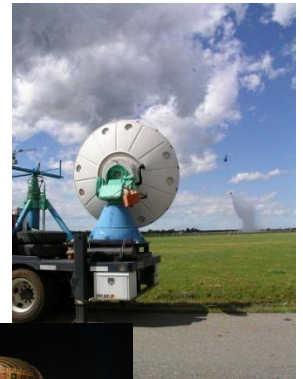
Coordinates USITs collective effort in the area

The section consist of about 40 people organized in 3 groups:

- ☐ Gruppe for digitale medier i læring (DML)
- ☐ Gruppe for vitenskapelig databehandling (VD)
- ☐ Gruppe for digital samlingsforvaltning (DS)

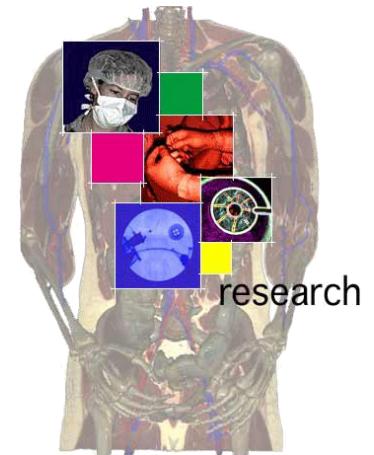
Contact: <http://www.usit.uio.no/suf/>

<https://wiki.uio.no/usit/suf/vd/hpc/index.php/VD>



Gruppe for vitenskapelig databehandling (VD)

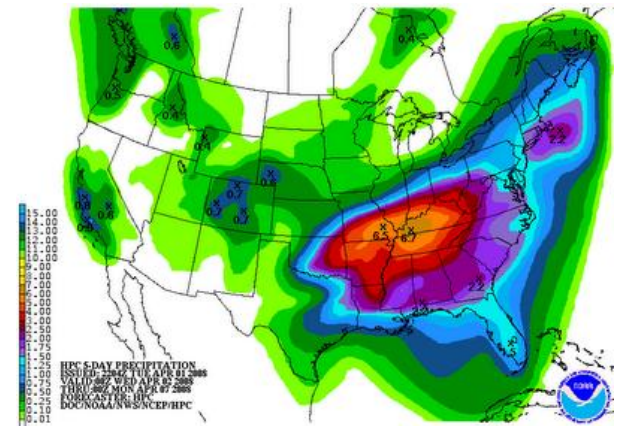
- IT-tools for scientific problems (programware)
- IT-infrastructure for scientific problems (hardware)
- Help and development for scientific problems (brainware)
- Storage services with graded security levels
- Promoting collaboration
- Course, counseling, documentation, user support
- National and international tasks, examples:
 - ☐ Norge: Notur, NorStore, NorGrid
 - ☐ Norden: NDGF (BioGrid, WLCG (CERN)), eNORIA)
 - ☐ EU: PRACE, EGI, network of excellence



- **WHAT** (services)

IT services for researchers

- User support
- Computation
- Storage
- Statistics
- Visualization
- Courses/training
- Services for qualitative research
- Advanced research support
- Sensitive research data



IT services for researchers

User support

Help with finding services

Help with getting access to services

Help with using services

Help with applications

Plain help

: `suf-vd@usit.uio.no`



<https://wiki.uio.no/usit/suf/vd/hpc/index.php/VD>

IT services for researchers : COMPUTATION

Computation

When the task at hand:

- is too demanding for your workstation (memory, IO, parallel)
- involves too many runs for one (or more) workstations
- involves applications or software too difficult to install on your workstation

Interface:

- log-in (command line interface)
- portals (for example the Biportal)
- grid, cloud



TITAN

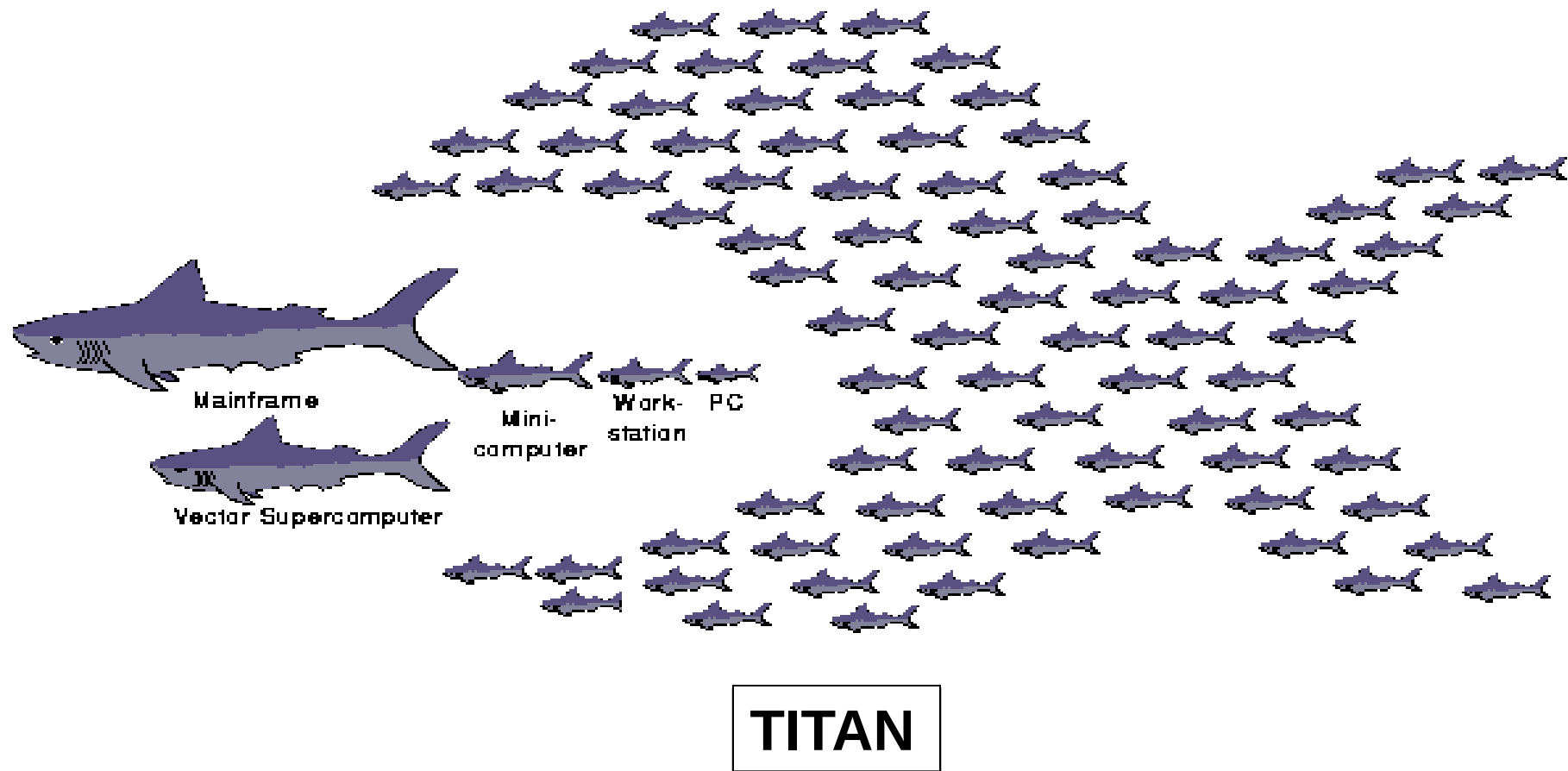


Titan – UiO's largest computational resource

<https://wiki.uio.no/usit/suf/vd/hpc/index.php/TITAN>

- 640 compute nodes, 5000 cores
 - Global infiniband interconnect (SUN Constellation 3456)
 - Heterogeneous (AMD, Intel, 4 – 32 cores, hugemem)
 - Minimum 2 GB RAM per core (more on hugemem nodes)
- 800 TB shared storage (> 1 PB raw)
 - GPFS parallel cluster file-system using RDMA
- Application nodes, login nodes, IO nodes, admin nodes
- Rocks OS (**Linux**), SLURM batch system
- Applications reflect multi-purpose/use:
 - Gaussian, VASP, WRF, structure, Mrbayes, Simwalk2, NPMLE, Phase, PAUPv4, FAMHAP, UNPHASEDm preassembly, BLAST, python, PHYML, Treefinder, OpenBUGS, hsest, paralign, cam + ccsm, Matlab, Disort, OsloCTM2, *many more*, ++ (in-house)
- Grid (WLCG Tier-1), portals (e.g. Bioportal, Galaxy (in development))

<https://wiki.uio.no/usit/suf/vd/hpc/index.php/VD>



Bioportal

2659 registered users, 700+ active

40+ applications (MrBayes, RaXML, BLAST, Paup, structure, R, BEAST og PhyML, ...)

Bio (life science), chemistry, statistics, odont?

Tailored 454 sequencing work-flow

Use nearly 3 mill CPU hrs. in 6 mo.

Pre-compiled binaries allow advanced optimizations, e.g. use of GPUs and MPI, *transparently to the users*



LOGIN

Norwegian university users



Other users



New user? Apply for access

STATISTICS

Members logged in: 10

Current submitted jobs: 194

Jobs submitted last week: 479

Total number of users: 2500

Number of jobs in:

2010: 19378

2009: 17515

APPLICATIONS INSTALLED

ADSCREENING OPENBUGS

AIR-APPENDER PAML

AIR-IDENTIFIER PAUP

UPCOMING EVENTS

Vilhelm Bjerknes' House Friday,
12th of November

Bioinformatics users forum

[more >](#)

October 11-15, 2010, University of
Oslo, Harald Schjelderups hus
(auditorium 1 and 2) and
Forskningsparken meeting room
11

High performance computing
workshop [more >](#)

October 14,15, 21 and 22, Kristine
Bonnevies hus, Blindern.

Bioportal and BIO4210 [more >](#)

11-20 April 2011, Hinxton,
Cambridge, UK

Computational Molecular

SYSTEM MESSAGES

[18.10.2010] Jobs crash due to
power outage [more >](#)

[28.06.2010] Short downtime
Tuesday 29. June [more >](#)

[07.05.2010] Downtime 7.5.2010
[more >](#)

[29.01.2010] Downtime February 4,
from 09:00 CET [more >](#)

[15.10.2009] Temporary problem
with BLAST jobs [more >](#)

NEWS

[21.10.2010] link to website for
BIO4210 workshop [more >](#)

[28.09.2010] Phylosity is renamed
as CLOTU now. [more >](#)

[25.06.2010] PhyML upgraded
[more >](#)

[07.06.2010] New application:
BEAST [more >](#)

[01.06.2010] RAXML upgraded
[more >](#)

New computational resource in 2012!

- Designed for throughput computing
- Life Science main focus
- Project total 70 MKr, joint RCN and UiO
- 36 MKr hardware
- UiO in-kind over 36% (25 MKr)
- Planned installation spring 2012
- Large Notur part, access governed by RFK
- Possibility for other partners (like today)
- Status May 2011

IT services for researchers : STORAGE

Research storage services

When:

Large amounts of data to be analyzed

NOT when:

Archiving (help! My M: disk is full)

USIT have other storage services for general needs

Storage hotel

[illegible]

<https://wiki.uio.no/usit/suf/vd/hpc/inaex.php/vd>

Titan storage

Storage is closely integrated with Titan

> 1 PB shared storage in two enterprise class SAN
SATA og FC disk

GPFS global parallel cluster file-system

Many (600+) nodes see the same file-system

3 separate GPFS clusters (NorStore, Xanadu II, Higgs)

I/O over IB and Ethernet (w. EtherChannel)

10 Gbps theoretical bandwidth between server and client

Scales very well: 16 I/O nodes (2x 8)

400 – 600 Mbyte/s at low loads

1 – 2 Gbyte/sec typical loads

> 4 Gbyte/sec + high loads

Backed up to redundant tape system

IT services for researchers: STORAGE

Available *research* storage services

NorStore (600 TB)

UiOStore (100 TB)

"TitanStore" (100 TB)

Sensitive research data

Project storage (we host it for you)



IT services for researchers : STORAGE (cont.)

Storage

hotel <http://www.uio.no/tjenester/it/hosting/lagring/lagringshotel/>

Local research storage services (aka Titan disk)

<http://www.uio.no/tjenester/it/forskning/lagring.html>

NorStore

<https://wiki.uio.no/usit/suf/vd/hpc/index.php/NorStore>

Institute/center/group with own
arrangements/agreements: vd-lagring@usit.uio.no

<https://wiki.uio.no/usit/suf/vd/hpc/index.php/VD>

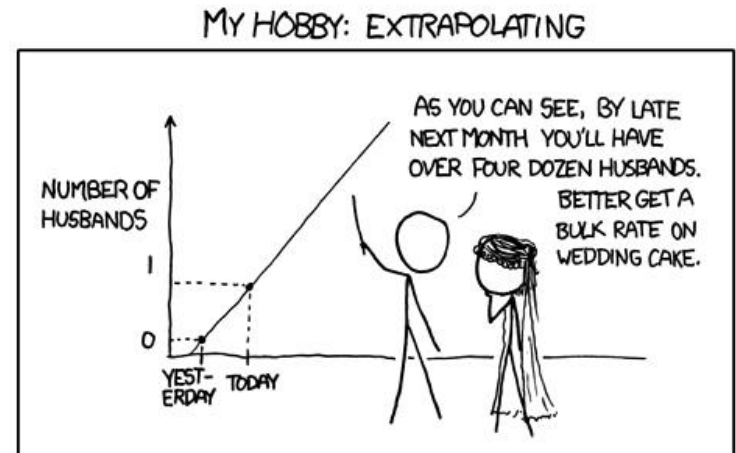
IT services for researchers : STATISTICS

Services in support of statistics

- Competence (IT + quantitative methods)
- Applications, tools and methods
- Data collection, advice and implementation
- Courses

Inquiries about statistics services:

statistikk@usit.uio.no



IT services for researchers : STATISTICS (cont.)

Statistics support

Software: SPSS, S-PLUS, STATA, R, MINITAB, SAS, MATLAB and STATISTICA

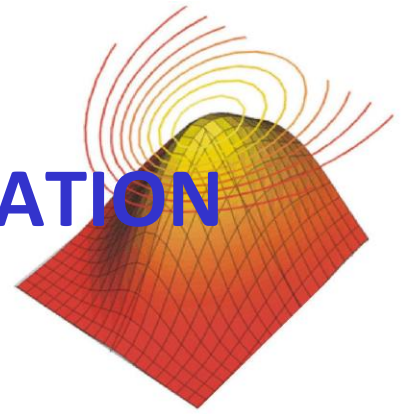
Statistics servers: Access through USITs “programvarekiosk” (Windows) or win.uio.no (for MacOSX og Linux). Servers with Windows operating system and popular statistics software.

<http://www.uio.no/tjenester/it/forskning/statistikk/hjelp/statistikkservere.html>

Inquiries about statistics services:

statistikk@usit.uio.no

<https://wiki.uio.no/usit/suf/vd/hpc/index.php/VD>



IT services for researchers : VISUALIZATION

Visualization support

Visualization of complex data-sets is relevant for several fields. Users with special or complex needs for visualization can contact RCS for information and help about resources and tools.

- Competence and advice

- Tools and applications, web design, 3D, GIS, multi-media and more

- Visualization for publication and dissemination

MAPS / GIS

In several fields data may be tied to mapped locations. UiO have a license agreement for the **ArcGis** suite from ESRI for handling mapped data. All UiO-researchers have access to the Arc-applications. Map collections from **Statens Kartverk** is available for use in research. For a complete overview over available applications please refer to **programvaredatabasen**.

IT services for researchers : QUALITATIVE METHODS

Qualitative methods focus for example on interview, observations, text, image, audio and video analysis. This methodology is used in many disciplines for example UV, SV and HF.

Available applications:

- Nvivo
- HyperResearch og HyperTranscribe

Inquiries om qualitative-services:

kvalitativ@usit.uio.no



IT services for researchers : QUALITATIVE METHODS

User support

Wiki pages related to use of available applications:

<https://wiki.uio.no/usit/suf/kvalitativ/index.php/Hovedside>

Courses

Courses for beginners and intermediate users of Nvivo and

HyperResearch are available several times every semester.

Course announcements are posted at UiO employees pages.

Inquiries about qualitative methods services:

kvalitativ@usit.uio.no



<https://wiki.uio.no/usit/suf/vd/hpc/index.php/VD>

IT services for researchers : ADVANCED USER SUPPORT

Advanced support in the research process

From time-to-time researchers need special support to solve their problems, examples:

- Optimizing code
- Parallelizing code
- Programming and compiling
- Design of research methods, formulating the research problem etc.



Members of the RCS can use time, from hours to months, together with researchers. In these cases the hours are not free, but it is possible, for example through Notur, to apply for hours for advanced user support.

Inquiries: suf-vd@usit.uio.no
<https://wiki.uio.no/usit/suf/vd/hpc/index.php/VD>

IT services for researchers : SENSITIVE DATA

Sensitive research data

What is sensitive data:

All information that can be related to a person. Examples:

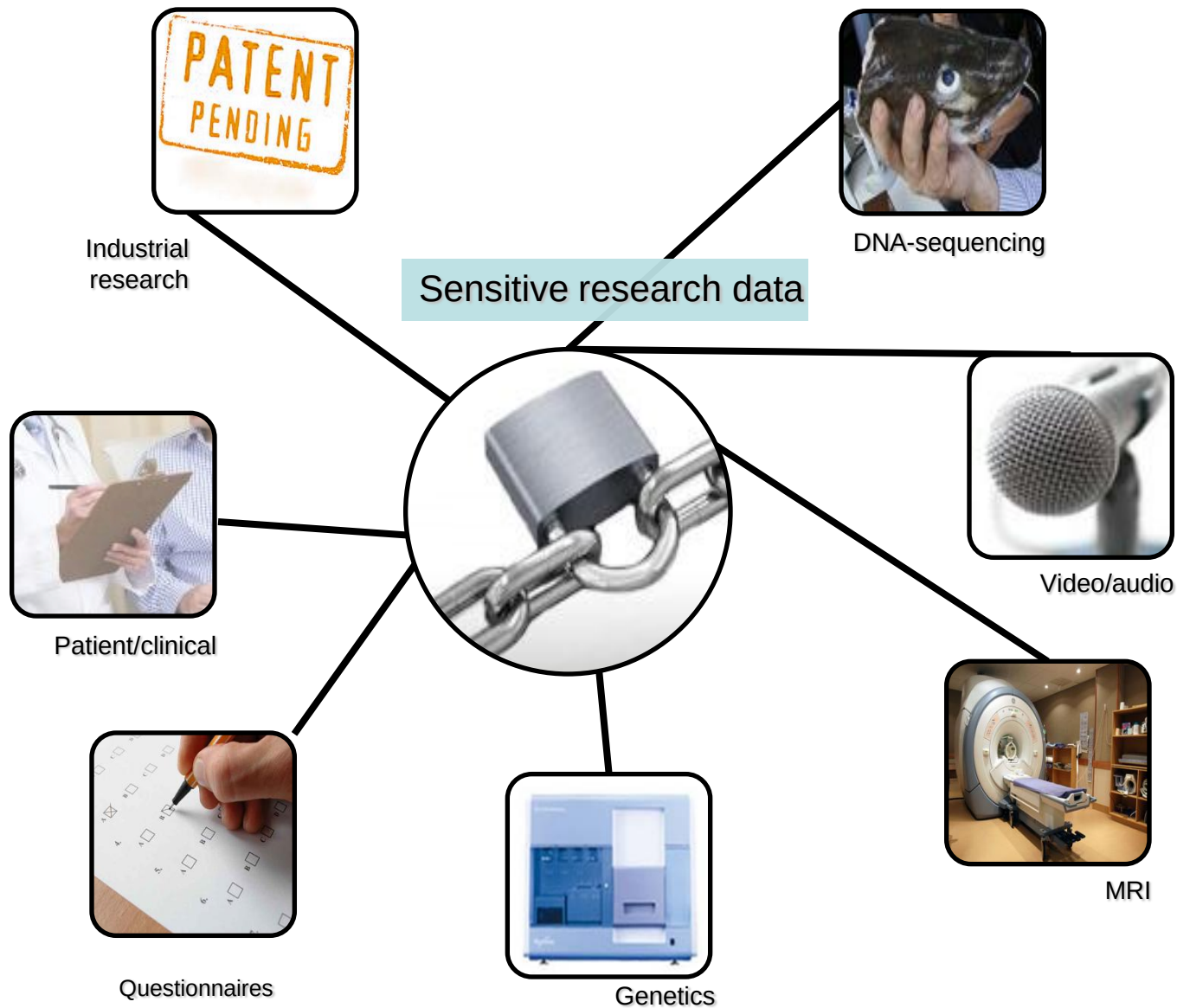
- Genome data
- video- and audio recordings of people
- Answers to surveys or interviews that identify the subject
- Medical information/records

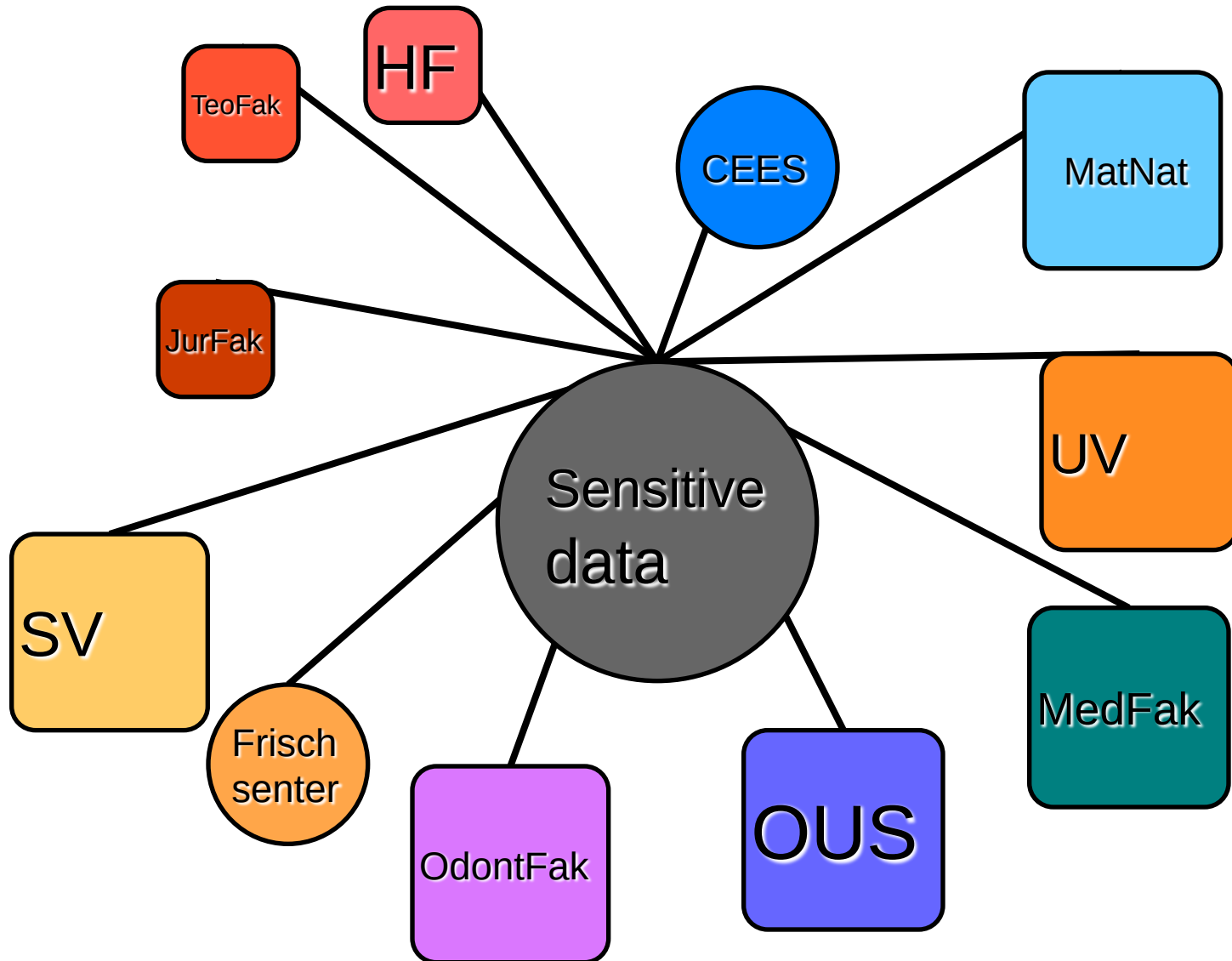
Contact us if you are in doubt!

Contact: usit-tsd@usit.uio.no

<https://wiki.uio.no/usit/suf/vd/hpc/index.php/>







Services for sensitive research data (TSD) today

- Storage of sensitive research data (> 1 TB)
Secure connection between user groups and stored data. Access via SSH (Linux) and/or network file-system.
- Secure research server. Windows/Linux server contained in a secure environment. Basically functions as a remote terminal server. Examples of use are data collection and simple analysis, applications.

Information: usit-td@usit.uio.no

The road ahead for services for sensitive research data

- The next steps in the work for establishing services for sensitive research data is
 - Expand and generalize the storage solution (the cornerstone of the service)
 - Computation/analysis on sensitive data
 - Remote/external access
 - Sharing of data securely
 - Collection of data
- National services, USIT together with Notur/Norstore

IT services for researchers : COURSES and TRAINING

Courses and workshops

At regular intervals the RCS conducts training/courses in

- Use of Titan
- Programming (MPI, OpenMPI, etc.)
- Statistics tools and applications
- Tools and applications for qualitative research
- Specific applications for communities (WRF etc.), any time upon request
- Bioportal
- Lynkurs



Contact: suf-vd@usit.uio.no

<https://wiki.uio.no/usit/suf/vd/hpc/index.php/VD>

- **HOW** (do I get help and access to resources)

The national programs – use them!

Notur



•



•



Access to services and resources

- Computational resources
 - Notur: calls twice a year (small requests may be granted outside of the main calls). We can help in the application process!
 - Local projects: if you belong to a research group that is a partner in Titan. Ask your project leader.
 - UiO: a small resource available to all UiO researchers (200 CPU cores, not recommended for large tasks)
- Storage resources
 - NorStore: calls twice a year. We can help in the application process!
 - UiOStore: Special agreements (contact hpc@usit.uio.no)
 - Titan: Special agreements (disk space rental, contact hpc@usit.uio.no)
 - Storage hotel: disk space rental (contact storage-core@usit.uio.no)

<https://wiki.uio.no/usit/suf/vd/hpc/index.php/VD>



Access to services and resources

- Advanced user support
 - Notur/NorStore: Calls twice a year. Requires a Notur/NorStore allocation. Get in contact with us first (suf-vd@usit.uio.no)
 - Direct to the RCS: We can work with any UiO research project based on standard internal UiO hourly wages (frikjøp)
 - Local IT?
- Courses and workshops
 - Contact us! (suf-vd@usit.uio.no), we are happy to come to you and give tailored courses
- Access to everything else
 - Contact: suf-vd@usit.uio.no

<https://wiki.uio.no/usit/suf/vd/hpc/index.php/VD>



International resources for HPC

*Scientific Computing Services Group, USIT
University of Oslo, Norway*

<https://wiki.uio.no/usit/suf/vd/hpc/index.php/VD>

International resources for HPC

UiO/USIT is part of different European Projects for sharing HPC resources:

- **PRACE**, Partnership for Advanced Computing in Europe
- **EGI**, European Grid Infrastructure
- **EUDAT**, European Data Infrastructure

PRACE

PRACE enable and support *high impact European scientific research* by providing:

- World class computing resources
- Data Managment
- Service and Support

World class computing resources

Tier-0 systems (huge amount of CPUs, for high scalability calculations (> 1000 cores)):

IBM Blue Gene/P “JUGENE” (GCS@Jülich, Germany)

Bull Bullx cluster “CURIE” (GENCI@CEA, France)

Cray XE6 “HERMIT” (GCS@HLRS, Germany)

SuperMUC (GCS@LRZ, Germany)

MareNostrum (BSC, Spain)

FERMI (CINECA, Italy)

Tier-1 systems

IBM Blue Gene/P, Cray XT and XE, IBM Power 6, range of large clusters including GPU resources made available in many European countries.

Earlier next year UiO will be a PRACE Tier-1 center

<https://wiki.uio.no/usit/suf/vd/hpc/index.php/VD>

Service and Support

PRACE provides support and expertise to scientists for:

- Enabling pre-existent codes to *efficiently run on petascale systems* (es. Implementing OpenMP/MPI scheme)
- Setting up environments and running computationally demanding jobs
- Designing strategies to store data.

How to access PRACE resources

(<http://www.prace-ri.eu/Calls-for-Proposals>)

Do you want to enable a code to run on Tier-0 resources (eg. by implementing MPI/OpenMP scheme)?

↳ *Apply for a Preparatory access*

You work on a large-scale project of high scientific quality and you want to run high scalability codes?

↳ *Apply for PRACE regular calls for Tier-0 resources*

You work on a high-quality scientific project and you want to run jobs?

↳ *Apply for a DECI regular calls for Tier-1 resources*

<https://wiki.uio.no/usit/suf/vd/hpc/index.php/VD>

EGI, European Grid Infrastructure

EGI enables access to computing resources for European researchers from all fields of science

Resources provided by EGI are suitable for data analysis and (many) single core calculations

It is mostly used by the High Energy Particle Physics

EGI resources at UiO / USIT

Tier-1, Tier-2 compute resources

- 552 dedicated cores, 20TB. To be increased w. the investment early '12
- free resource (idle cores), frequently able to run > 1000 grid jobs

Tier-1 storage pools (dCache)

- 240 TB as of April 2009, 24pools
- 4 storage elements
- 10 gigabit connectivity
- Due to be upgraded in 2011!

What can YOU contribute with?

- Describe and flag needs (current and future) for infrastructure and services
 - "What we have achieved because of X"
 - "What we could have achieved if we had Y"
- Bring these up for the UiO administration, RCN (NFR), policy makers etc.
- Join pool of competence and developers – we need people that can help users (your colleagues) locally

Thank you for your attention!

Questions?

