

Introduction to PDC's environment



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High Performance Computing

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PDC

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What to learn?

- How to login
- Where to store things
- How to run a program



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Don't!

- **NEVER write your PDC password on a computer which you are not able to touch!**
- Never disclose your PDC password. Keep it secret. Keep it safe.
- User account details? Log in information? Don't e-mail your password!
It's yours, all yours!
- Never let anyone else use your PDC account. No, not even me!



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Finding Information

- man, -help, -h, apropos ...
- <http://www.pdc.kth.se/>
- Flash News
- Mailinglists
- Course assistants
- support@pdc.kth.se



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Modules

- Modules handles PATH, MANPATH ...
- module avail
- module add modulename
- module show modulename
- module list



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Common PDC modules are: i-compilers, mpi, afsws, heimdal and easy. Use the Summer School module **summer/10**.

Kerberos



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Now this Cerberus had three heads of dogs, the tail of a dragon, and on his back the heads of all sorts of snakes.

- Kerberos — system for **authenticating users and services on a network**.
- **Kerberos server**, trusted by users and services.
- A **Kerberos principal** (`username@NADA.KTH.SE`) is a user's or service's username for a certain **Kerberos realm** (`NADA.KTH.SE`).

Getting your Kerberos ticket

- `kinit` — proves your identity
- `klist` — list your Kerberos tickets
- `kdestroy` — destroy your Kerberos ticket file
- `kpasswd` — change your Kerberos password
- `module add heimdal`

```
kinit -f -l 7d username@NADA.KTH.SE
```

```
klist -Tf
```

```
Credentials cache : FILE:/tmp/krb5cc_500
```

```
Principal: username@NADA.KTH.SE
```

Issued	Expires	Flags	Principal
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Mar 25 09:45	Mar 25 19:45	FI	krbtgt/NADA.KTH.SE@NADA.KTH.SE
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Mar 25 09:45	Mar 25 19:45		afs/pdc.kth.se@NADA.KTH.SE
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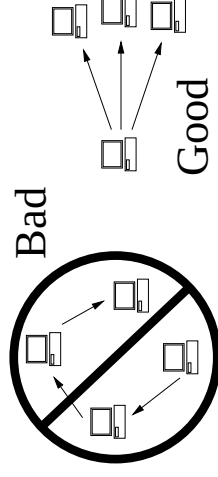
Important!

REMEMBER! You are **NOT** allowed to write your password on any computer that you are remotely connected to!!!. If you expose your password you endanger not only your own work, you are putting all other cluster users at risk.

- Once you have your **local Kerberos ticket** you **never** need to type your password again!
- Get **forwardable** Kerberos tickets (pass the **-f** flag to kinit).
- **Kerberos enabled software** knows to forward/use local Kerberos tickets for remote authentication.
- **Forward your forwardable tickets when opening a remote connection.**



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Login using Kerberos tickets

- Make sure you have **forwardable** Kerberos tickets
- **Forward** your forwardable tickets for remote login and secure X-windows redirect:
 - `ssh -Y -l username summer-10.pdc.kth.se`
 - The ssh command has to use **GSSAPI key exchange**.
 - Test your ssh using
`ssh -vv -Y -o GSSAPIKeyExchange=yes -o \`
`GSSAPIAuthentication=yes -l elimo summer-10.pdc.kth.se`



Storage in AFS

- **AFS** is a global, distributed file system.
- Any computer with an **AFS client** installed can access files in AFS.
- **Kerberos enabled software implementations of AFS** (Arla, OpenAFS) provide secure authentication to your network storage.
- AFS data is stored on a number of **AFS server machines**
- **Client machines** request file data from servers when necessary and cache them locally.



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Your home directory

- Your **home directory** is located in **AFS**.
- When you login you arrive in your AFS home directory, `~`.
- The path to your PDC AFS home directory is `/afs/pdc.kth.se/home/u/user` where username is your username and u is the first letter in your username.
- The storage space in `~` is 500 MB (mega byte). Type `fs ls ~` to verify!
- Some pre-existing **files and folders to keep**:
.bashrc **.forward** **Public** **Private** ...
- **Oldfiles** contain `~`, as it was yesterday, i.e. a **backup**.



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AFS tokens

- When you have a valid **Kerberos ticket** it can be used to give you **AFS tokens** for access to your files in AFS.
- Usually you get AFS tokens automatically when receiving your Kerberos ticket with `kinit`.
- If not, `afslog` gives you the AFS tokens using your Kerberos ticket.
- `unlog` destroys your AFS tokens (compare `kdestroy` for Kerberos)
- `tokens` shows your current AFS tokens and when they expire.
- Kerberos `kinit`, `kdestroy` includes commands `afslog` and `unlog`
- `klist -Tf` lists your **AFS tokens** and **Kerberos tickets**
- module `add afs`



AFS and directories

In AFS access rights are set on **directory level** and not for single files.

- fs handles directory **access management**
- List and set persons (usernames) access to directories in AFS:
fs listacl
fs setacl
fs help commandname
- pts manages groups of persons (usernames) in **access control lists** (ACLs)

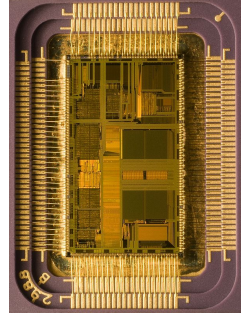
```
pts member username
pts creategroup groupname
pts adduser username groupname
pts examine groupname
pts help adduser
```



What's a computer cluster?



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CPU/core



Node



Rack



Cluster

Where to run your programs

- Login nodes — **don't run jobs here!**
- Interactive nodes — for test runs, shared among users
- Dedicated nodes (batch nodes) — for running final programs



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Run a serial program on an interactive node

- Login on the login node **summer-10.pdc.kth.se**
- Find which nodes are interactive ones:
module add easy
spusage | grep interactive
- Log out from the login node:
kdestroy
exit
- **Login from your local computer** to an interactive node
- Setup a proper environment:
module add summer/10
- Compile your program:
ifort -FR -o example1 -O2 example1.f
- Run the program:
./example1



Run a serial program on a dedicated node

- Login on the login node **summer-10.pdc.kth.se**
- Setup your environment:
module add summer/10
- Compile your program:
ifort -FR -o example1 -O2 example1.f
- Run the program on a dedicated node:
esubmit -n1 -t5 ./example1
- Watch the progress of your job:
spq -u \$USER
- You will **receive two e-mails** — one when your job starts and later another containing the output of your program.



When does my job start?

- Many users continuously submit jobs to the cluster
- Each job needs a certain **time** and a number of **nodes** to run
- At PDC the **queuing system (scheduler)** EASY keeps track of the submitted jobs and when and where each job can run on the cluster
- Every user belongs to at least one **time allocation** on a cluster. You belong to the time allocation (CAC) **summer-2010**
- A CAC states **how many node hours per month you have on a specific cluster**.



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Time Allocations

- Check which time allocation, **CAC**, you belong to:
cac members username
cac examine summer-2010
cac help
- Get current status of a time allocation:
spjobsummary -h
spjobsummary -c summer-2010
spjobsummary -u username -f 201008 -w
spsummary -h
spusage -h
spfree -h
- If your time allocation has run out of time for the month, your jobs are automatically assigned to a virtual CAC that runs only when no other jobs can run called free.username



Submitting jobs with EASY

- Jobs should be submitted from the login node using `esubmit`
- Please look at `esubmit -h -v`
- `spat tach` is intended for use with `mpi run` and also **runs on the submit node**
- Submitting a MPI program (in a script) on four nodes for 30 minutes in the time allocation summer-2010:
`esubmit -n 4 -t 30 -c summer-2010 ./myscript.sh`
- Redirecting STDOUT for your program to the file `job.out`:
`esubmit -n 4 -t 30 ./myscript.sh "> job.out"`



Thank you for listening!



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