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(Using) **HPC** (at NTNU)

Invited talk for AI masterclass

Hello, world

- I am Jan Christian from the HPC group at the IT dept.

  (and part-timer at IDI)

- We do
  - Procurement and maintenance of HPC infrastructure

    (for NTNU, and nationally)
  - Support for researchers with computational problems
  - HPC research

    ...

November 1986:

Cake X/MP

Bjørnar Pettersen
(Marin teknikk)

Arve Dispen

Cray X/MP

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Successors

Y-MP	T3E	Embla	Njord

4

64

512
(Last Shared Memory Machine)

16640/16
(Total)   (Node)

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Successors II

Vilje

Betzy

22464/16

172032/128

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Shared, distributed, who cares?

60.000.000 NOK alternatives from 2012:

UltraViolet 2000
4096

Altix ICE X 4800
22464/16

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List of merits

- Initial design of GSM
- Structural analysis of oil rig designs
- Magnetohydrodynamics of the solar chromosphere
- Discovery of metallic superfluid state of Hydrogen
- Many years of operational weather forecasting

  ...et cetera...

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www.ntnu.edu

Who are the main users?

- Climate simulations
- Naval architecture
- Materials
- Chemistry
- Nano

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Where are the GPUs?

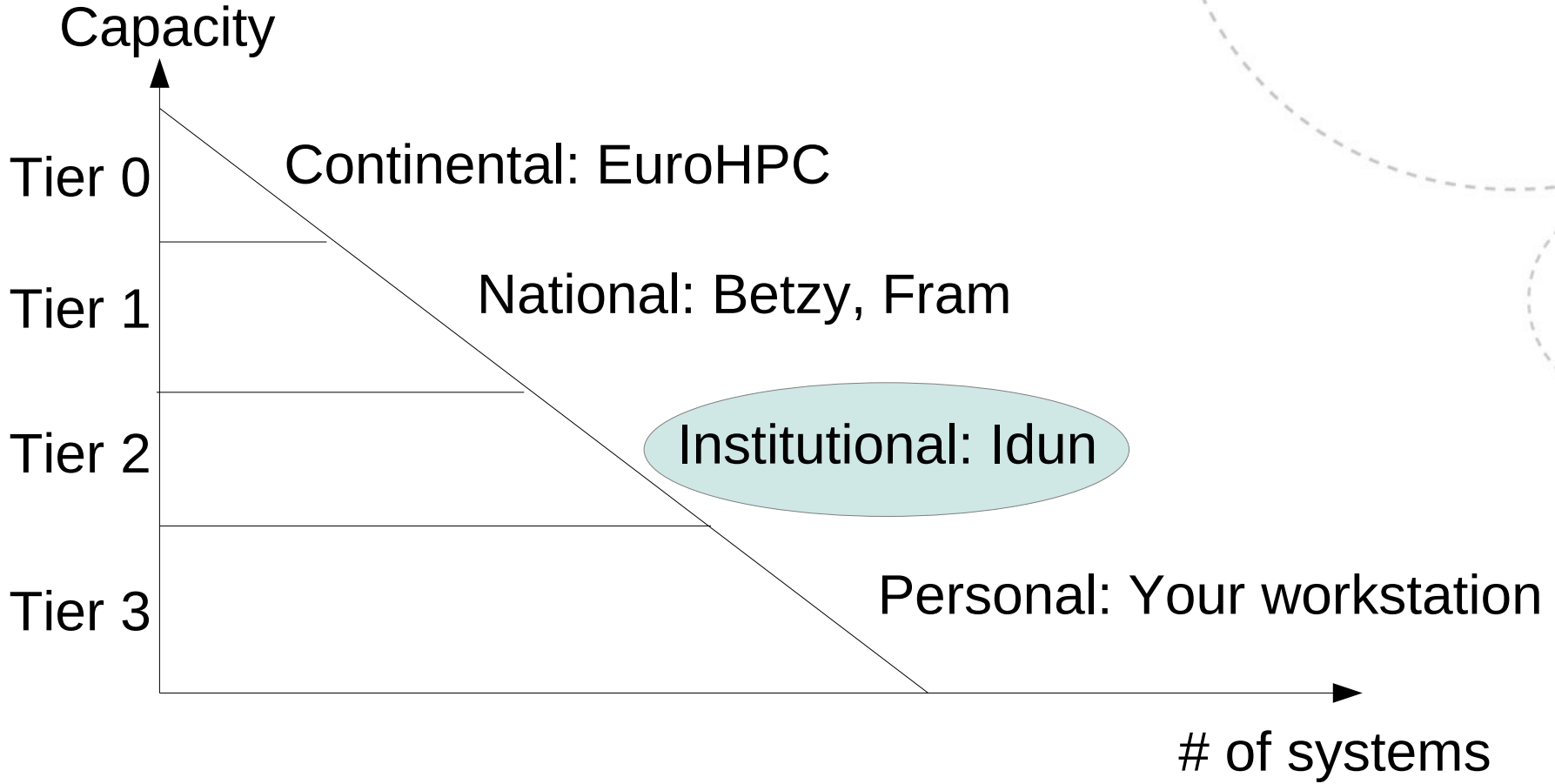Switzerland   USA   Italy

- We can't justify machines like these quite yet
  - Many of the classical applications can't utilize them
- They will be here in 5-10 years, though
  - It's a work in progress
- Where will our programs be?

The chicken and the egg

- If we buy a gajillion-GPU system tomorrow, it will idle while everyone ports their programs

- If we don't provide any GPU system, nobody can port their programs before the gajillion-GPU one becomes inevitable

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The European HPC pyramid

Capacity

Tier 0 — Continental: EuroHPC

Tier 1 — National: Betzy, Fram

Tier 2 — Institutional: Idun

Tier 3 — Personal: Your workstation

# of systems

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Meet Idun:

- Acquired by institutes at NTNU

- Research vehicle

- (Comparatively) small, and hence,
  - Easy to access
  - Flexibly managed
  - Heterogeneous node classes
  - Wonderful sandbox to start from

- We're hoping for novel applications (like yours) to emerge from here

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How to gain access

- Get your supervisor/professor to send an e-mail to help@hpc.ntnu.no, stating that they want you to be able to use it.
  - Remember user name, and that it's about Idun
- Wait for confirmation
  - Shouldn't take much more than a business day
- Log in with ssh
  - ...and Bob's your uncle.

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What's at your disposal?

- https://www.hpc.ntnu.no/idun/hardware/
- The majority of the GPUs are procured by IDI
- You can use the rest of the hardware as well
  - That's part of the cluster's purpose

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Structural view

Interact with these
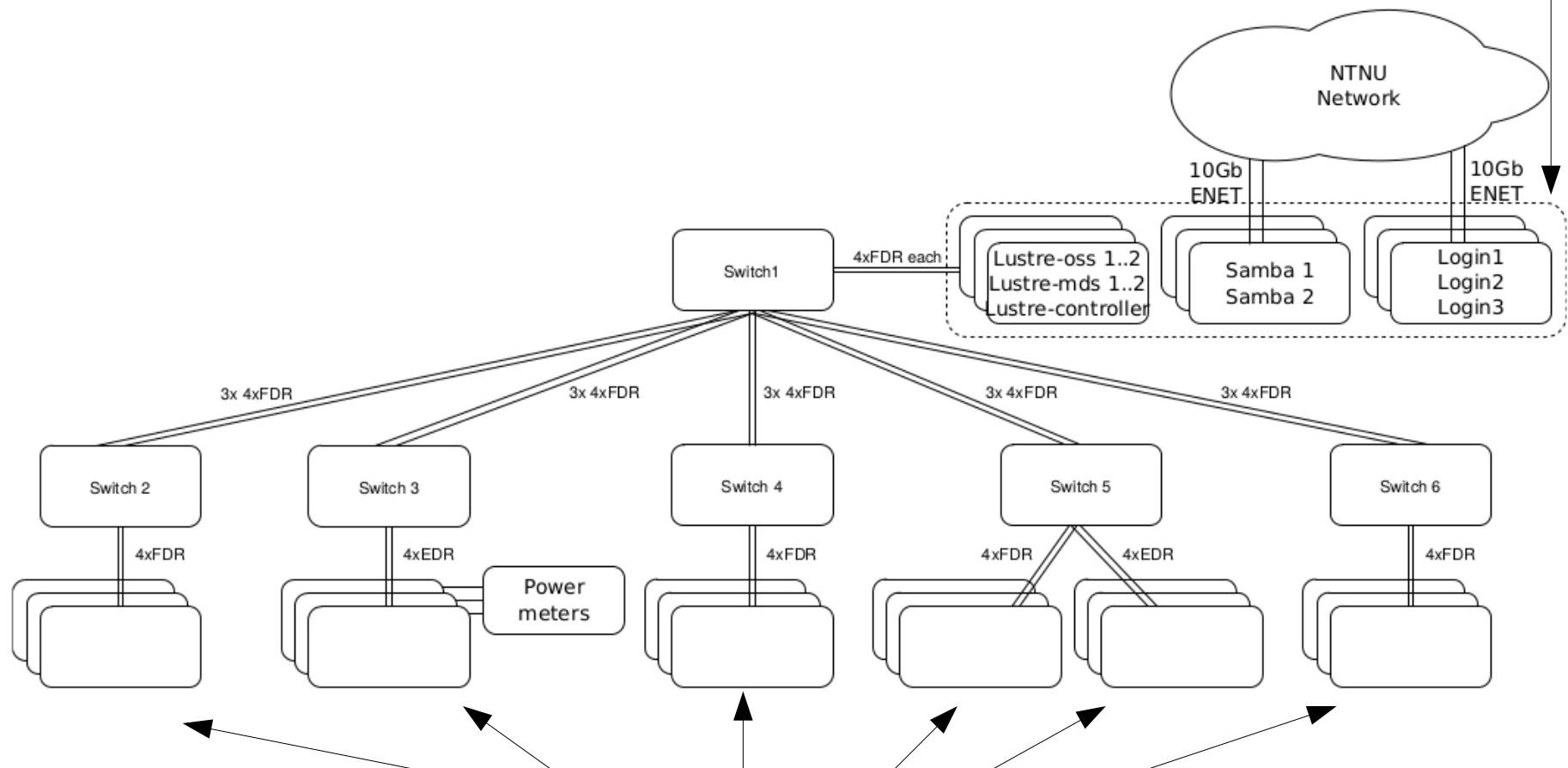
Work runs here

How to use it

(Philosophically)

- ## The machine is a shared resource
  - If it's full, your work has to wait in line
  - You submit pre-written scripts to a batch system, so that you don't have to sit there and wait along with it
  - Output can be found in your home directory when the job has run
- ## Start early
  - If you can't get a job through sideways, write to help@hpc.ntnu.no, we try our best to make everyone happy
  - Users who seem to monopolize it can usually be asked to tone things down a little, we never yet had to force anyone
  - Try not to jump to conclusions

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How to use it
(Practically)

- ## Write a batch script like this one

```
#! /bin/bash
#SBATCH –-job-name="MyJob"
#SBATCH -—time=00:10:00
#SBATCH --partition=GPUQ
#SBATCH --account=share-ie-idi
#SBATCH --nodes=1
#SBATCH --ntasks-per-node=1
#SBATCH --gres=gpu:1

cd ${SLURM_SUBMIT_DIR}
module load fosscuda/2019b
mpirun hostname
mpirun ./my_cuda_program
```

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How to use it

(Practically)

- Submit it like this

  `sbatch my_scriptfile.slurm`

  (and obtain a ticket number that identifies your job)

- See that it's there

  `squeue`

  `squeue -u <username>`

- Delete it if you're unhappy with it

  `scancel <job#>`

- ...or wait for it to finish.

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SLURM commands

- sbatch : submit job script
- squeue : inspect the queue
- sinfo : view information about nodes and partitions
- scontrol : view job specifications
- …
- Documentation at
  https://www.hpc.ntnu.no/idun

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Practical tips

- Be (as) prepared (as you can) to configure and compile your tools in your home directory
  - We do global installations on request, but complicated dependency chains can take a lot of time
  - Binary packages aren't 100% trustworthy on these systems
- Overestimate time limits sensibly
  - Your job won't be scheduled until the scheduler can guarantee a sufficient window
- **<u>Don't hesitate to get in touch</u>**
  - It's partly a computer, and partly a user community
  - We can't run it well without some dialogue with the users

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Thank you for your time!

- Can I answer any questions?

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