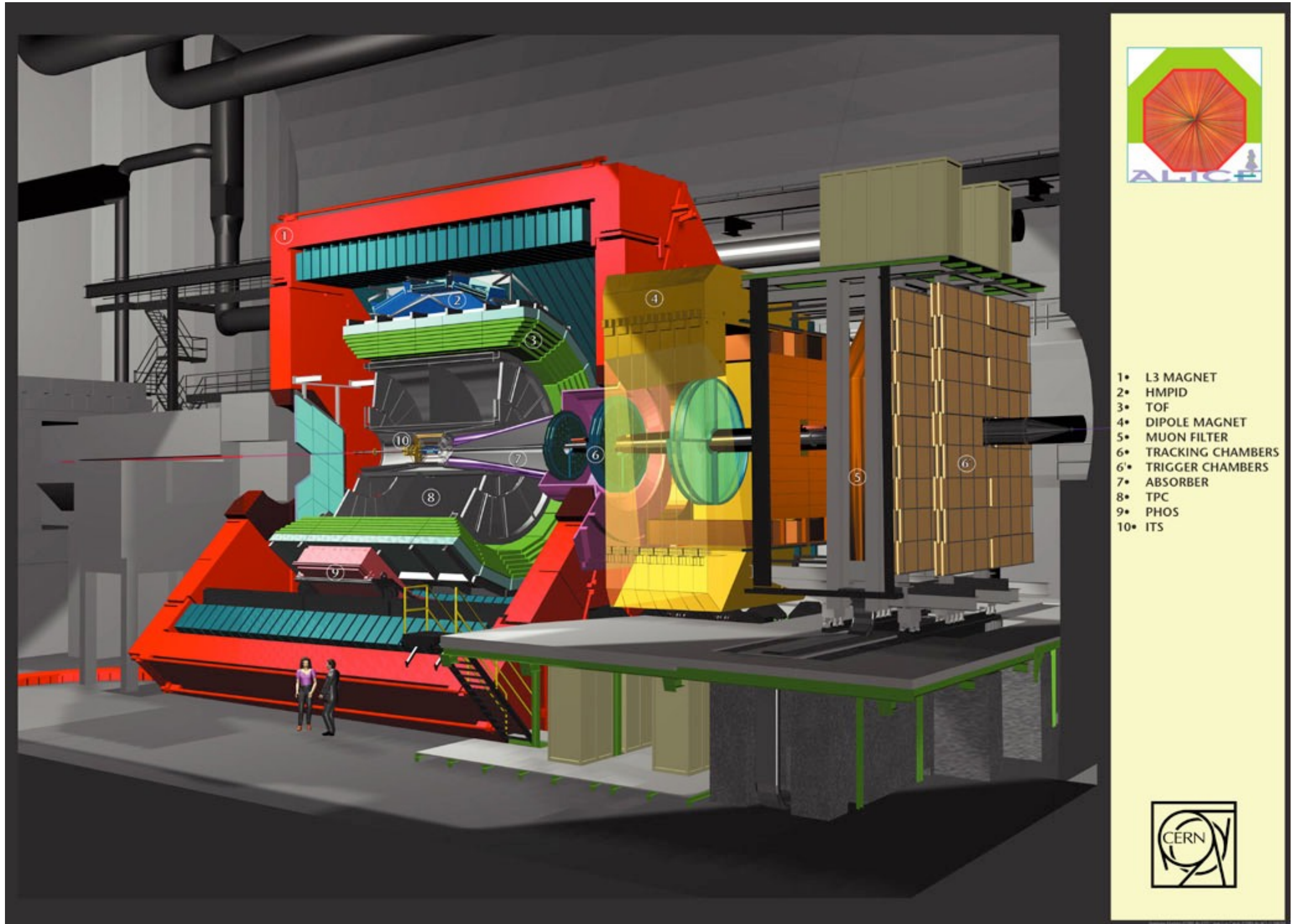


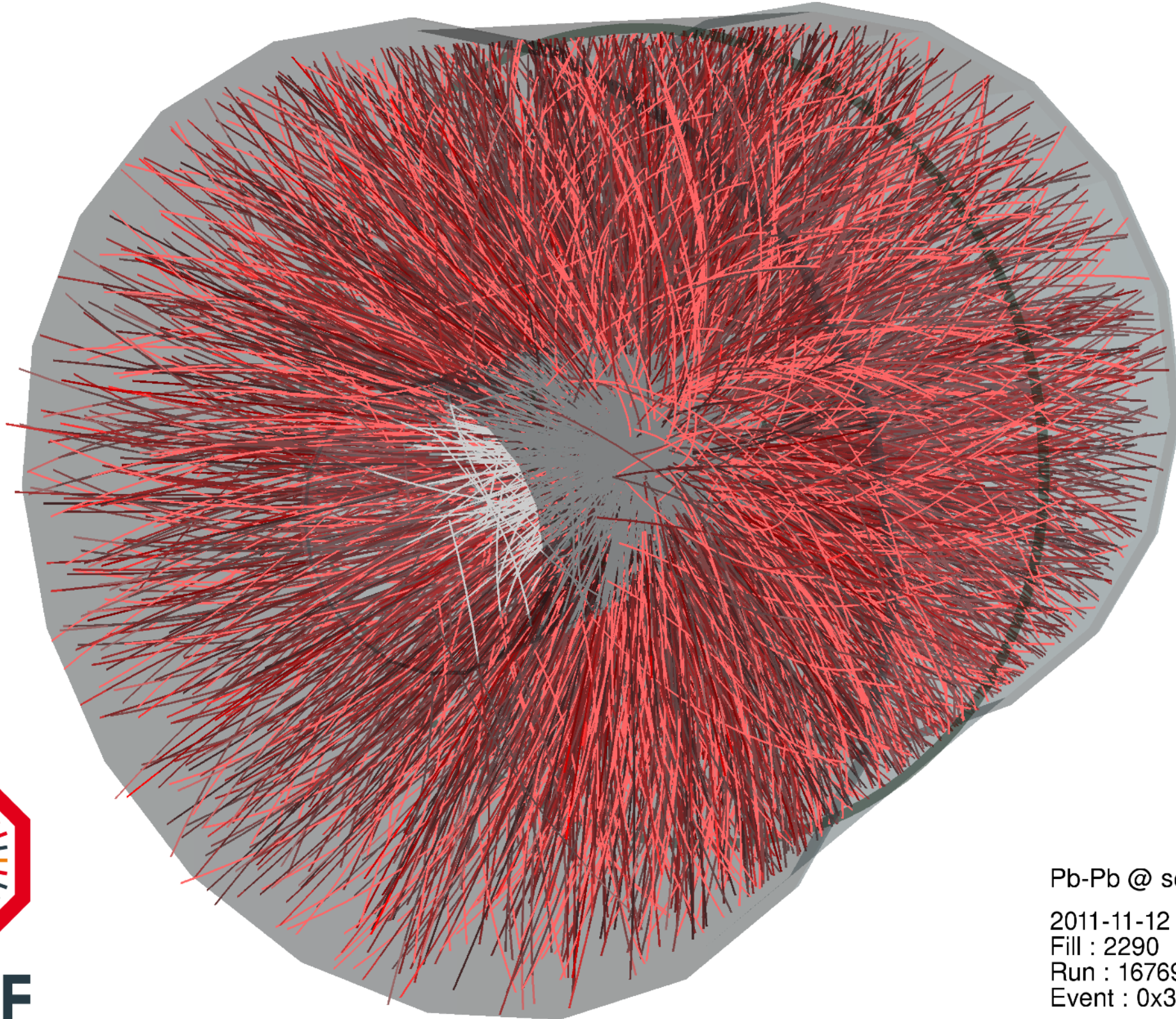
ALICE Computing in Norway

Boris Wagner

ALICE



Heavy Ion Event



ALICE

A JOURNEY OF DISCOVERY

Pb-Pb @ $\sqrt{s} = 2.76$ ATeV

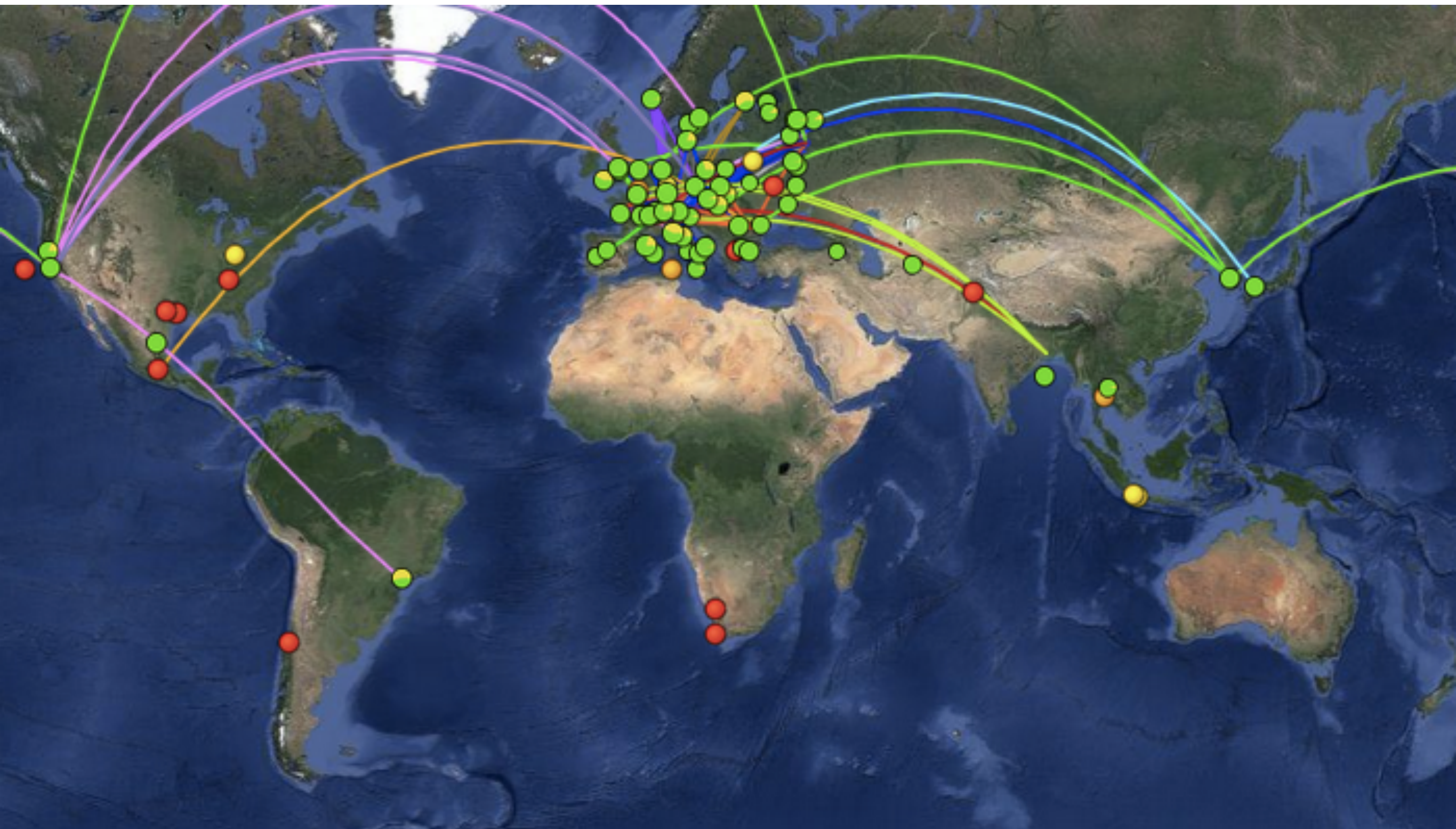
2011-11-12 06:51:12

Fill : 2290

Run : 167693

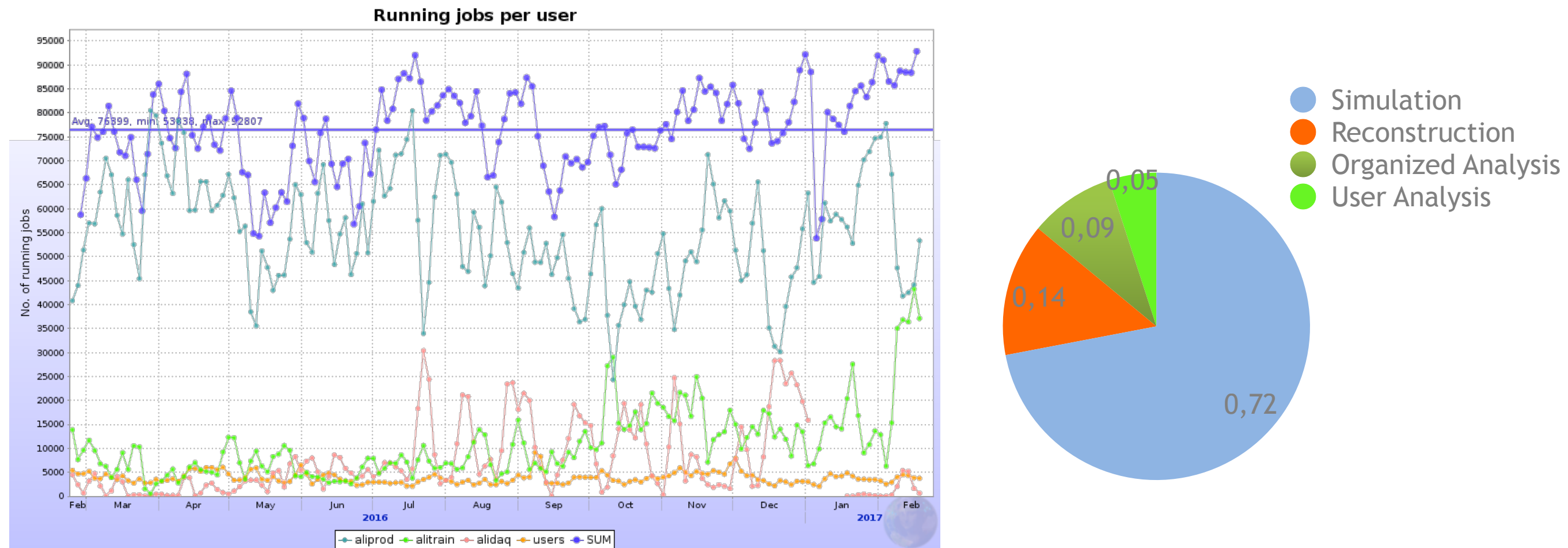
Event : 0x3d94315a

ALICE Grid



Running up to 100000 jobs concurrently

Grid usage



- High grid usage, good utilization of opportunistic resources
 - Average 76K parallel jobs, record 112K jobs
 - ALICE HLT cluster provides 4K jobs (5% of total)

P. Buncic

Norwegian ALICE Tier-1

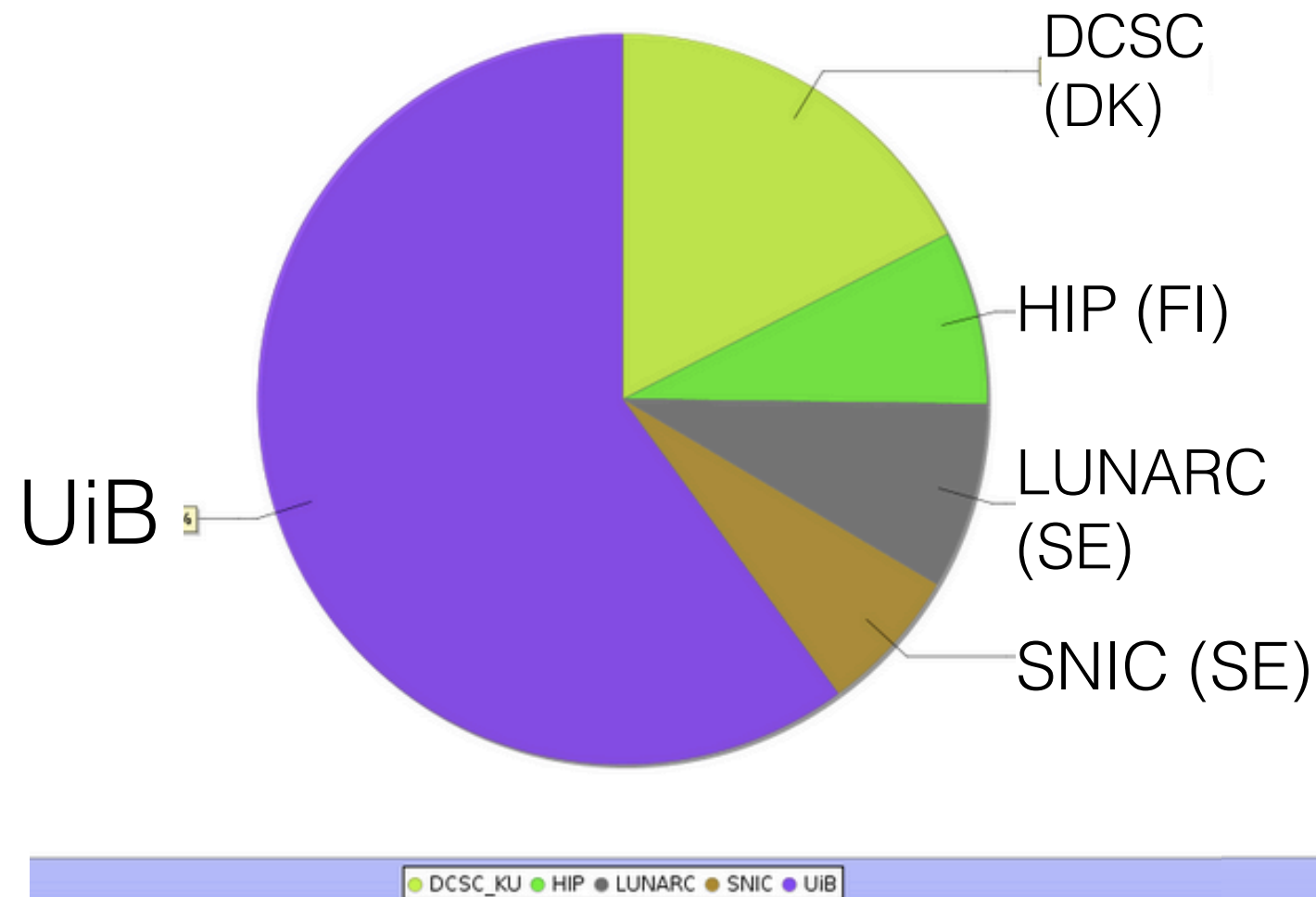
- The ALICE Tier-1 is part of the IT department of the University of Bergen (UiB).
- Resources provided:
CPU: 800 (HT)cores ~6500 HEPSPEC06 (including old machines)
Disk: 1.05 PB
Tape: 200 TB
- The storage resources are provided with the dCache middleware.
- Grid jobs come directly from CERN through the ALICE Grid middleware called AliEn.



Nordic ALICE Tier-1 Resources

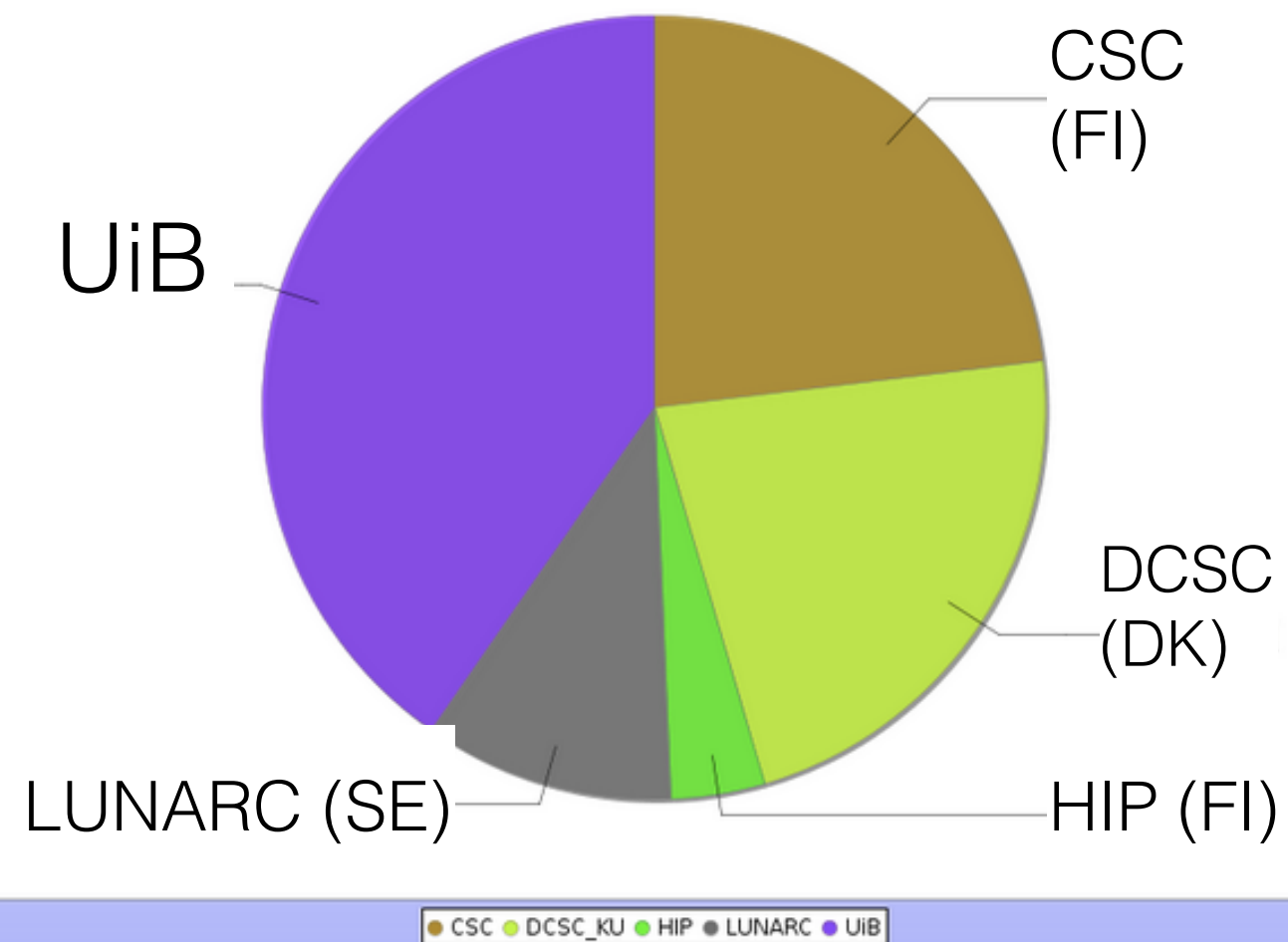
Norway should provide ~50% of the Nordic ALICE Tier-1 part.

Total wall time kSI2K hours for ALICE jobs



2016

Total CPU time for ALICE jobs [hours]



2015



Hardware



Hardware

Tape pool machines

2 x Dell R720XD

2 x Xeon 2.4 GHz

32 GB Ram

24 x 1.2TB

1 x Dell R720XD

2 x Xeon 2.4 GHz

32 GB Ram

2 x 400 GB SSD

2 x 146 GB 15k

1 x FibreChannel 8G

Tier-1

29 x Dell R720XD

2 x Xeon 2.4 GHz

32 GB Ram

12 x 4TB

+4 x for Lustre file system

Interconnect is 10Gbit Ethernet

Dell Poweredge C6220
(+6 x R720)

22 x

2 x 8 core Xeon E5 2.6 GHz

128 GB Ram

4 x 500GB

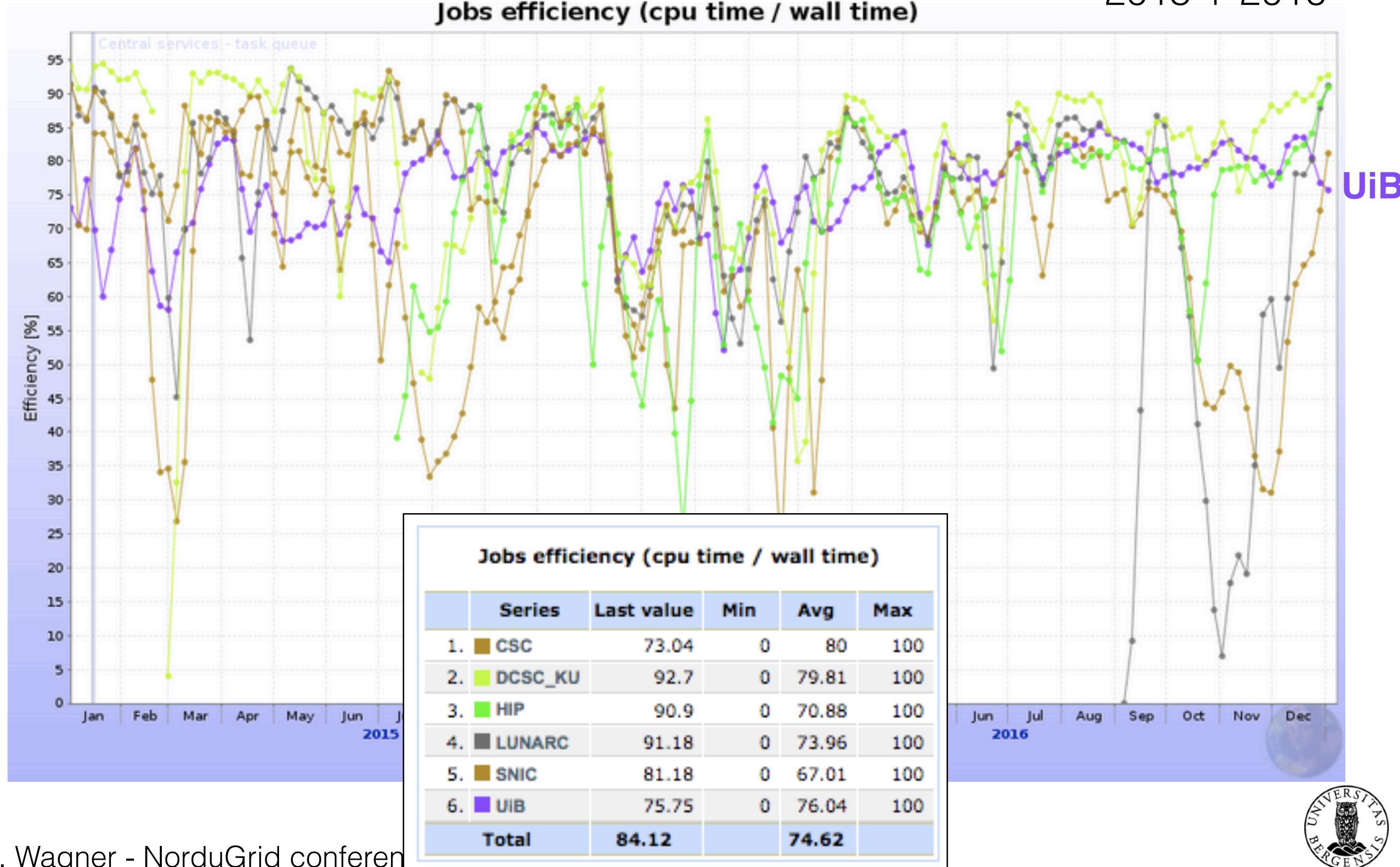
Network

- At the moment 10Gbit/s dedicated link, provided on a best effort basis
- Network between Norwegian universities will be upgraded to 100Gbit/s
- ALICE Tier-1 will switch to VPN/VLAN solution to Oslo with 10Gbit/s guaranteed QoS using the same link, meaning better support
- Upgrade to 20Gbit/s is needed in the near future



Job efficiency

2015 + 2016



Improvements for ALICE Tier-1

- 4GB per core helps to deal with memory spikes
- Follow the NDGF recommendation for dCache storage hardware
- Only provide few services:
AliEn vobox, dCache pools and squids for CVMFS

Percent of delivered HEPSPEC06 pledge (2015) averaged over 90 day window



Cern Pledges

- Pledge 2013
- 4700 HEPSPEC06
In 2015: 6500 HEPSPEC
- 1 PB disk
- 200 TB tape

- Pledge 2017
- 12000 HEPSPEC06
- 1.16 PB disk
- 140 TB tape

Cern Pledges

Resource requirements more than doubled

- Pledge 2013
- 4700 HEPSPEC06
In 2015: 6500 HEPSPEC
- 1 PB disk
- 200 TB tape

- Pledge 2017
- 12000 HEPSPEC06
- 1.16 PB disk
- 140 TB tape

Cern Pledges

Resource requirements more than doubled

**National infrastructure call in 2016
Result expected in summer 2017**

- Pledge 2015

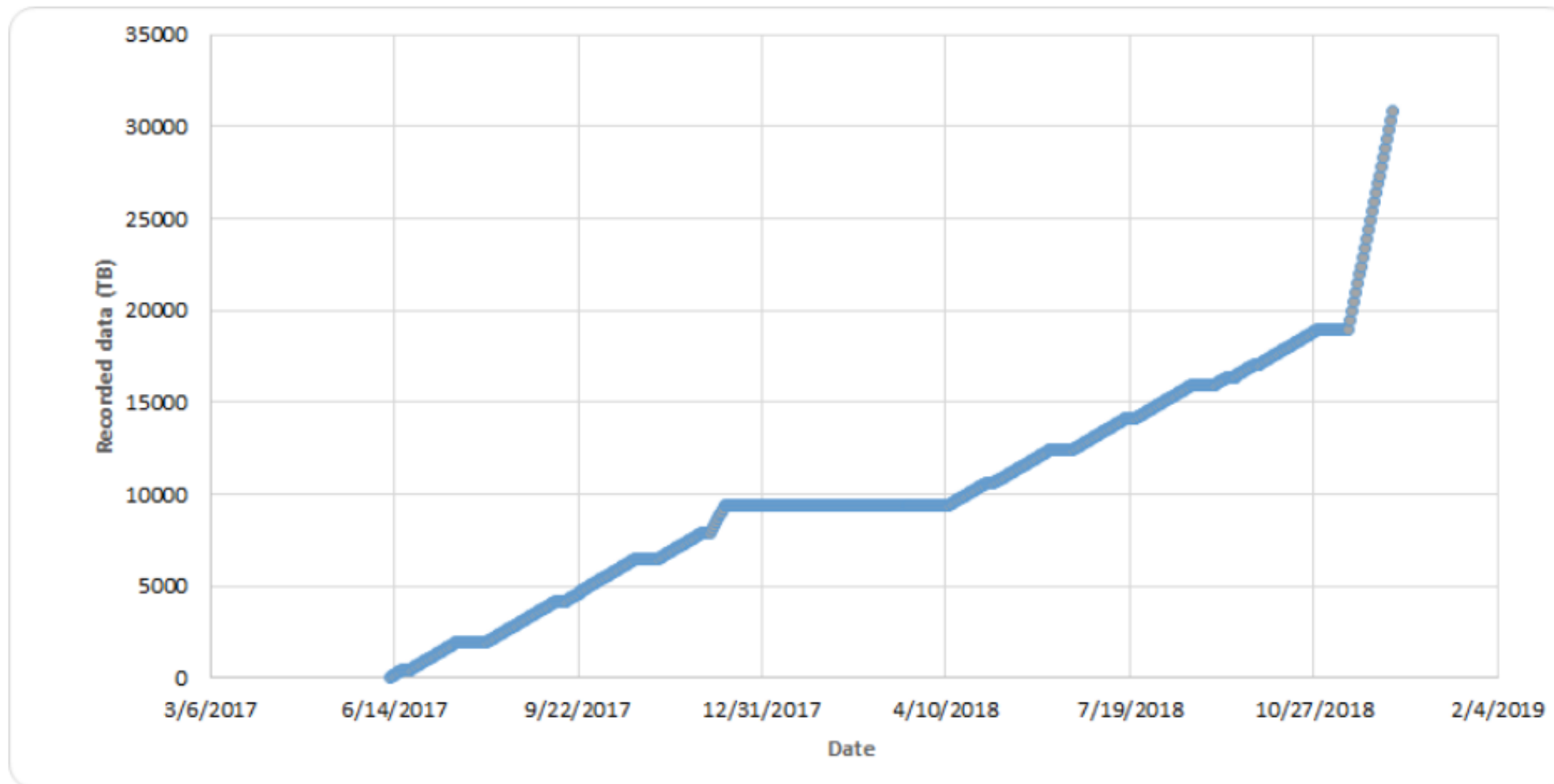
- 4700 HEPSPEC06
In 2015: 6500 HEPSPEC
- 1 PB disk
- 200 TB tape

- Pledge 2017

- 12000 HEPSPEC06
- 1.16 PB disk
- 140 TB tape



Expectations for 2017 and 2018



- During pp data taking mode will be set to limit the TPC readout rate to 400 Hz
 - The goal is to reach the statistics objective set for Run 2 in all trigger categories as well as at the reference energy of 5.02 TeV
 - The total amount of data recorded will be 17.5 PB
- During the Pb-Pb run in 2018, assuming the HLT compression of a factor of 6 we anticipate a total readout rate of 10 GB/s
 - The total amount of data recorded will be 12 PB

Research

- The computing research in Bergen is mainly done at Høgskulen på Vestlandet and focuses on deployment methods of ALICE grid infrastructure through virtual machines or containers
- Ongoing development includes a fast and lightweight deployment system called **vmBatch**
- Integration of modern monitoring systems for the Grid is another focus



People

- At Høgskulen på Vestlandet:
 - Håvard Helstrup, research
 - Bjarte Kileng, research
 - Kristin Fanebust Hetland, research
 - Maksim Storetvedt, PhD student
- At UiB:
 - Boris Wagner, research, Tier- 1 operations
 - Saerda Halifu, Tier-1 operations



Conclusion

- Services have been running smoothly for a long time
- Update on networking will solve most of the remaining problems
- Warranty extension for existing computing resources until 2020
- Running old computing hardware on a best effort basis has proven valuable to fulfill the pledges



Thanks!