NDGF,
(more than)
a Nordic Tier-1 for WLCG

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LCSC 2007

Linköping, 17th October 2007

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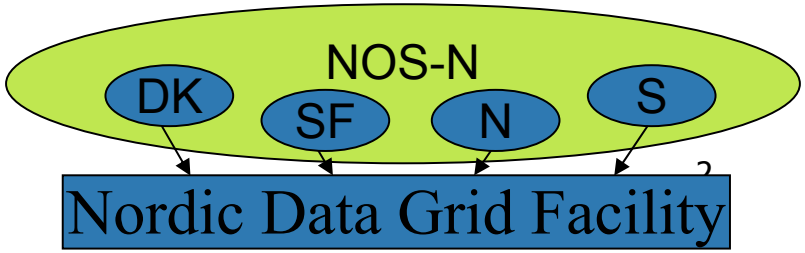
Nordic DataGrid Facility

NDGF (more than) a Tier-1

- A Co-operative Nordic Data and Computing Grid facility
  - Nordic production grid, leveraging national grid resouces
  - Common policy framework for Nordic production grid
  - Joint Nordic planning and coordination
  - Operate Nordic storage facility for major projects
  - Co-ordinate & host major eScience projects (i.e., Nordic WLGC Tier-1)
  - Develop grid middleware and services
- NDGF 2006-2010
  - Funded (2 M€/year) by National Research Councils of the Nordic Countries

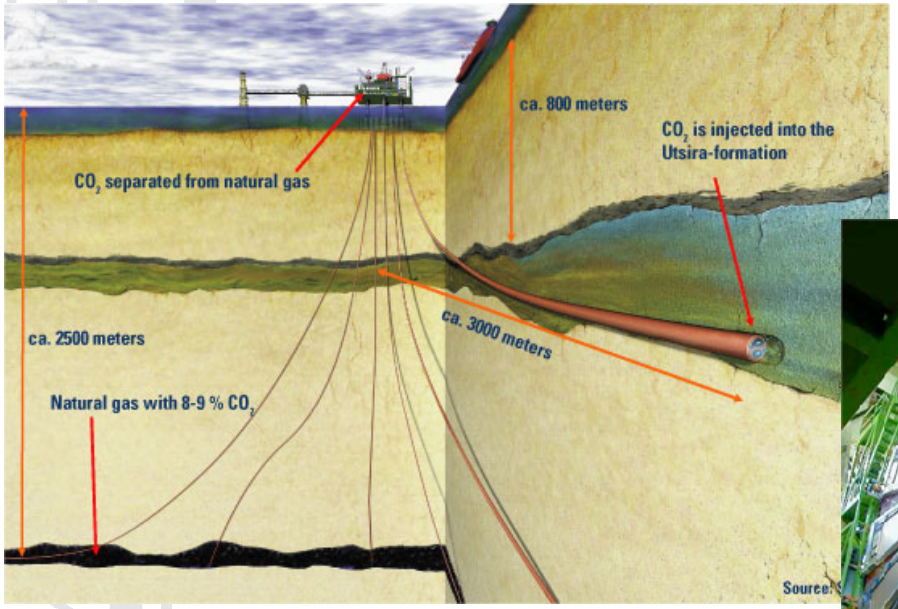


NDGF Vision

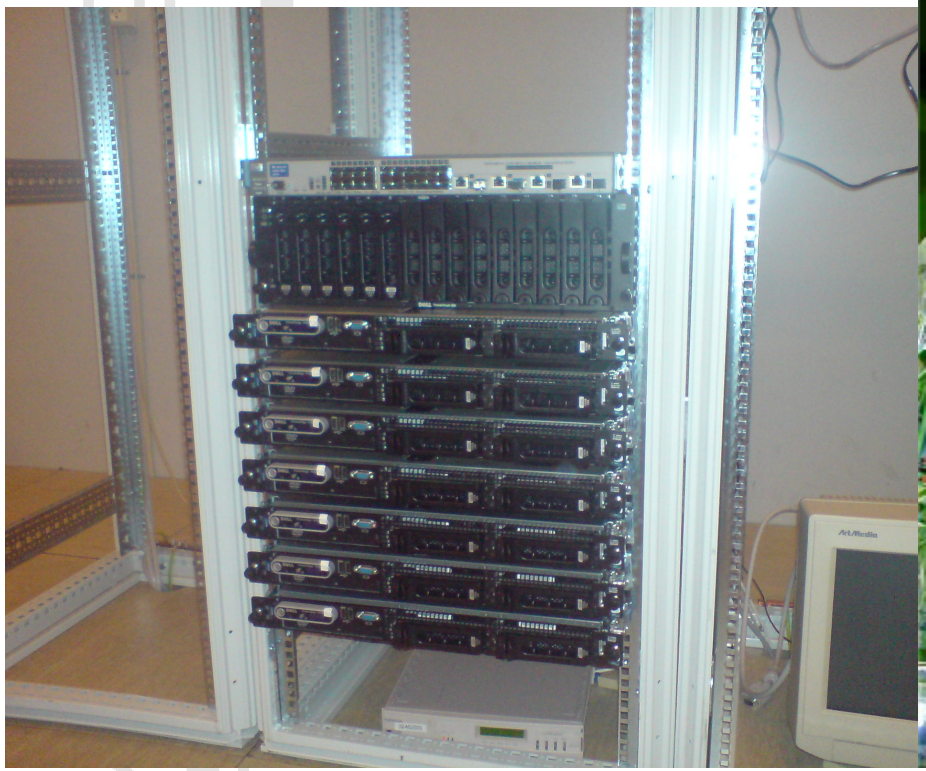
- "...to establish a Nordic data grid facility and to involve Nordic countries in European and global co-operation in data sharing in a variety of fields."
- To *coordinate* and *facilitate* the creation of a Nordic eInfrastructure sharing platform
- To enable Nordic researchers to participate in major international projects
- To optimize and standardize use of resources
- To optimize Nordic participation in international projects

NDGF eScience projects

- BioGrid community grid
- CO_2 sequestration community grid
- Nordic Tier-1



NDGF a Tier-1 for WLGC



NDGF a Tier-1 for WLGC

- Organization / Governance
- Tier-1 Services:
  - Computing
  - Storage
  - ATLAS
  - ALICE
  - Accounting
  - Monitoring
  - Operation

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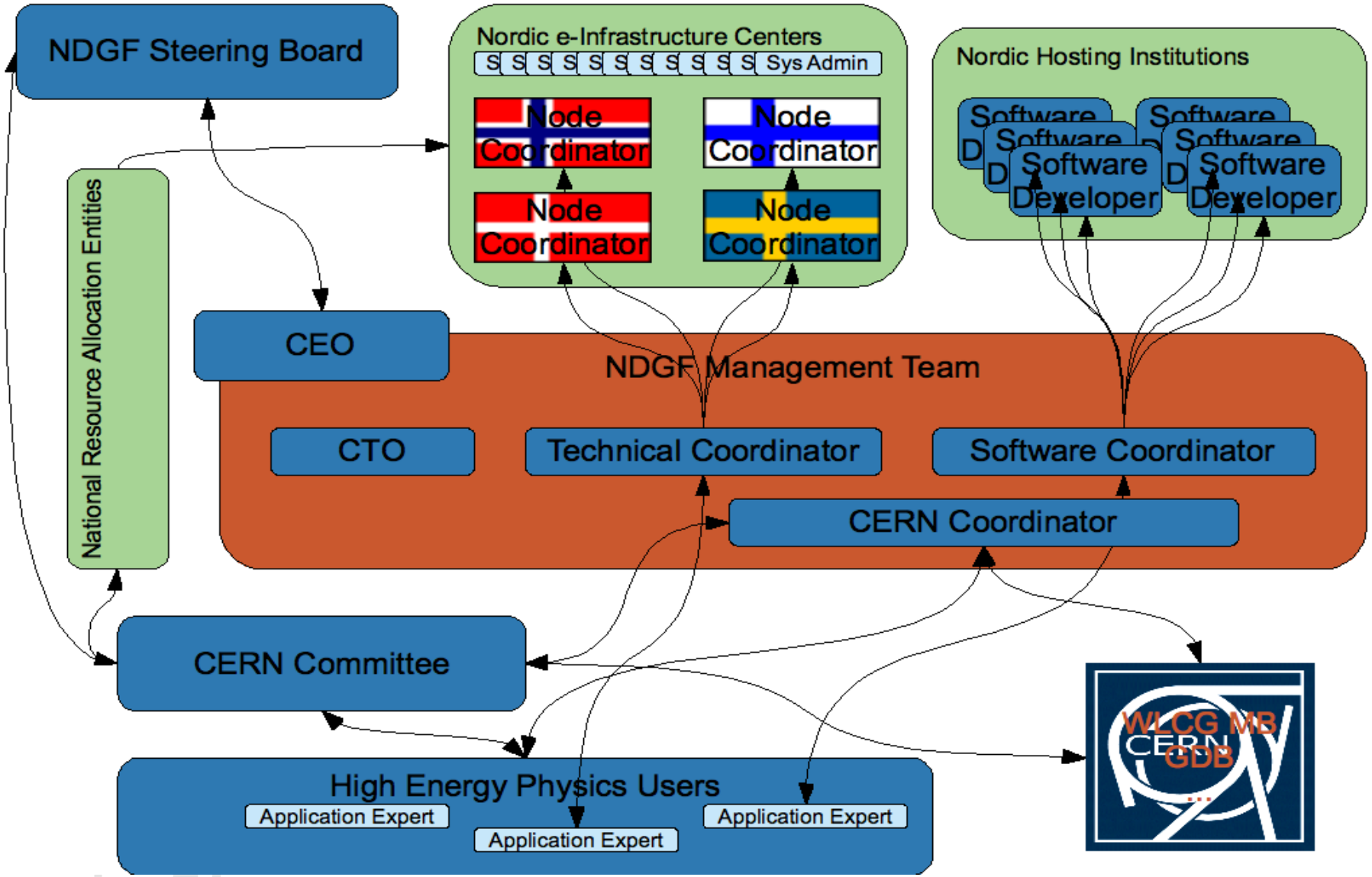
Organization – CERN related



NDGF Tier-1 Resource Centers

- The 7 biggest Nordic compute centers, dTier-1s, form the NDGF Tier-1
- Resources (Storage and Computing) are scattered
- Services can be centralized
- Advantages in redundancy
- Especially for 24x7 data taking

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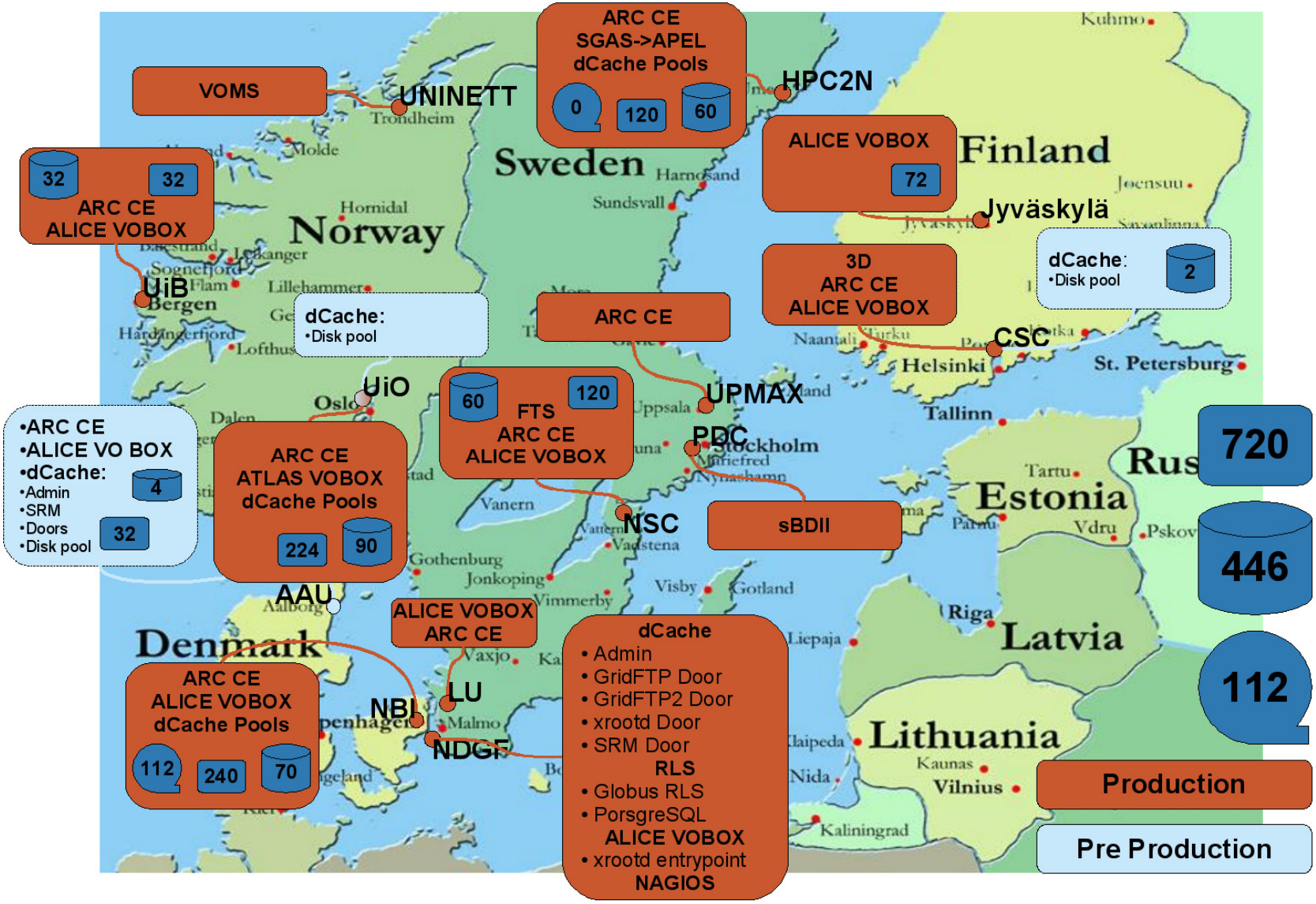
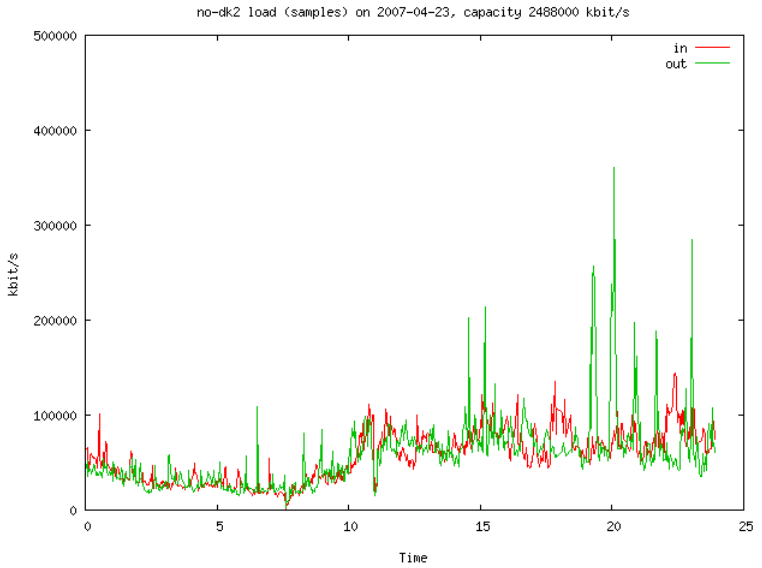
NDGF Facility - 2007Q3



Tier-1 Services: Networking

- Today NDGF is connected directly with GEANT 10GBit fiber to CERN
- Inter-Nordic shared 10Gbit network from NORDUnet
- A Dedicated 10Gbit LAN covering all dTier-1 centers next year



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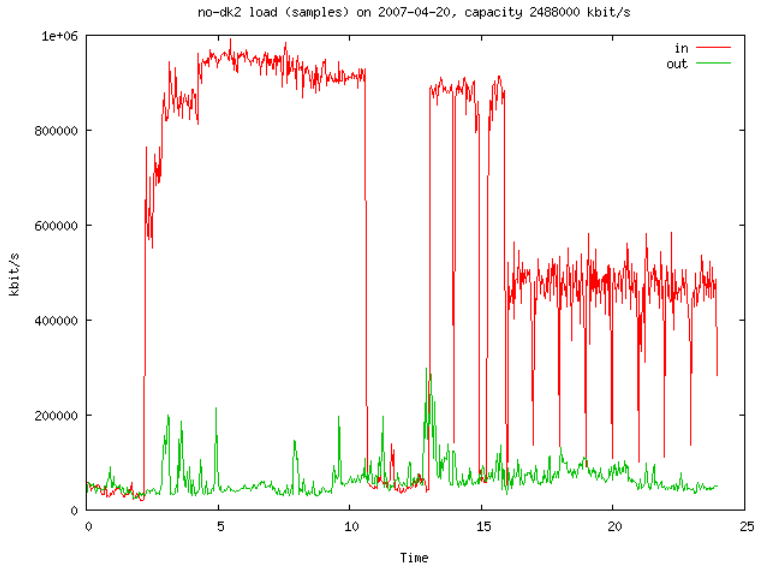

NDGF Tier-1 Services: Networking / OPN

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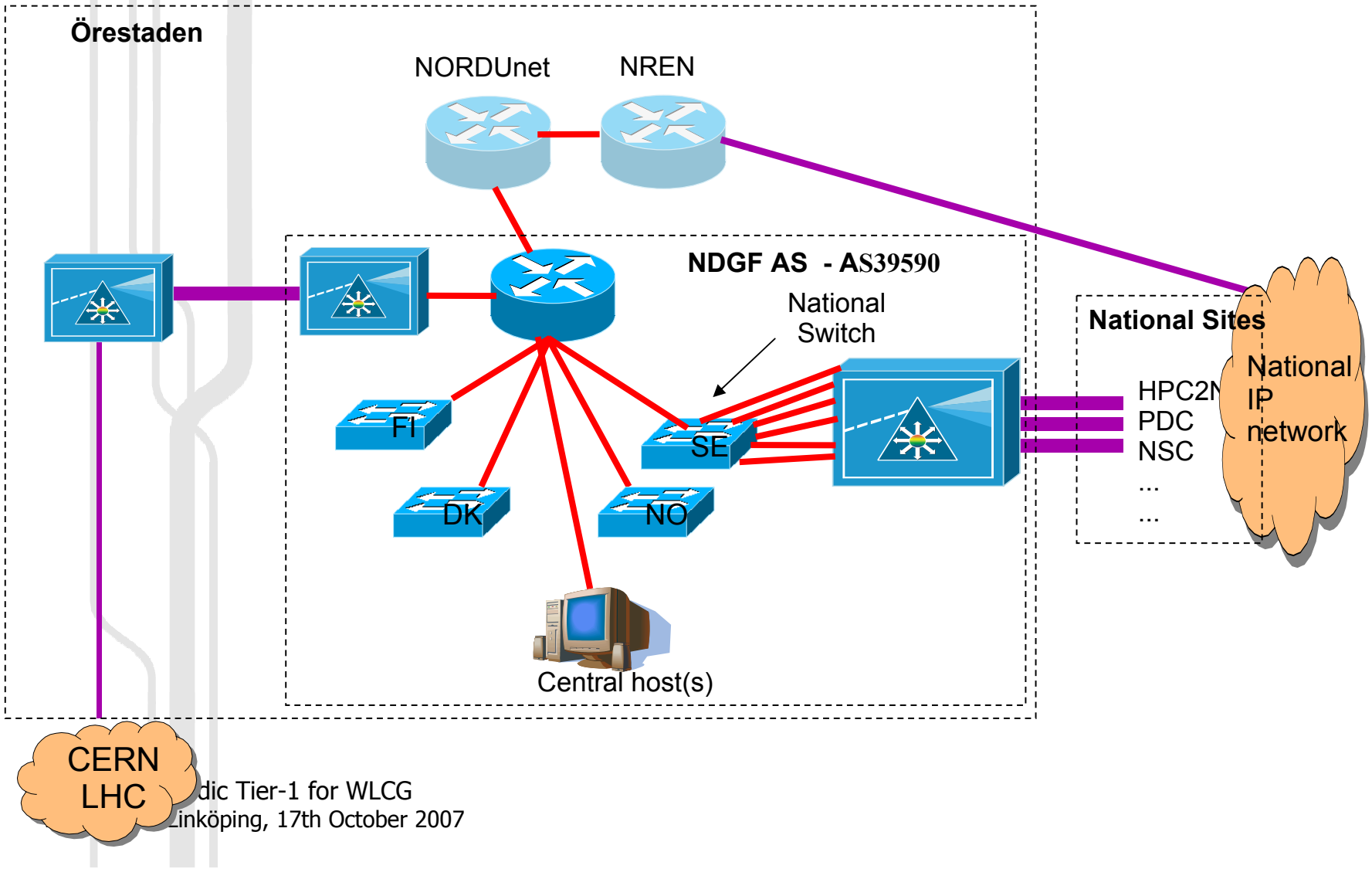

Tier-1 Services: Computing

- NorduGrid / ARC middleware for Computing
- Used routinely since 2002 for e.g. ATLAS data challenges
- Deployed at all the dTier-1 sites

Grid Monitor - Microsoft Internet Explorer

Processes: Grid Local

Country	Site	CPUs	Load (processes: Grid+local)	Queueing
Australia	Atlas (UniMelb)	26	0+2	0+0
	Charm (UniMelb)	36	0+0 (queue down)	0+0
	Alfred (UniMelb)	90	0+6	2+1
Denmark	DistLab (DIKU)	10	0+0	0+0
	Aalborg Grid Gateway	46	38+0	0+0
	Niflheim (DCSC/DTU)	902	0+898	0+17
	Horseshoe (DCSC/SDU)	1192	0+873	0+3
	HEPAX1	1	0+0	0+0
	Morpheus	18	15+0	23+0
	Theory (DCSC/KU)	112	0+42	0+1
	VCR (VideoRecorder)	1	1+0 (queue down)	0+0
Estonia	UT IMCB Anakonda clus>	15	3+0	0+0
	UT CS Antarctica Clus>	20	6+0	0+0
	CMS on CERN Linux	1	0+0	0+0
	CMS Production server	5	0+0	0+0
	UT DOUG Cluster	2	0+0	0+0
	CMS test cluster	1	0+0	0+0
	EENet cluster	6	0+0	0+0
	UT Physics Cluster	3	3+0	0+0
Finland	CSC Kirppu	1	1+0	6+0
	Mill (Physicum)	60	0+15	0+0
	Alpha (HIP)	1	0+0	0+0
	Testbed0 (HIP)	1	0+0	4+1
Germany	FZK cluster	996	83+349	0+0
	LRZ cluster	234	0+230	0+243
Norway	Oslo Temp Cluster	11	0+0	25+0
	Parallab IBM Cluster	58	0+57	0+75
	Bergen Grid Cluster	2	2+0	7+0
	Oslo Grid Cluster	41	9+15	51+0
	UiO Grid	100	0+98	0+1
Slovenia	SiGNET	40	6+31	6+0
Sweden	Bluesmoke (Swegrid,NS>	99	95+0	187+0
	Kosufy farm	60	36+0	0+0
	ISV	4	4+0	14+0
	Hagrid (SweGrid, Uppm>	100	50+0	68+0
	Ingrid (SweGrid,HPC2N)	101	69+0	124+0
	Monolith (NSC)	398	0+342	0+121
	Quark Cluster	7	0+0	0+0
	Beppe (SweGrid PDC KT>	96	92+0	49+0
	Sigrid (SweGrid, Luna>	99	49+50	19+25
	Toto7/Whenim64 (Lunar>	192	0+161	0+11
Switzerland	Bern ATLAS Cluster	8	8+0	12+0
TOTAL	*42 sites*	*5196*	*570 + 3169*	*597 + 499*

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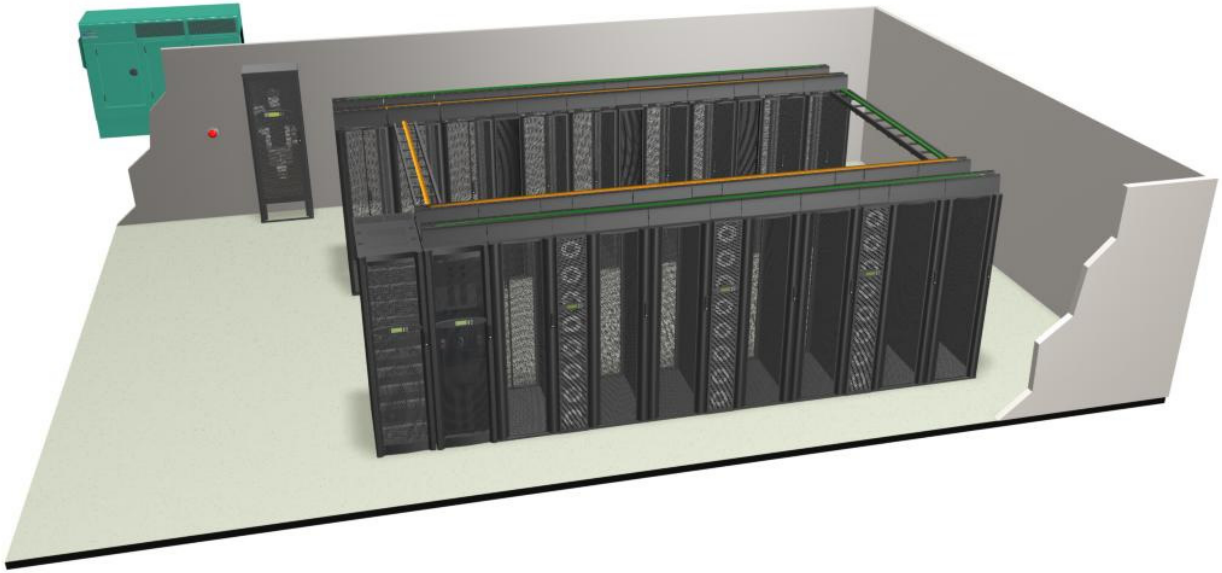
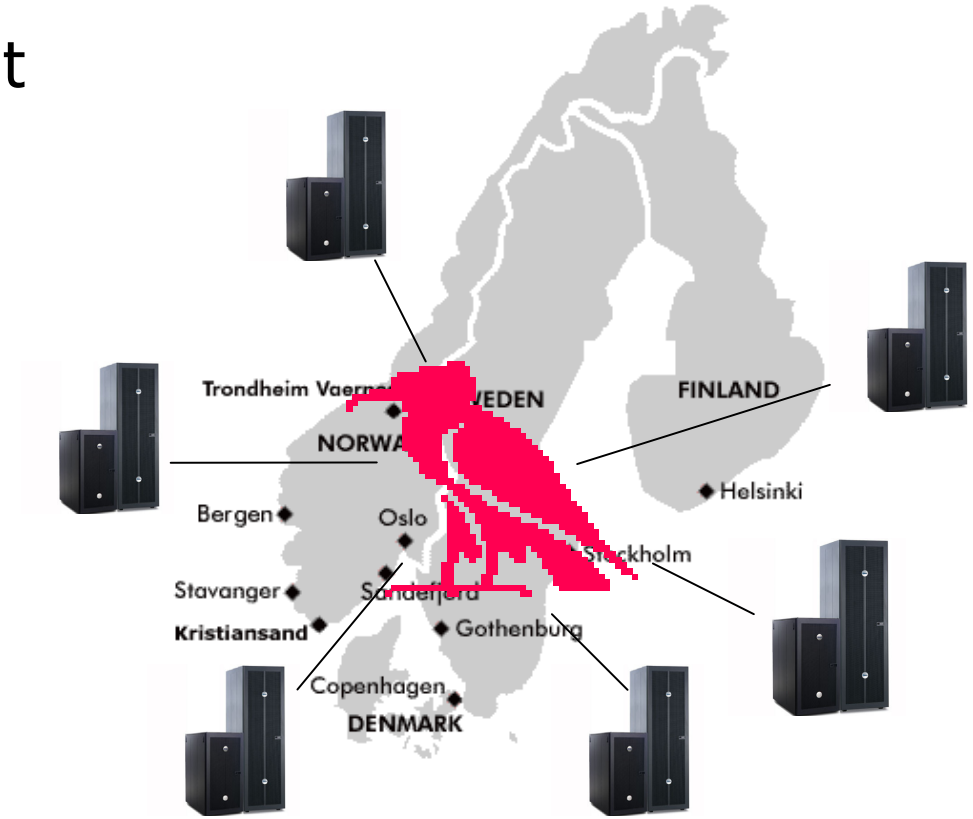
Storage



Storage

- dCache Installation
- Admin and Door nodes at GEANT endpoint
- Pools at sites
- Very close collaboration with DESY to ensure dCache is suited also for distributed use



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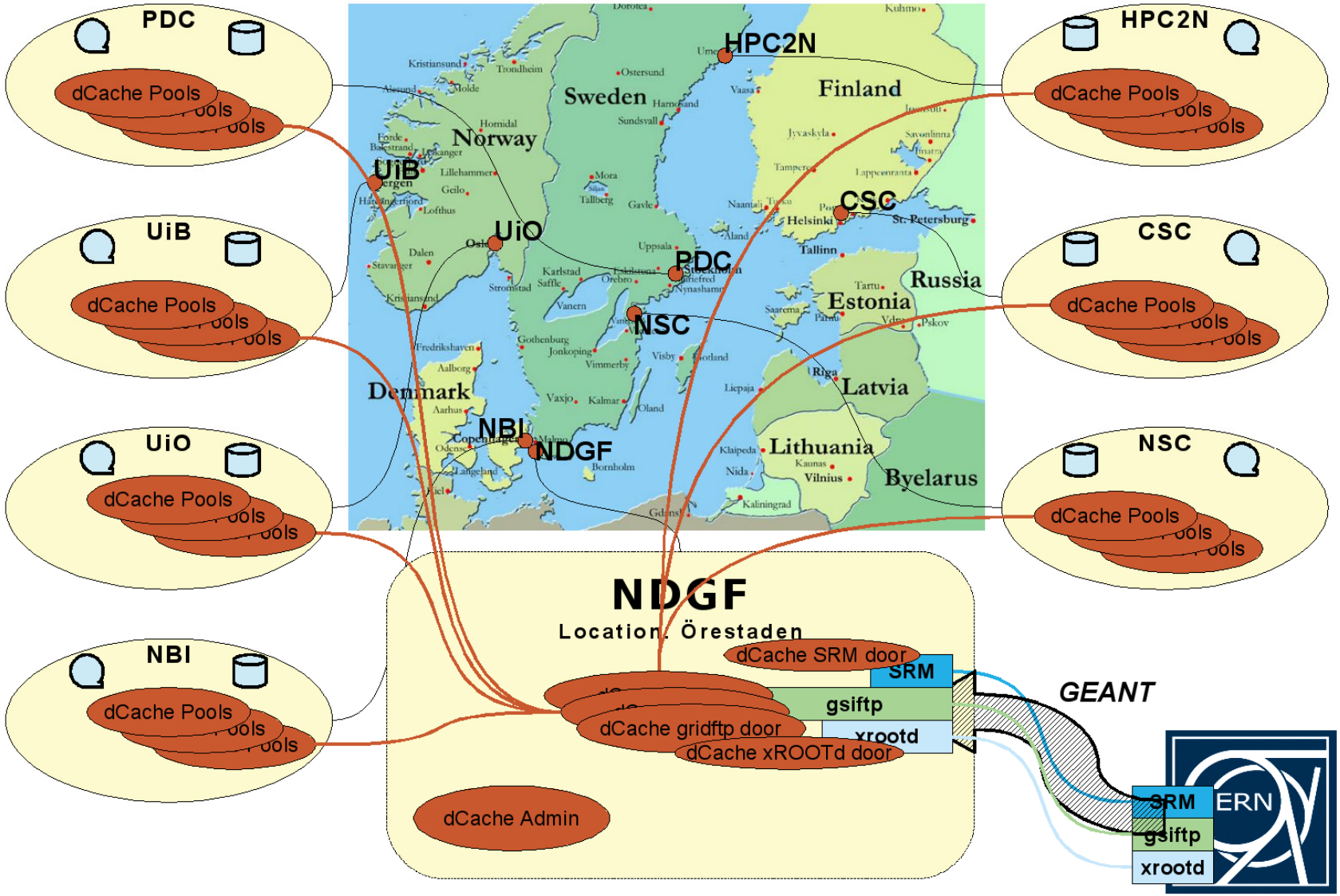
NDGF Storage



FTS

- Running FTS2.0
- Patched version of Globus supporting GridFTP2

- Located in Linköping:
  - 1 Server for FTS
  - 1 Server for Oracle database
- Channels:
  - STAR-NDGF
  - others...

3D

- Minimal setup located in Helsinki:
  - One dual core dual Xeon box with 4GB of memory
    - no RAC, just one server
  - High availability SAN storage
  - a bit more than one TB of space allocated for data
  - upgrade to 3-5 node RAC in 2008

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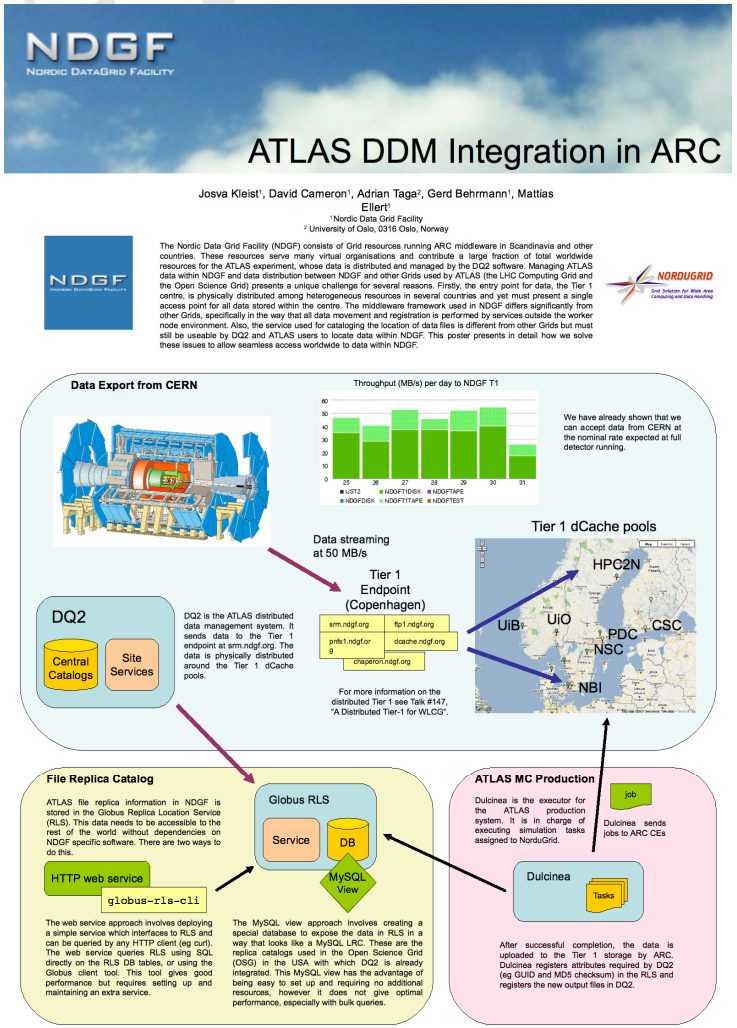
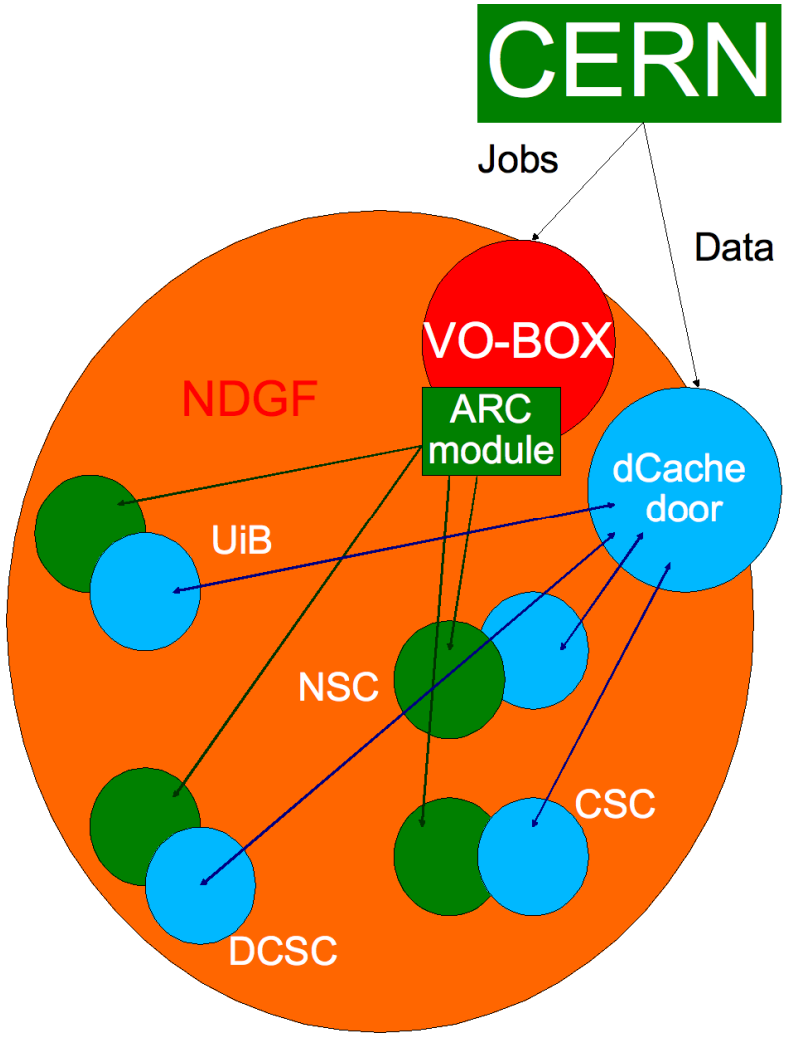
ATLAS VO Services



- ATLAS VOBox (ARC flavor) services fully implemented
  - ARC uses Globus RLS
  - US-ATLAS-LRC view on the mysql
  - Enables outside ATLAS subscription to data stored on old Ses
  - and internal through RLS

ALICE VO Services

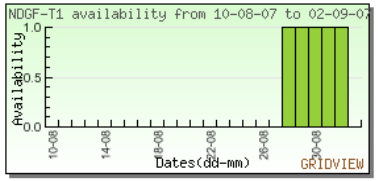
- ALICE VOBox boxes:
  - Jyväskylä
  - CSC
  - NSC
  - LUNARC
  - DCSC/KU
  - UiB – using submission via ARC
  - Örestaden – xrootd storage frontend



Service Availability Monitoring

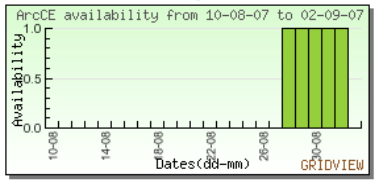
- SAM sensors:
  - BDII
  - SE
  - SRM
  - FTS
  - ARC-CE
    - This is the only different sensor as compared to other sites

Overall Service Availability for site NDGF-T1 : Daily Report



Individual Service Availability for site NDGF-T1 : Daily Report

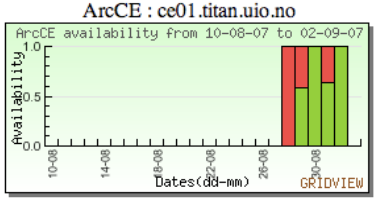
ArcCE



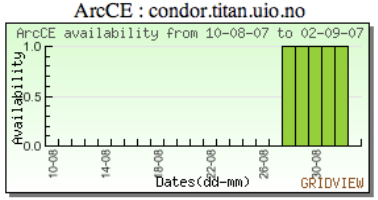
Service Instance Availability for site NDGF-T1 : Daily Report

Site Services

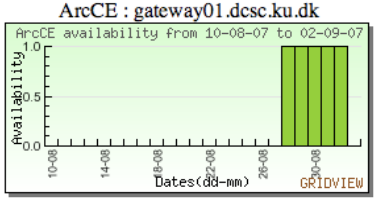
ArcCE : ce01.titan.uio.no



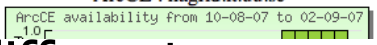
ArcCE : condor.titan.uio.no



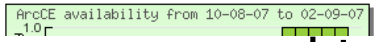
ArcCE : gateway01.dcsc.ku.dk



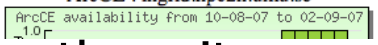
ArcCE : hagrid.it.uu.se



ArcCE : hive.unicc.chalmers.se



ArcCE : ingrid.hpc2n.umu.se



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Accounting

- Sites report using SGAS
  - (SweGrid Accounting System)
- SGAS report translated to APEL
- Injected into the APEL DB

- Functional from September 07
  - some sites already accounted

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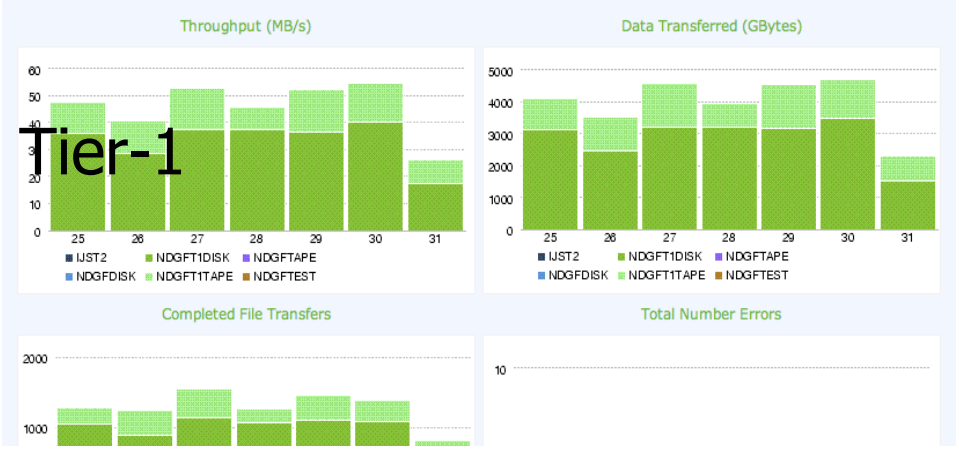
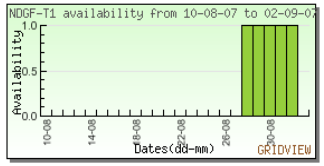
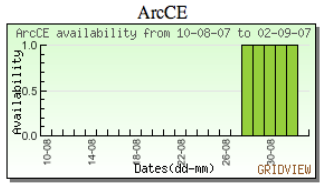
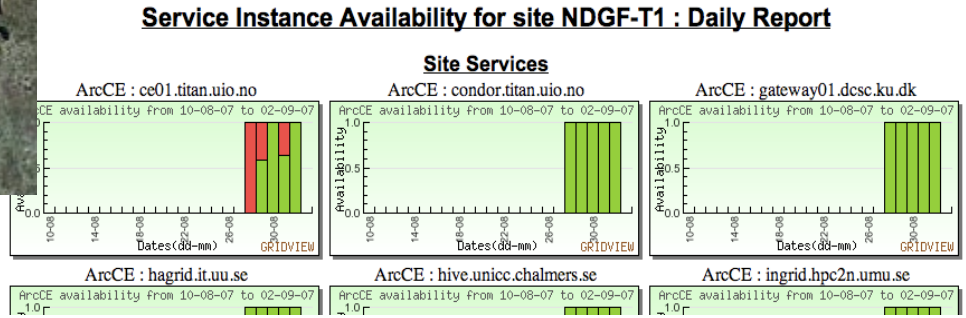
Conclusions

- We have build a distributed Tier-1
  - dCache – for storage
  - ARC for computing
- Interoperabel with:
  - ALICE
  - ATLAS
  - ARC monitoring and accounting
  - LCG monitoring and accounting
- It works !



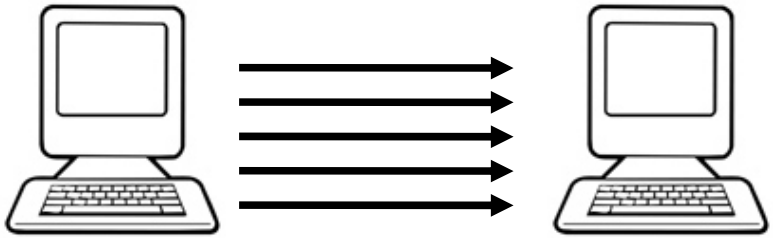


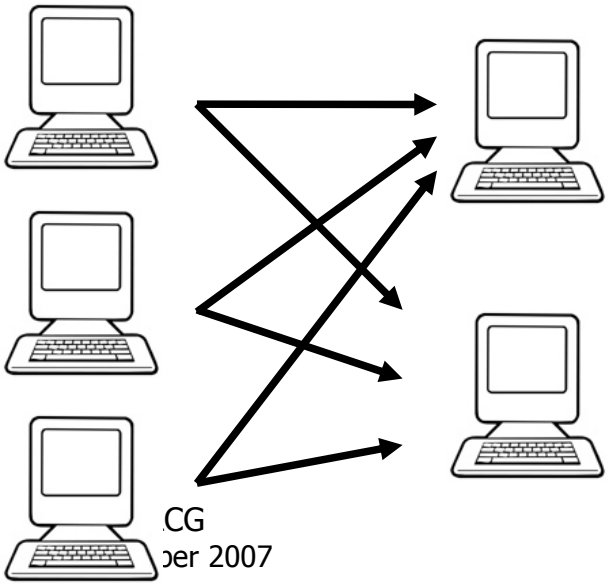




Thanks!

GridFTP v1



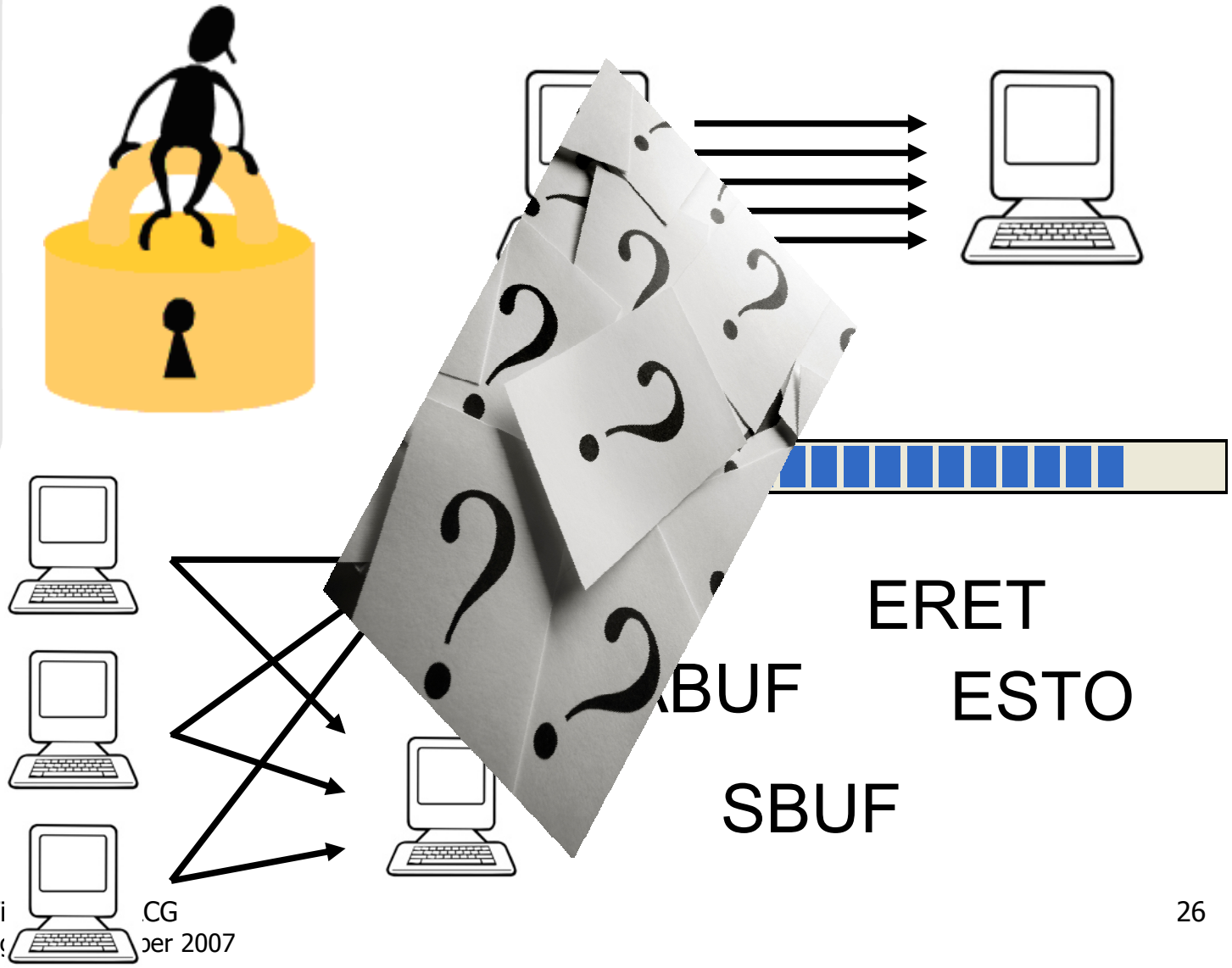


ERET

ABUF ESTO

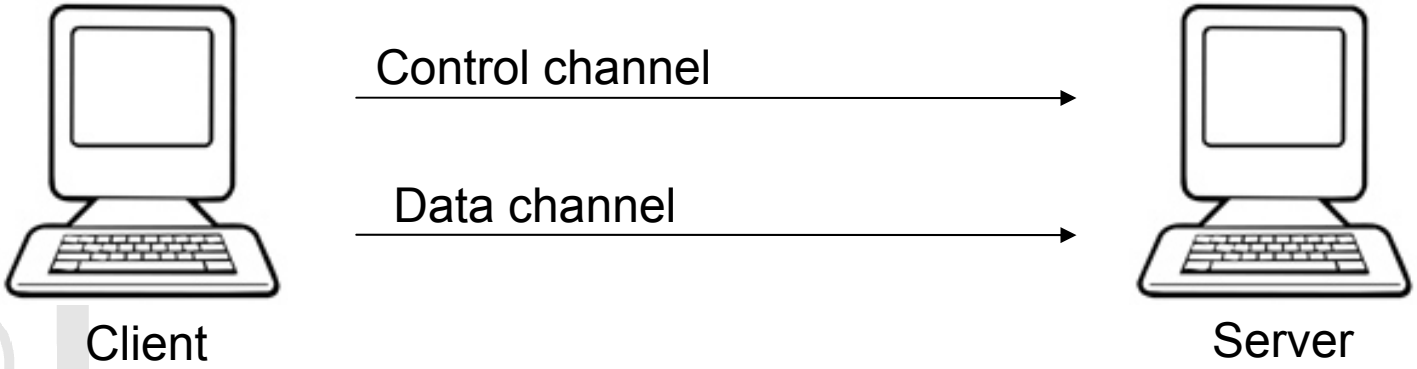
SBUF

GridFTP v1

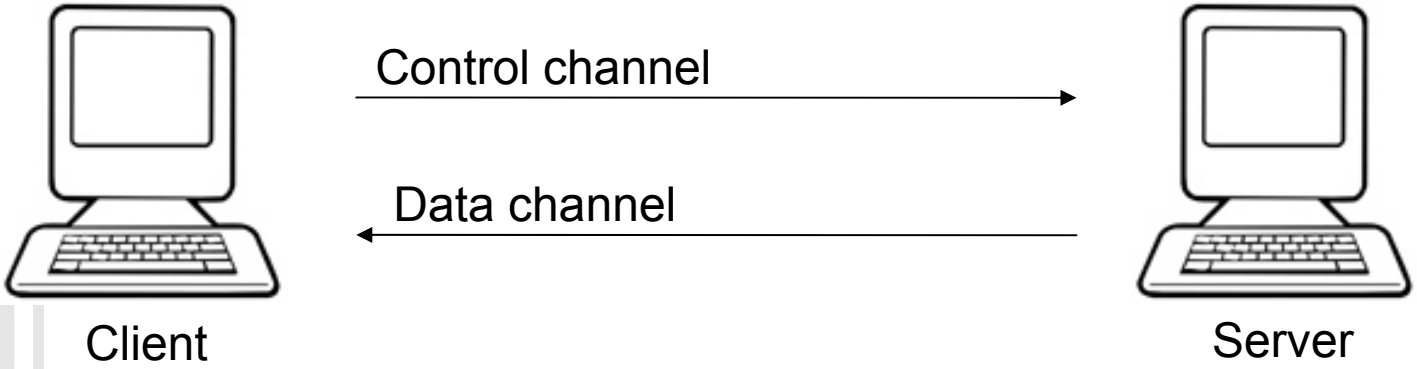


FTP Transfers

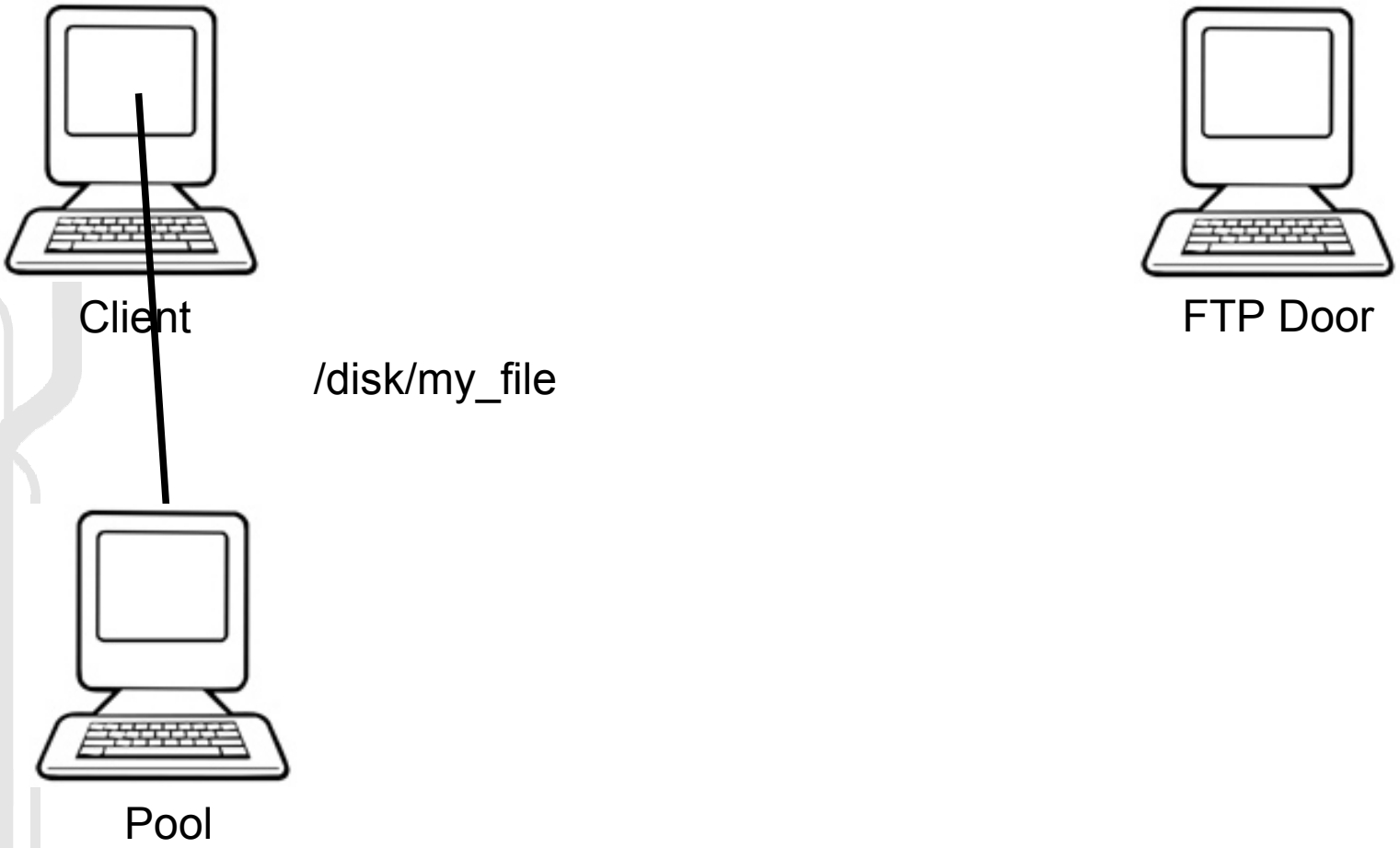
Passive servers



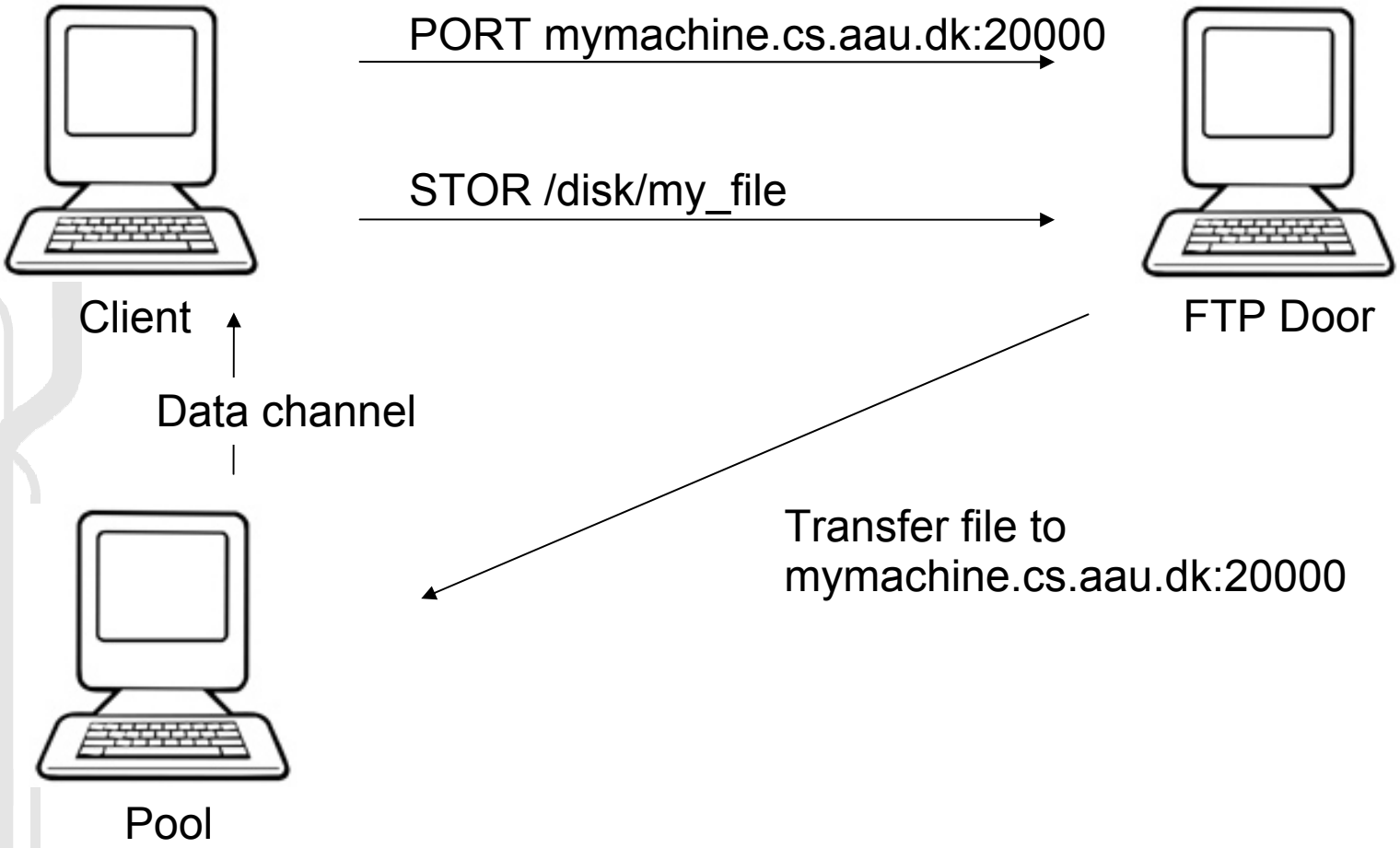
Active servers



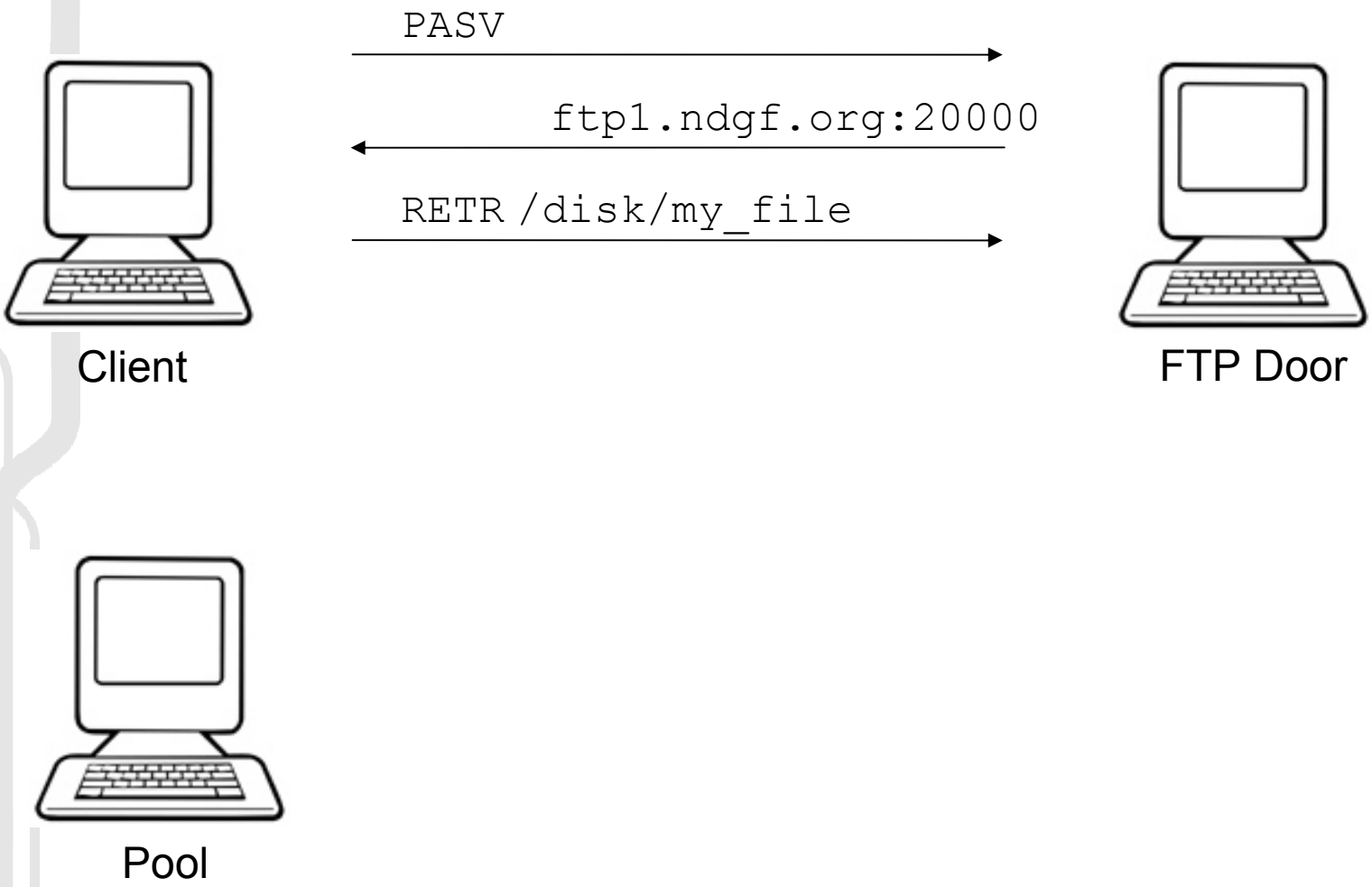
FTP in dCache



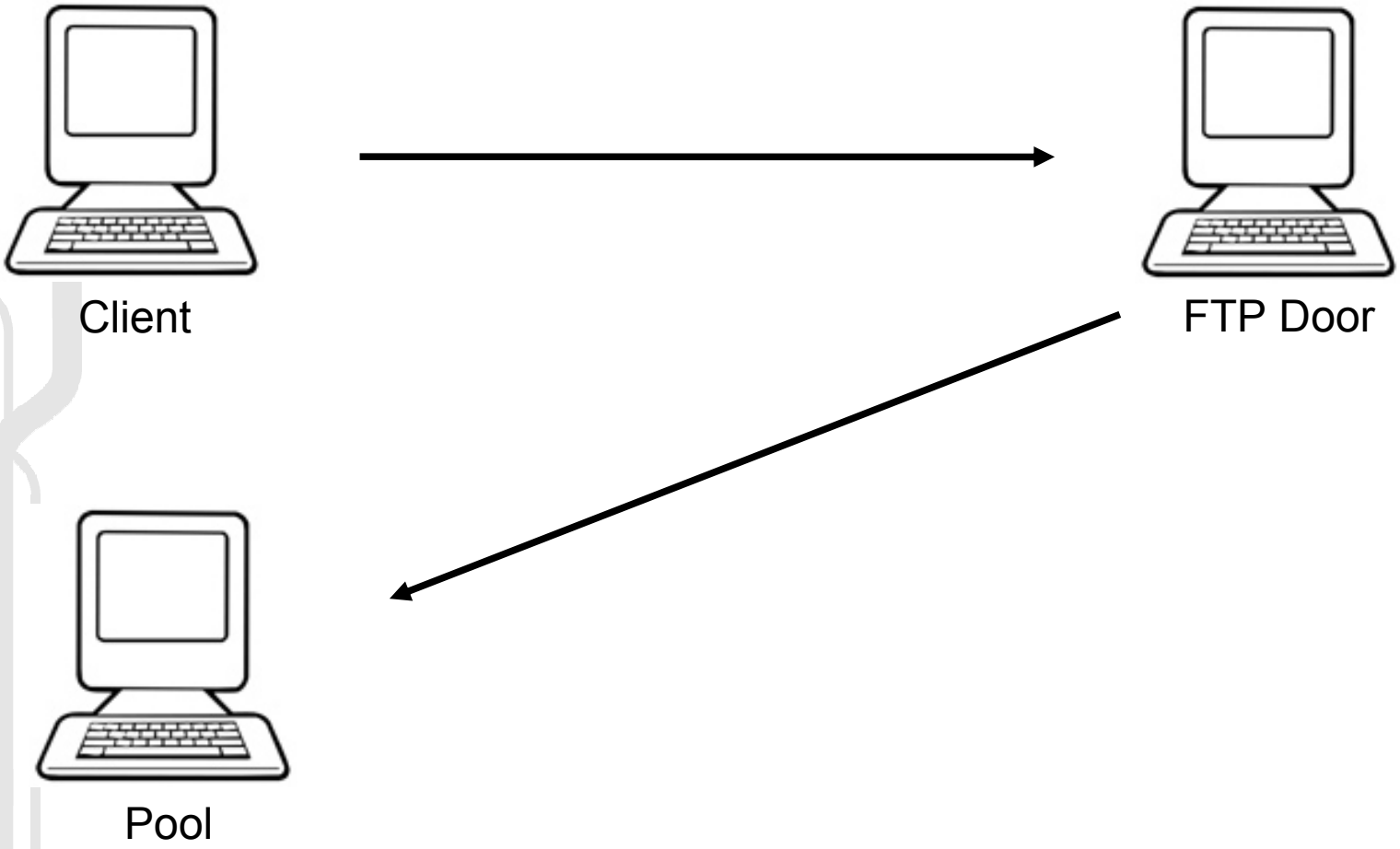
Active transfers in dCache



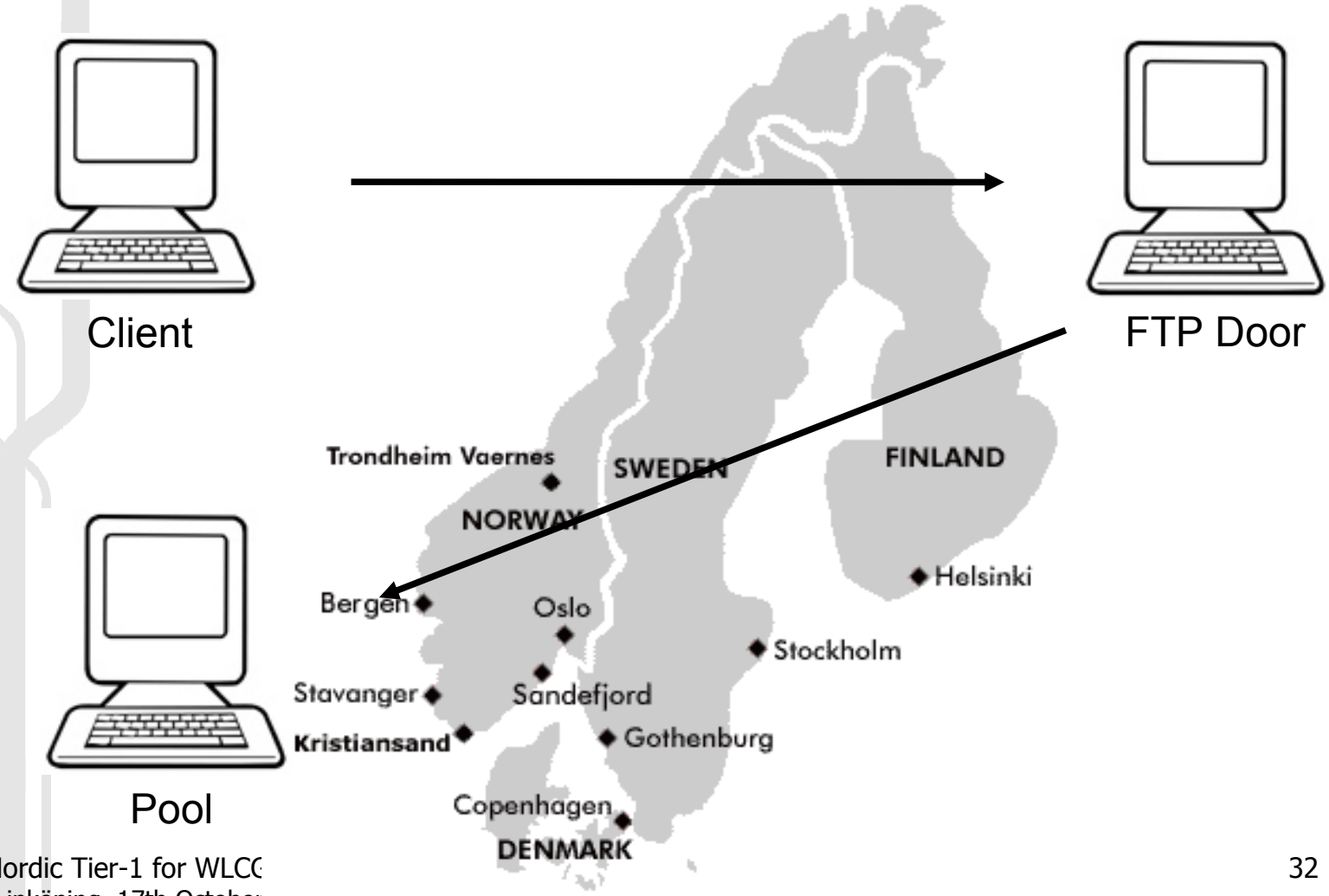
Passive transfers in dCache



Passive transfers in dCache

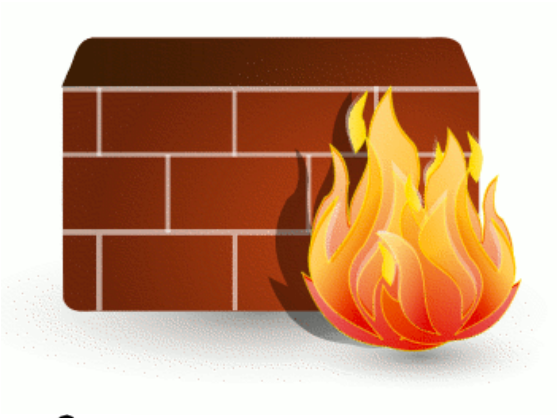


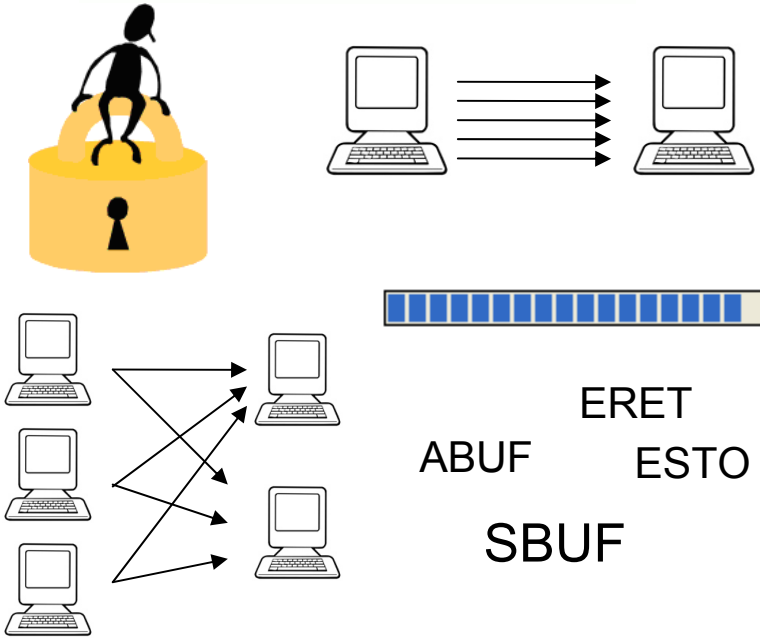
Passive transfers in dCache



Use active transfers!

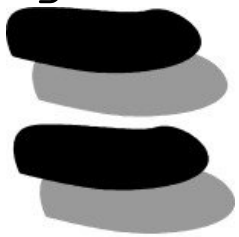
Active transfers won't work



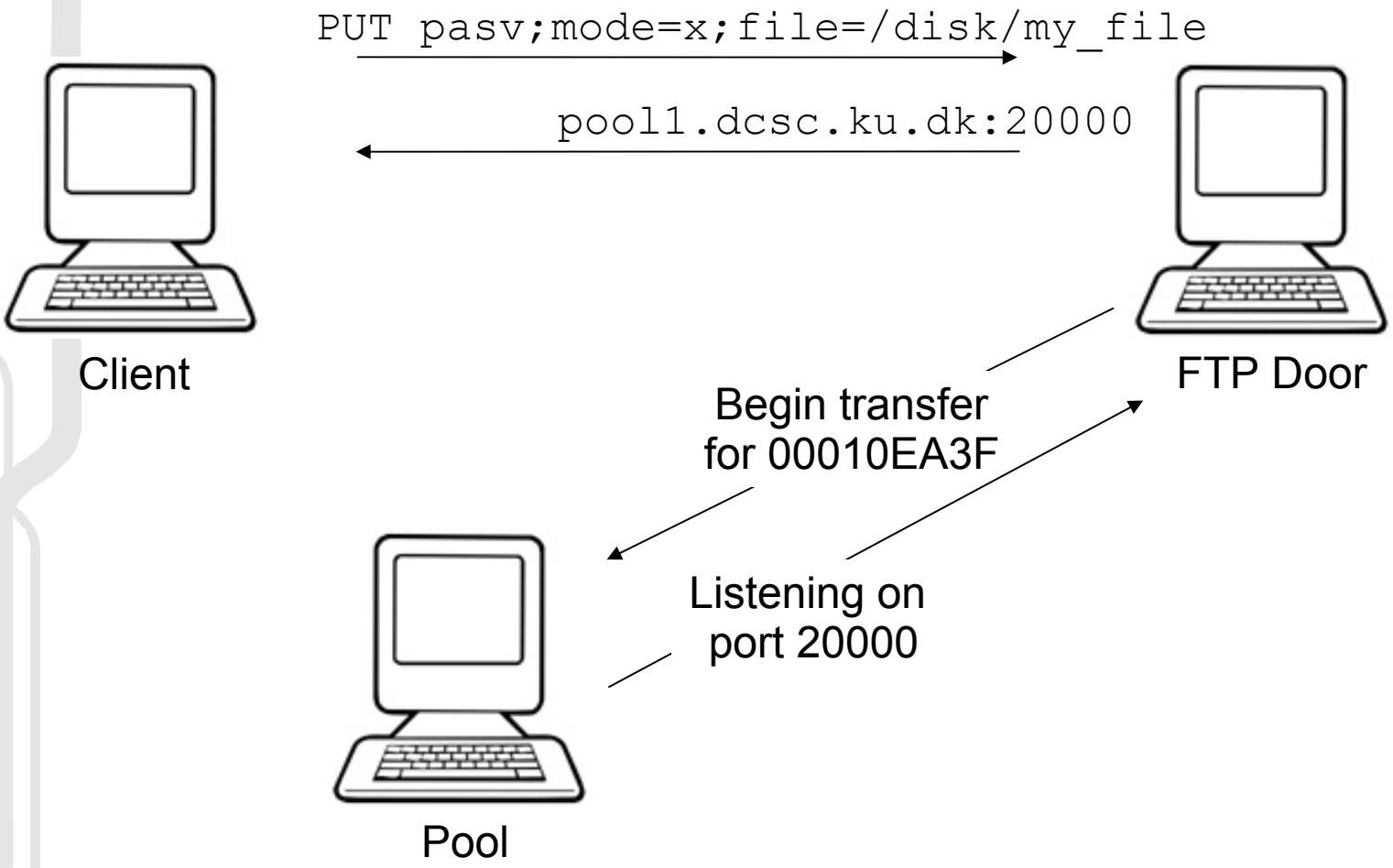


Introducing GridFTP2 GETPUT

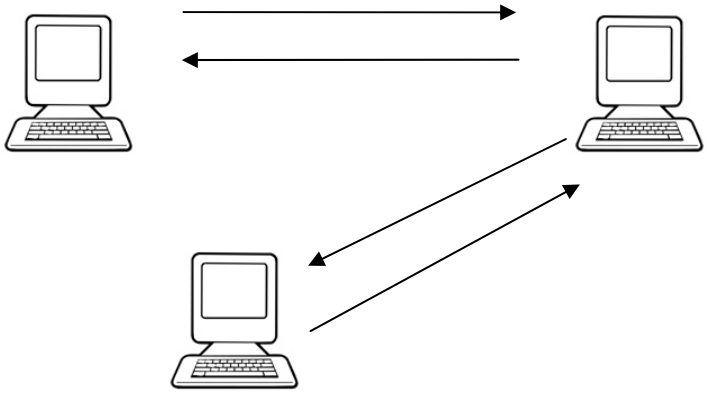
```
PASV
227 PORT=(a.b.c.d)↰
MODE E
200 OK
STOR /disk/my_file
150 Opening data channel
```



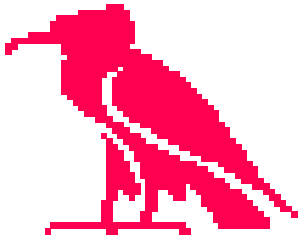
```
PUT pasv;mode=x;file=/disk/my_file
127 PORT=(a.b.c.d)↰
150 Opening data channel
```


PUT pasv;mode=x;file=/disk/my_file
pool1.dcsc.ku.dk:20000
Client
FTP Door
Begin transfer
for 00010EA3F
Listening on
port 20000
Pool

GridFTP2



GridFTP2 Implementations



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Fermilab

the globus toolkit