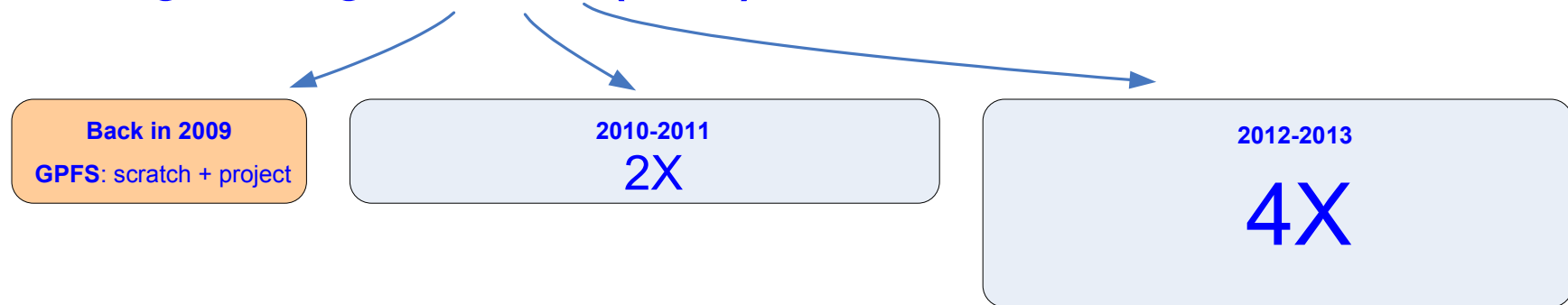


# The World of HPSS



# Storage Capacity Expansion Plan

Storage Budget: \$ \$ \$ (5PB)



## Rational:

- \* the longer we wait, the more resources we can buy with the same budget

## Manage usage and expectation:

- \* allocations
- \* introduction of quotas & [HSM<sup>IBM</sup>+TSM] for limited data offload
- \* regular purging

## What have we learned in 1 ½ years of operation?

- \* GPFS problems and limitations at a 4000 nodes scale
- \* user data distribution patterns not GPFS or HPC friendly

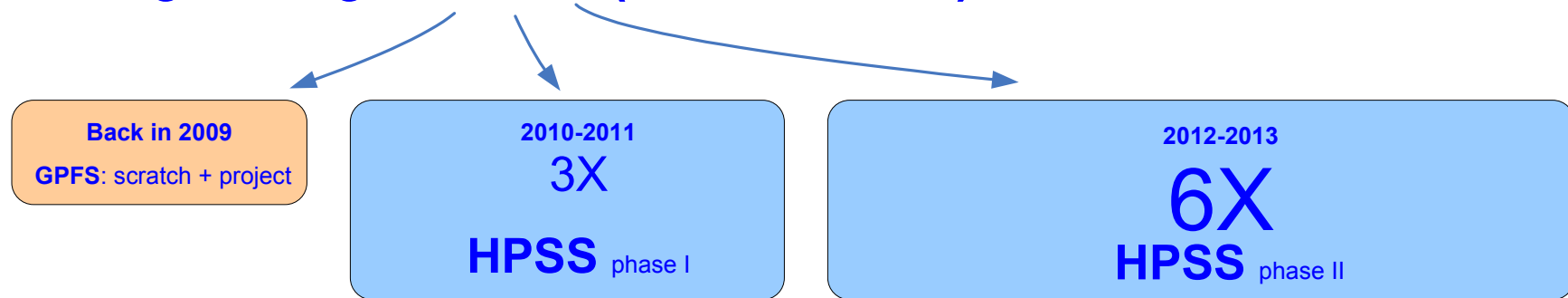
## Conclusion:

- \* just adding spinning disks to active filesystems is not a good solution
- \* more users, more data, more files => more problems



# Storage Capacity Expansion Plan

Storage Budget: \$ \$ \$ (5PB or more)



## Solution:

- \* near online storage with HPSS (tape backed hierarchical storage system)

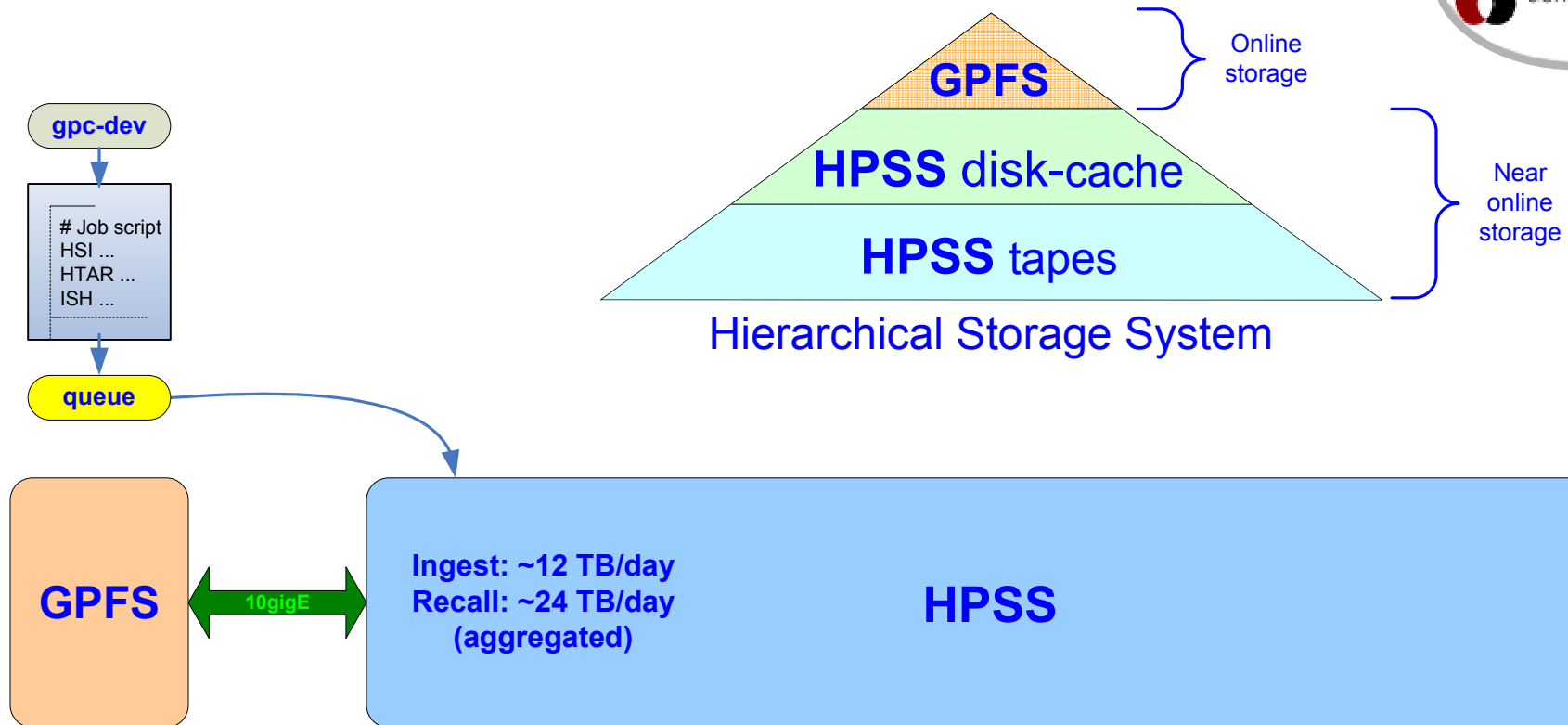
## Manage usage and expectation:

- \* allocations: GPFS + HPSS
- \* quotas & massive offload data to HPSS
- \* regular purging
- \* less utilization of small files
- \* more utilization of tarballs in the regular workflow by users (new campaign)

## About HPSS (High Performance Storage System):

- \* 10+ years history, used by 50+ facilities in the “Top 500” HPC list
- \* very reliable, data redundancy and data insurance built-in.
- \* highly scalable, reasonable performance at SciNet
- \* HSI/HTAR (and ISH) clients also very reliable and used on several HPSS sites.

# Storage Capacity Expansion Plan



- \* access and transfer management is done through the GPC queue system
- \* end-user interaction via HSI/HTAR/ISH calls in the job scripts
- \* HSI is a client with an ftp-like interface which can be used to archive and retrieve large files. It is also useful for browsing the contents of HPSS.
- \* HTAR is a utility that creates tar formatted archives directly into HPSS. It also creates a separate index file (.idx) that can be accessed quickly.
- \* ISH is a TUI utility that can perform an inventory of the files and directories in your tarballs.



# Scripted File Transfers

File transfers in and out of the HPSS should be scripted into jobs and submitted to the archive queue. Scripts should use the HIS, HTAR and/or ISH clients as in the example below:

```
#!/bin/env bash
#PBS -q archive
#PBS -N hsi_put_file_in_hpss
#PBS -j oe
#PBS -me

/usr/local/bin/hsi -v <<EOF
cput -p /scratch/$USER/workarea/finished-job1.tar.gz : finished-job1.tar.gz
EOF
status=$?
if [ ! $status == 0 ];then
    echo '!!! TRANSFER FAILED !!!'
fi
exit $status
```

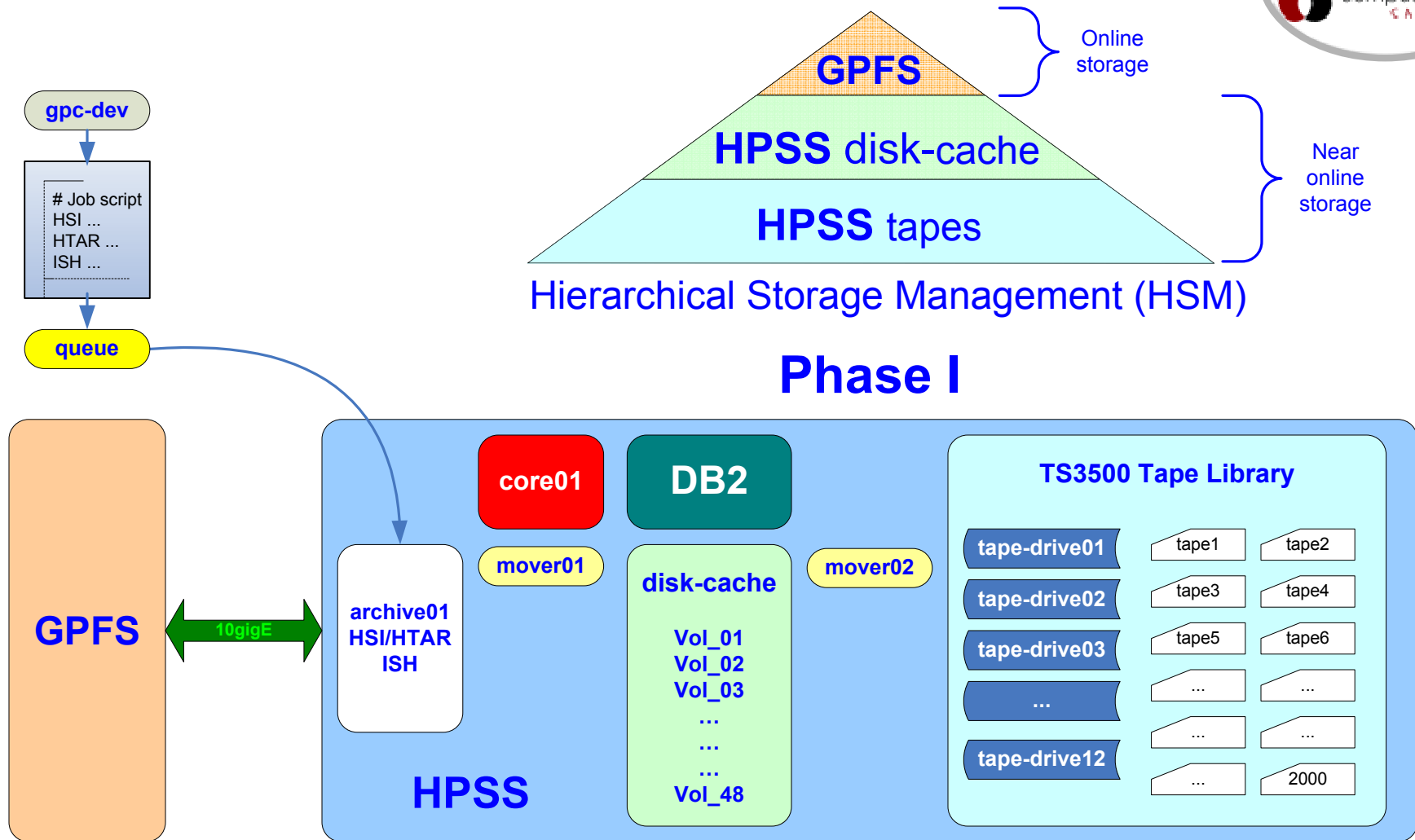
**Note:** Make sure to check the application's **exit code** and the returned log files for errors after all data transfers and any tarball creation process

The status of pending jobs can be monitored with `showq` specifying the archive queue:

```
showq -w class=archive
```

For more details and examples please consult the the following wiki page:  
<https://support.scinet.utoronto.ca/wiki/index.php/HPSS>

# HPSS – main components



**HPSS\* =**

nodes + disks + network + FC + HPSS + DB2 + HSI + HTAR + ISH + Library + tapes + services

# HPSS – scaling potential



## Phase II

