Grid Collector

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A View of the Analysis Process

- Users want to analyze some events of interest
- Events are stored in millions of files
- Files are distributed on many storage systems
- To perform an analysis, a user needs to
  1. <u>Write the analysis code, run it</u>
  2. <u>Specify the events of interest</u>
  3. Locate the files containing the events
  4. Prepare disk space for the files
  5. Transfer the files to the disks
  6. Recover from any errors
  7. Read the events of interest from files
  8. Remove the files

Design Goals of Grid Collector

Make analysts more productive by

- Reading only events of interest

- Automating the management of distributed files and disks

Approaches of Grid Collector

- Allow users to specify events of interest using meaningful physical quantities
  - numberOfPrimaryTracks > 1000 AND vectorSumOfPt > 20
  - Simplify step 2
- Automate file management tasks
  - Use File Catalogs to locate files
  - Use Storage Resource Manager to manage the disk space and file transfers
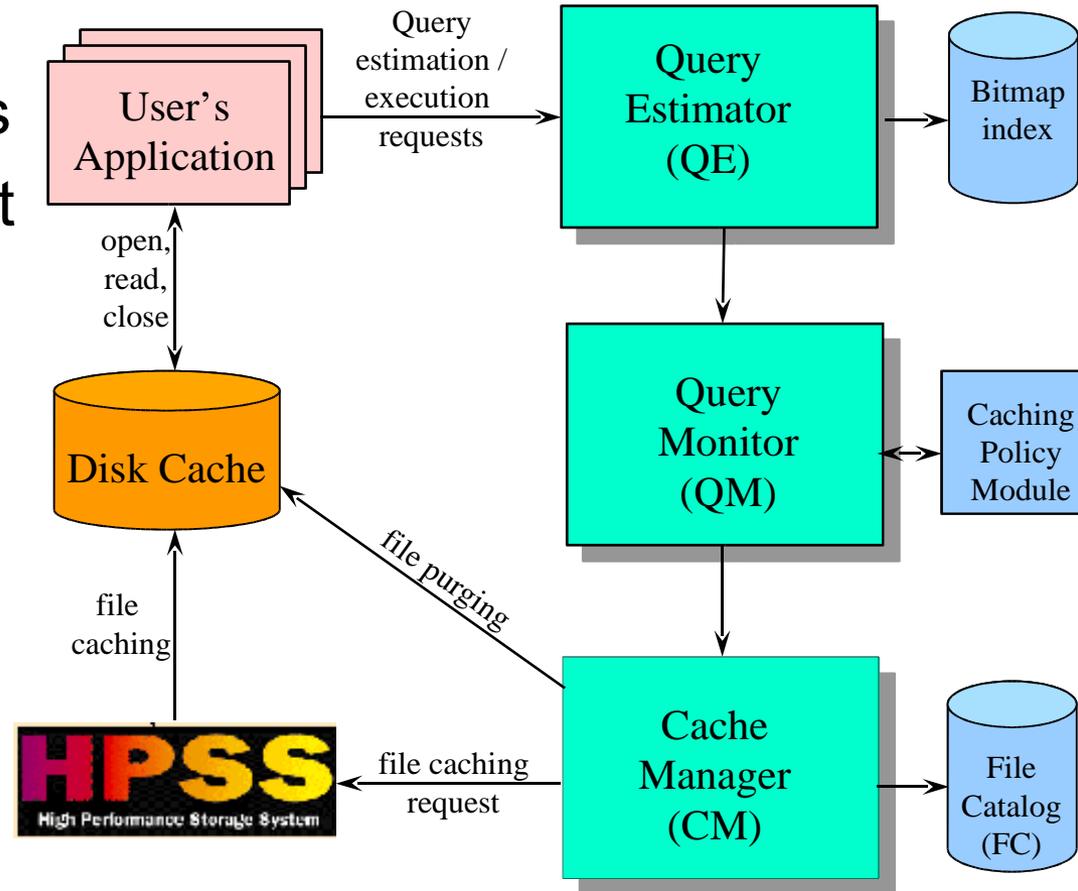 - Remove steps 3 -- 8
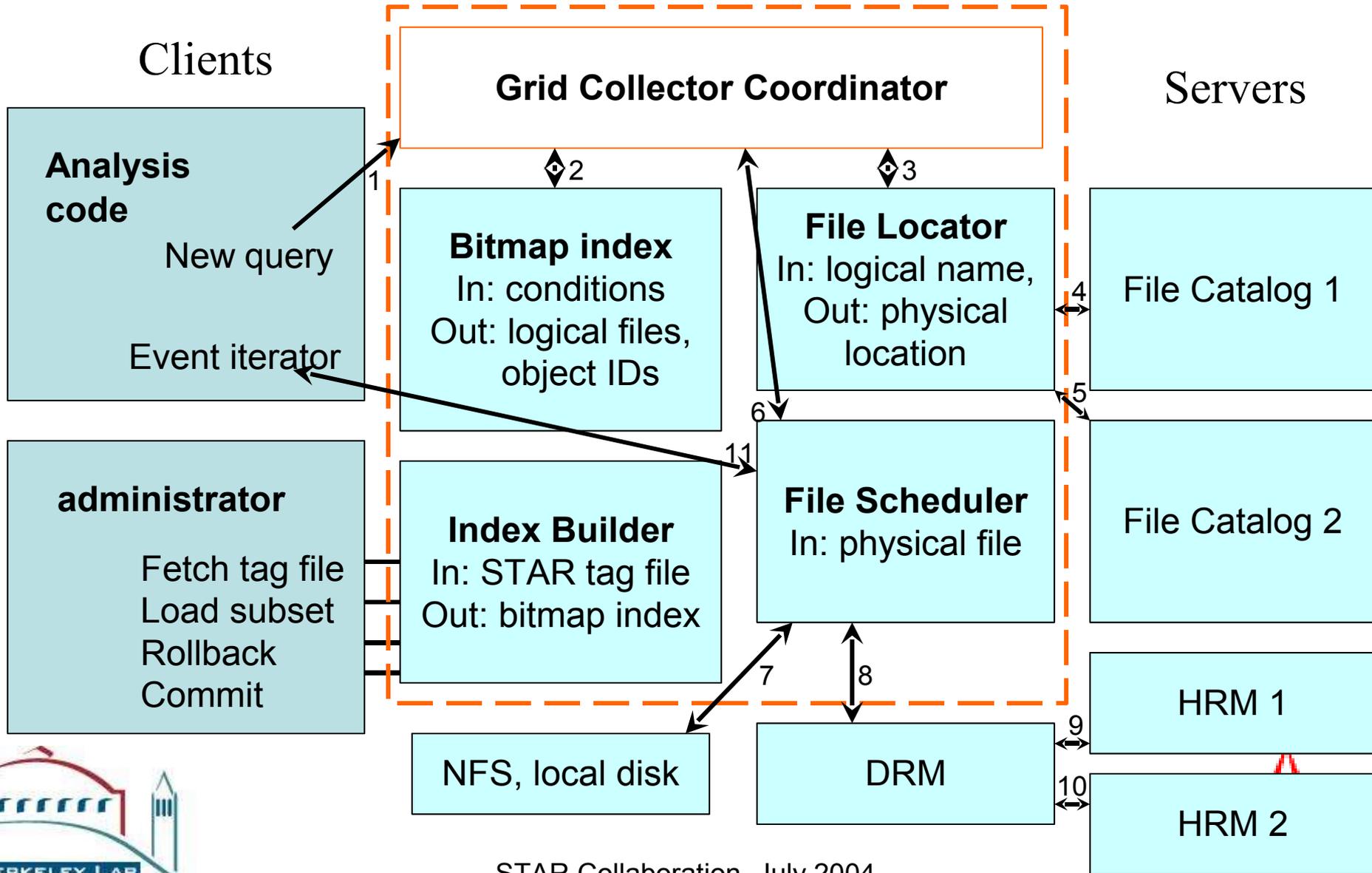
Storage Access Coordination System

<u>Strength</u> –

- Allow user to specify events as range conditions
- Automate file management tasks

<u>Weakness</u> –

- Designed for Objectivity data
- Access only one HPSS

User's Application

Query estimation / execution requests

Query Estimator (QE)

Bitmap index

open, read, close

Disk Cache

Query Monitor (QM)

Caching Policy Module

file purging

file caching

HPSS
High Performance Storage System

file caching request

Cache Manager (CM)

File Catalog (FC)

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STAR

Grid Collector: Architecture

STAR Collaboration, July 2004
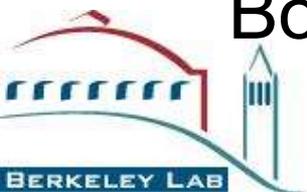
GC vs. STAR Scheduler

GC

- Select events with range conditions

- Read only selected events

- Automate all file and space management tasks

Scheduler

- Specify a list of files on disk

- Read all events of the files

- Use Data Carousel for HPSS files

Both can split large jobs to multiple machines

GC vs. STACS

GC

- Use multiple File Catalogs and multiple Storage Systems

- Integrate index building functions into the server
    - Improves index building speed

- Make use of distributed disk caches, clients can have their own caches

STACS

- Limit to only one File Catalog and one Storage System

- Use a separate Index Feeder to digest tag files
    - Has very low data transfer rate through CORBA

- Make use of one disk cache, clients must access the disk cache

Both select events with range conditions
Both automatically manage files and disks

This Year vs. Last Year

This Year

- Process all files, including MuDST

- Build indices fast
  - Use automated file management functions
  - Indexing 15 million events took one week

- Interact with multiple File Catalogs

Last Year

- Process event files, but not MuDST

- Build indices slowly
  - Index feeder requires manual file transfer
  - Indexing 5 million events took 10 weeks

- Interact with only one File Catalog

What Can Grid Collector Do For You

- If you gather statistics on lots of events
  - Grid Collector allows you to work with files not already on disk

- If you search for rare events, Grid Collector allows you to
  - Specify the events with ease
  - Access only relevant files
  - Read only selected events

- If you want to try some analysis ideas outside of the main computer centers,
  - Grid Collect manages file and space for you
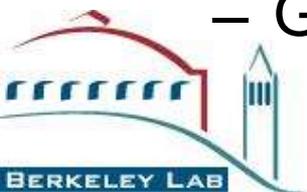
How To Use The Grid Collector

- Must use StIOMaker
  - StIOMaker can now handle all files including MuDST

- Replace StFile with StGridCollector
  - StIOMaker requires a StFileI object
  - One currently uses "new StFile(…)" to create a StFileI object
  - Grid Collector provides a new way, "StGridCollector::Create(SELECT geant, event WHERE …)"

- Iterate through events as usual

How To Use -- More Details

- External dependencies
  - Globus, ROOT, STAR Software
  - Storage Resource Manager (DRM, HRM)
  - ORBACUS
- Servers
  - Main Grid Collector Coordinator
  - DRM/HRM
  - File Catalogs
- Client library
  - User need to load this in the macros

How To Select Events

- SELECT [MuDst|event|…] WHERE NV0>100 AND …

- The WHERE clause consist of range conditions joined with logical operators AND, OR, NOT.

- All tags and a few File Catalog key words can be used in the WHERE clause

- Variables with multiple values can be addressed with index, e.g., scaAnalysisMatrix[7]

Status Of Grid Collector

- One version in production mode at BNL
- An updated version in final testing stages
- Brave early adopters still needed

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