



Enabling Grids for E-scienceE

Workload Management System (WMS)

HungChe Jen

EGEE Tutorial, June 5, 2007

Academia Sinica Grid Computing

www.eu-egee.org

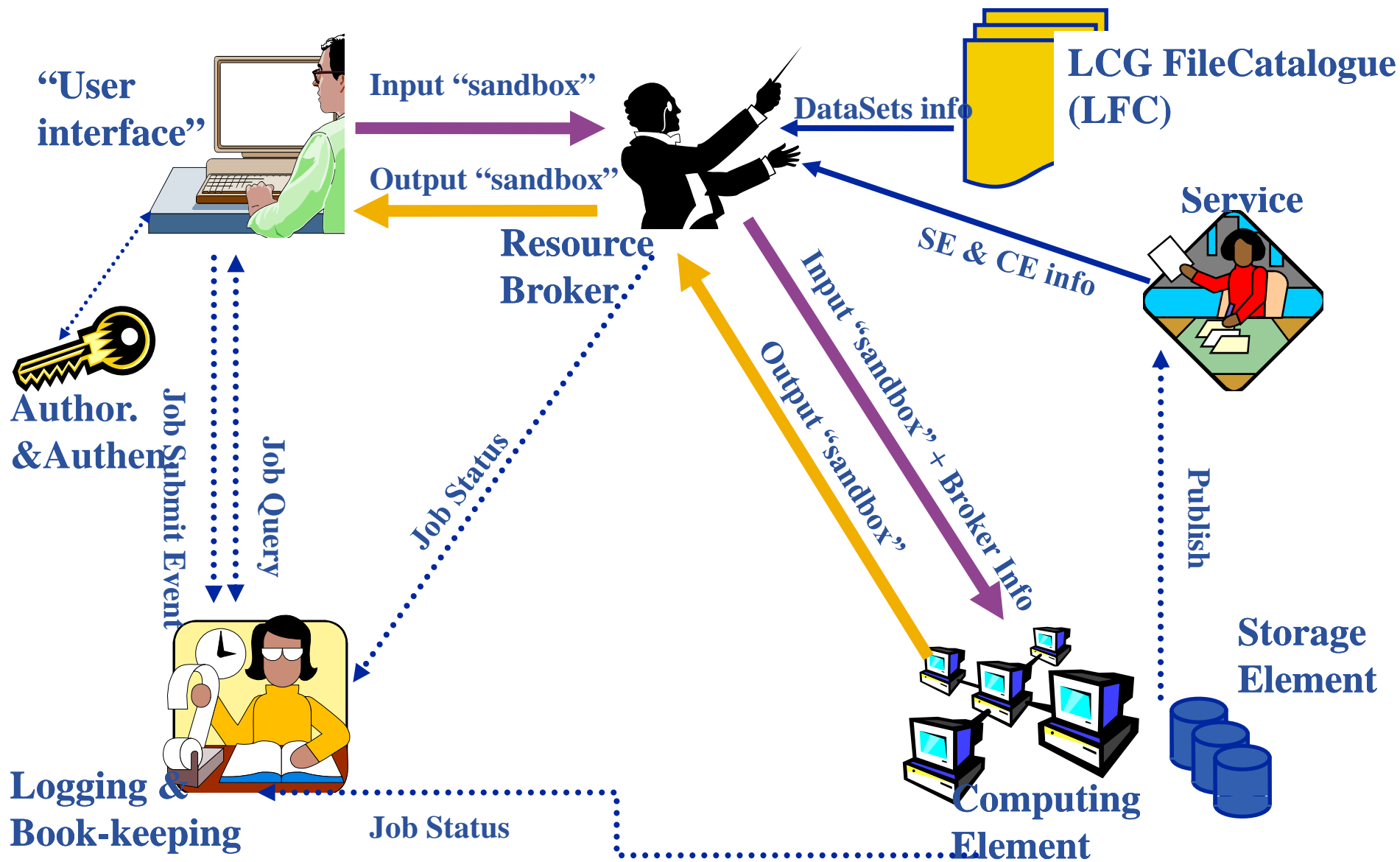


Information Society

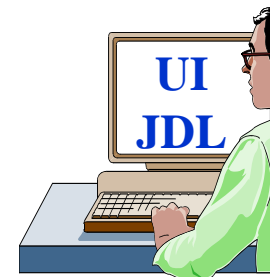


- Workload Management System
 - Introduction
 - Short review of concept
 - User Interface
 - JDL (Job Description Language)
 - Job work flow

- **The purpose of the Workload Management System (WMS) is to accept user jobs, to assign them to the most appropriate Computing Element, to record their status and retrieve their output .**
- **The Resource Broker (RB) is the machine where the WMS services run .**



- **The user's interface to the Grid**
- **Command-line interface to**
 - Proxy server
 - Job operations
 - To submit a job
 - Monitor its status
 - Retrieve output
 - Data operations
 - Upload file to SE
 - Create replica
 - Discover replicas
 - Other grid services
- **Also C++ and Java APIs**



- **To run a job user creates a JDL (Job Description Language) file**

- Submit job to grid via the “resource broker”,

edg-job-submit hostname.jdl

Example JDL file

```
Type = "Job";
JobType = "Normal";
Executable = "/bin/hostname";
StdOutput = "hostname.out";
StdError = "hostname.err";
OutputSandbox = {"hostname.err", "hostname.out"};
Arguments = "-f";
Requirements = other.GlueHostProcessorModel=="P4";
```

- **Type** = "Job";

Indicates the type of request, "Job" is the default value, could also be "DAG"

- **JobType** = "Normal";

For "Job" request type could be also Interactive, MPICH, Partitionable, Checkpointable

- **Executable** = "/bin/hostname";

The executable which is going to be run on the Worker Node (WN)

- **StdOutput** = "hostname.out";

The filename where, on WN, the standard output will be redirected

- **StdError** = "hostname.err";

The filename where, on WN, the standard error will be redirected

- **OutputSandbox** = {"hostname.err", "hostname.out"};

The files which have to be retrieved when job completes execution

- **Arguments** = "-f";

Optional arguments passed to the executable

- **Requirements** = other.BlueHostProcessorModel==“P4”;

Specify the resources where the job should run.

- **InputData** = "lfn:/grid/VOname/mydir/testfile.001";

The filename which need for this job.

- **DataAccessProtocol** = "gridftp";

Which access protocol you want to use . Gridftp , rfiio , etc.

```
[singapore40@glite-tutor HC]$ edg-job-list-match hostname.jdl
```

Selected Virtual Organisation name (from proxy certificate extension): gilda

Connecting to host glite-rb.ct.infn.it, port 7772

COMPUTING ELEMENT IDs LIST

The following CE(s) matching your job requirements have been found:

CEId

dgt01.ui.savba.sk:2119/jobmanager-lcgpbs-infinite

dgt01.ui.savba.sk:2119/jobmanager-lcgpbs-long

dgt01.ui.savba.sk:2119/jobmanager-lcgpbs-short

trigriden00.unime.it:2119/jobmanager-lcgpbs-infinite

trigriden00.unime.it:2119/jobmanager-lcgpbs-long

trigriden00.unime.it:2119/jobmanager-lcgpbs-short

- [singapore40@glite-tutor HC]\$ **lcg-info --vo gilda --list-ce --attrs Processor**

- CE: ce-gilda-edu.ceta-ciemat.es:2119/jobmanager-lcgpbs-infinite

- Processor Xeon

- CE: ce-nano-37.to.infn.it:2119/jobmanager-lcgpbs-infinite

- Processor PIII

- CE: trigrident00.unime.it:2119/jobmanager-lcgpbs-short

- Processor P4

.

.

- [singapore40@glite-tutor HC]\$ **lcg-info --list-attrs**

Attribute name	Glue object class	Glue attribute name
----------------	-------------------	---------------------

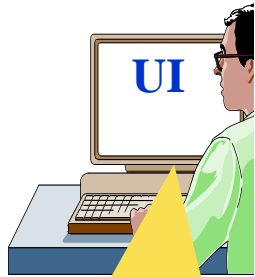
Processor	GlueSubCluster	GlueHostProcessorModel
-----------	----------------	------------------------

Memory	GlueSubCluster	GlueHostMainMemoryRAMSize
--------	----------------	---------------------------

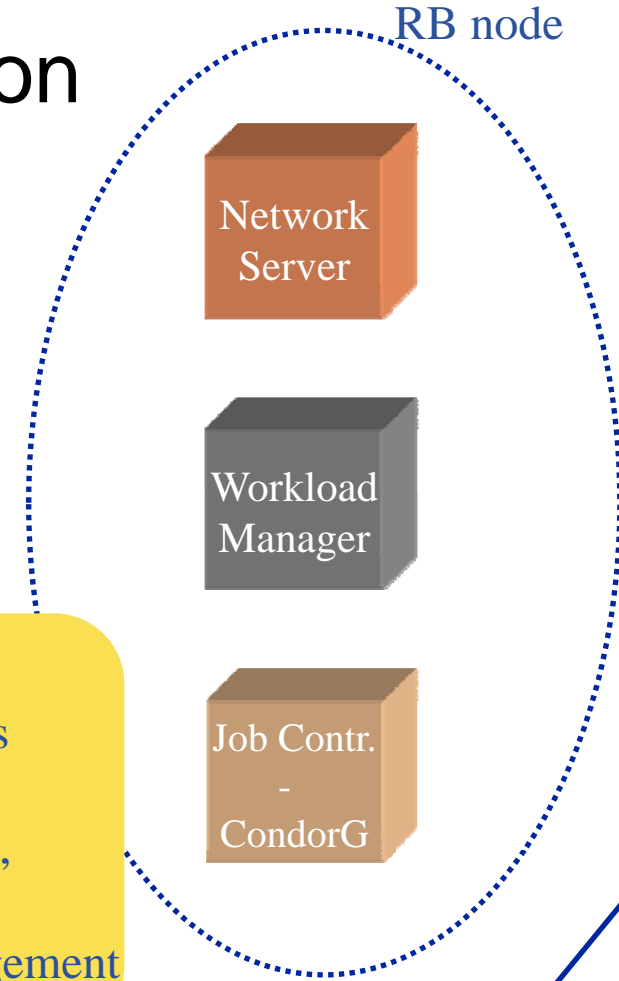
SEType	GlueSE	GlueSEType
--------	--------	------------

.

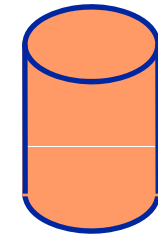
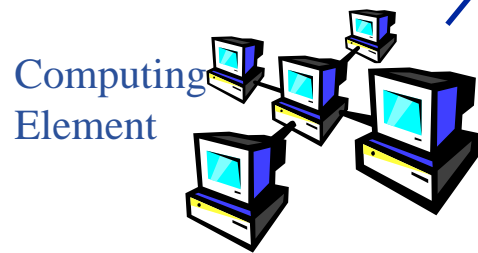
Job submission



UI: allows users to access the functionalities of the WMS (via command line, GUI, C++ and Java APIs)
WMS: Workload Management System



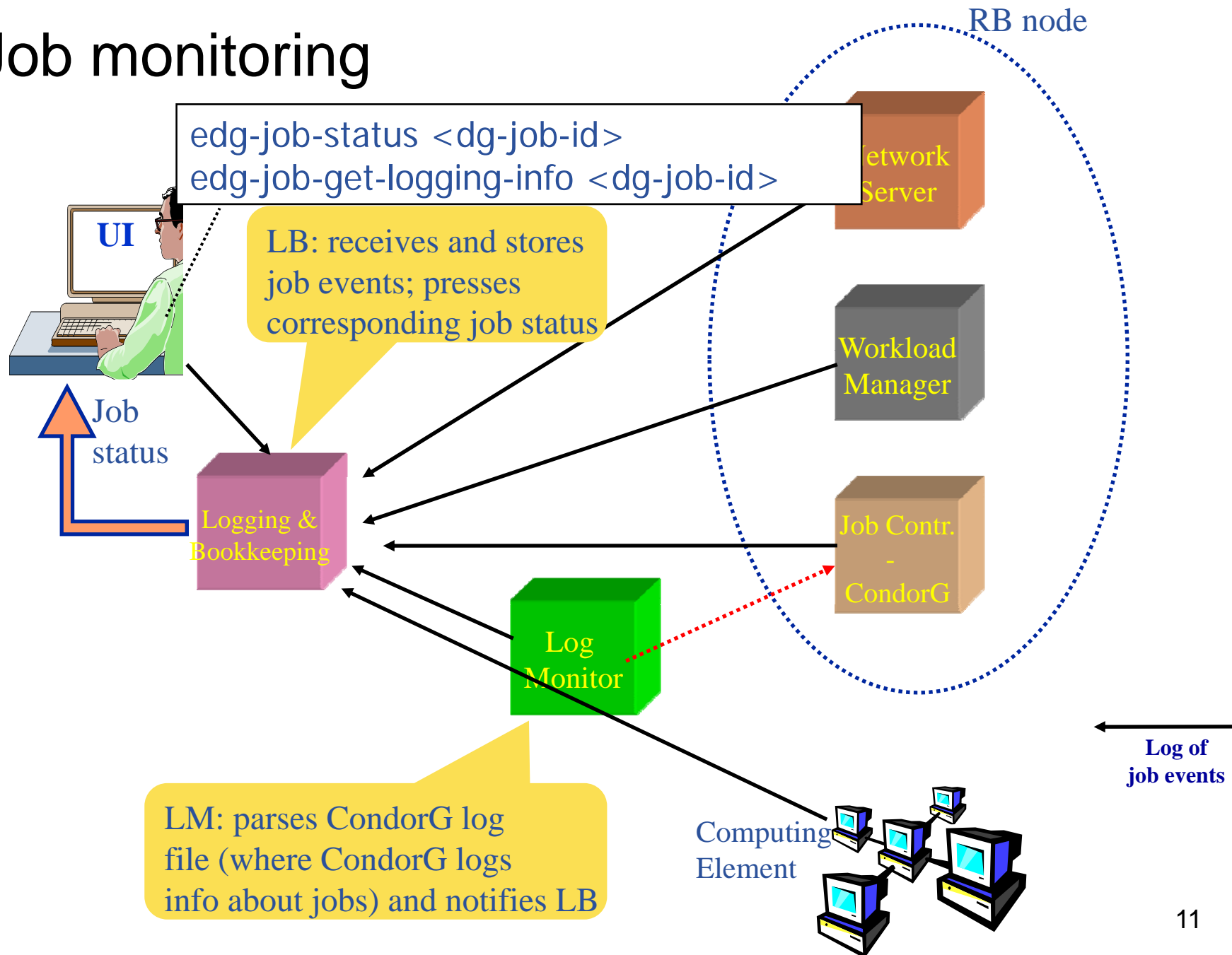
Job Status



CE characts & status

SE characts & status

Job monitoring



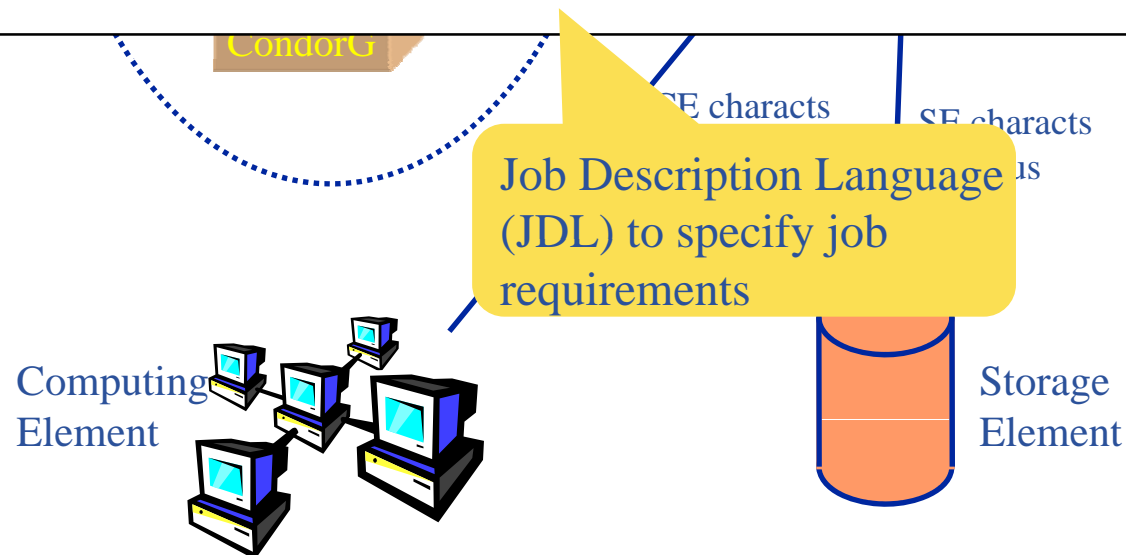
edg-job-submit myjob.jdl

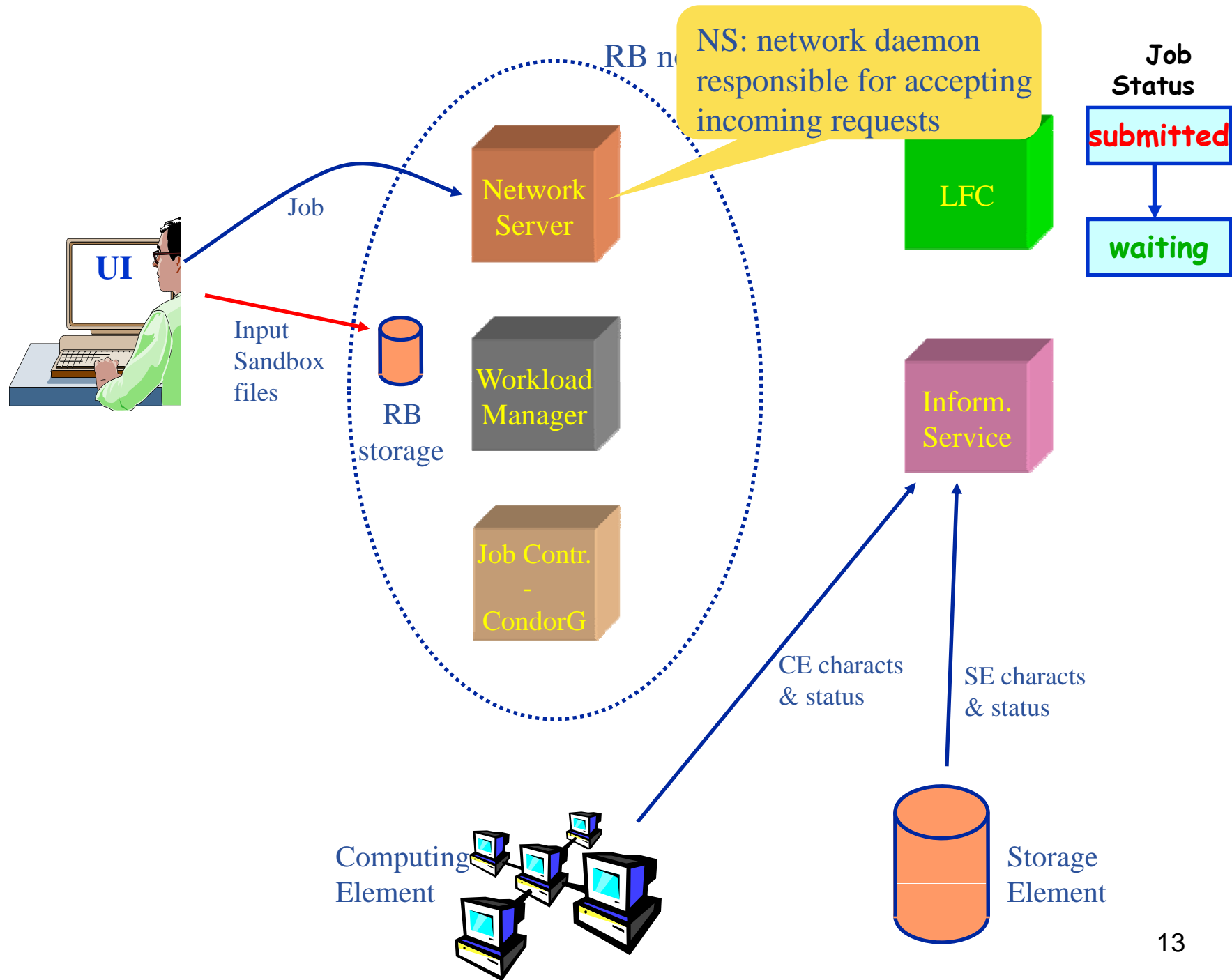
Myjob.jdl

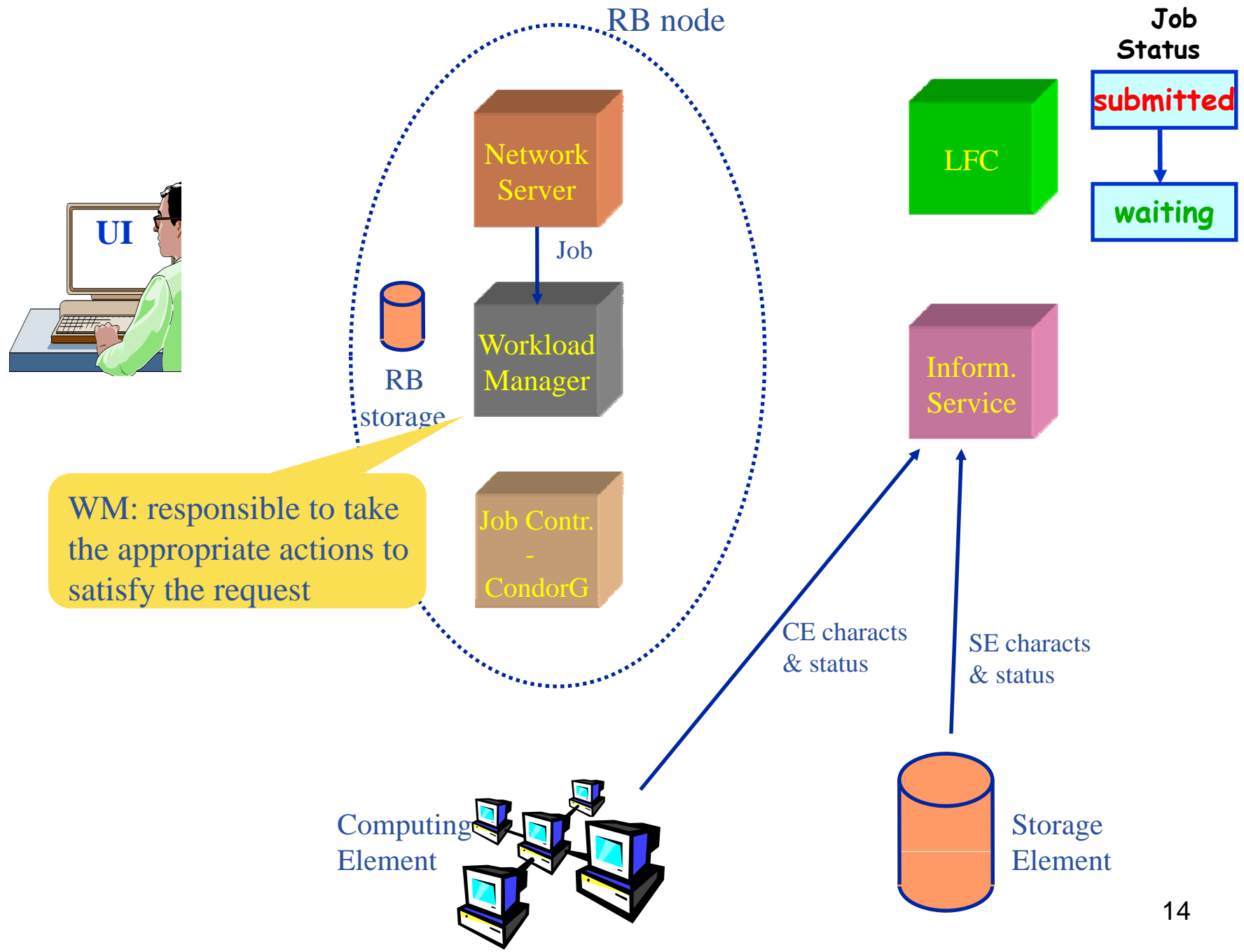
```
JobType = "Normal";  
Executable = "$(CMS)/exe/sum.exe";  
InputSandbox = {"/home/user/WP1testC", "/home/file*",  
"/home/user/DATA/*"};  
OutputSandbox = {"sim.err", "test.out", "sim.log"};  
Requirements = other. GlueHostOperatingSystemName ==  
"linux" &&  
other. GlueHostOperatingSystemRelease == "Red Hat 7.3" &&  
other. GlueCEPolicyMaxCPUTime > 10000;
```

Job
Status

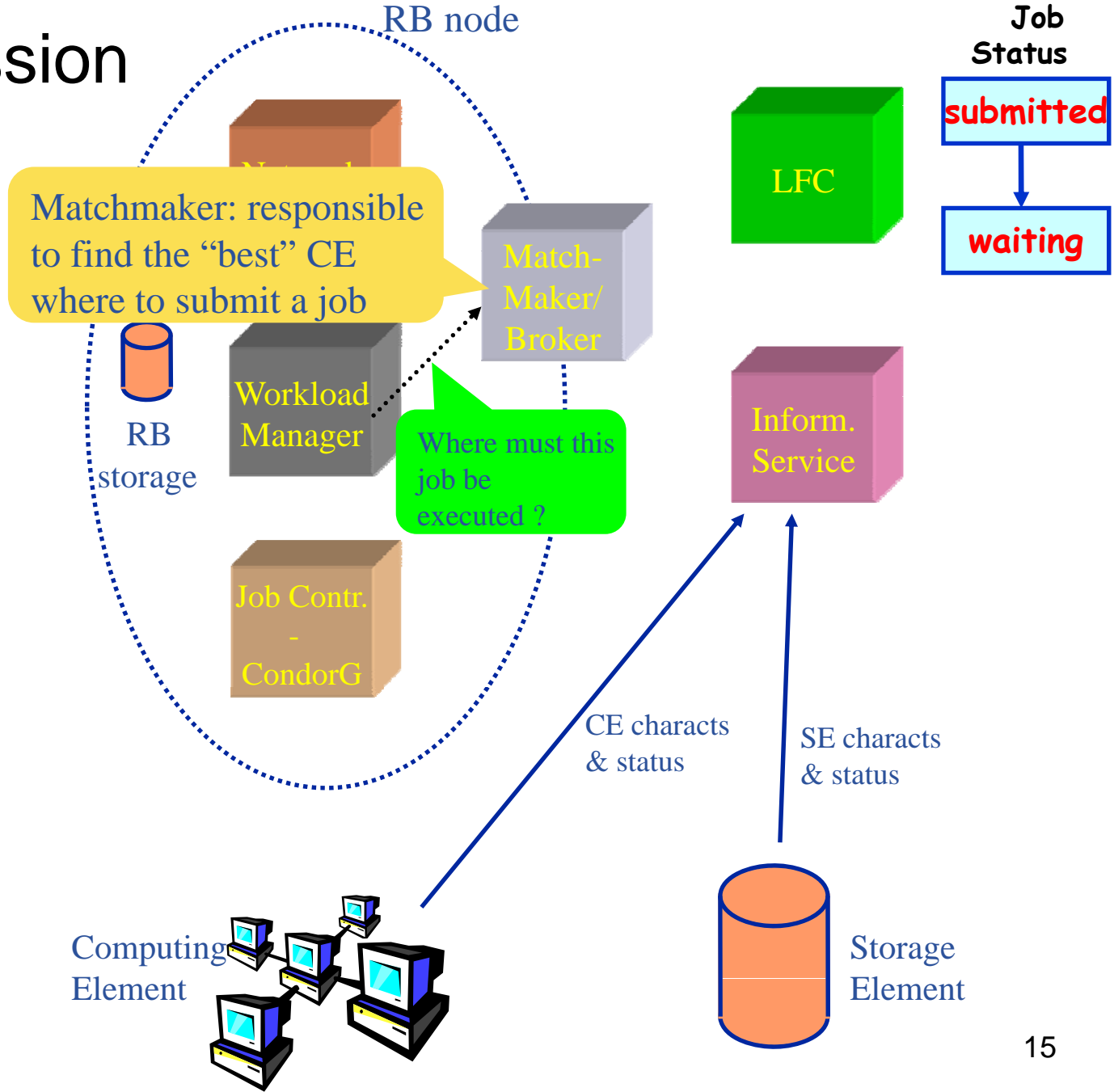
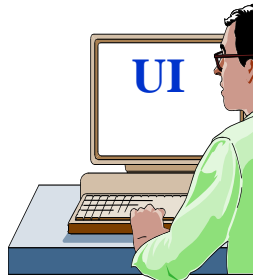
submitted



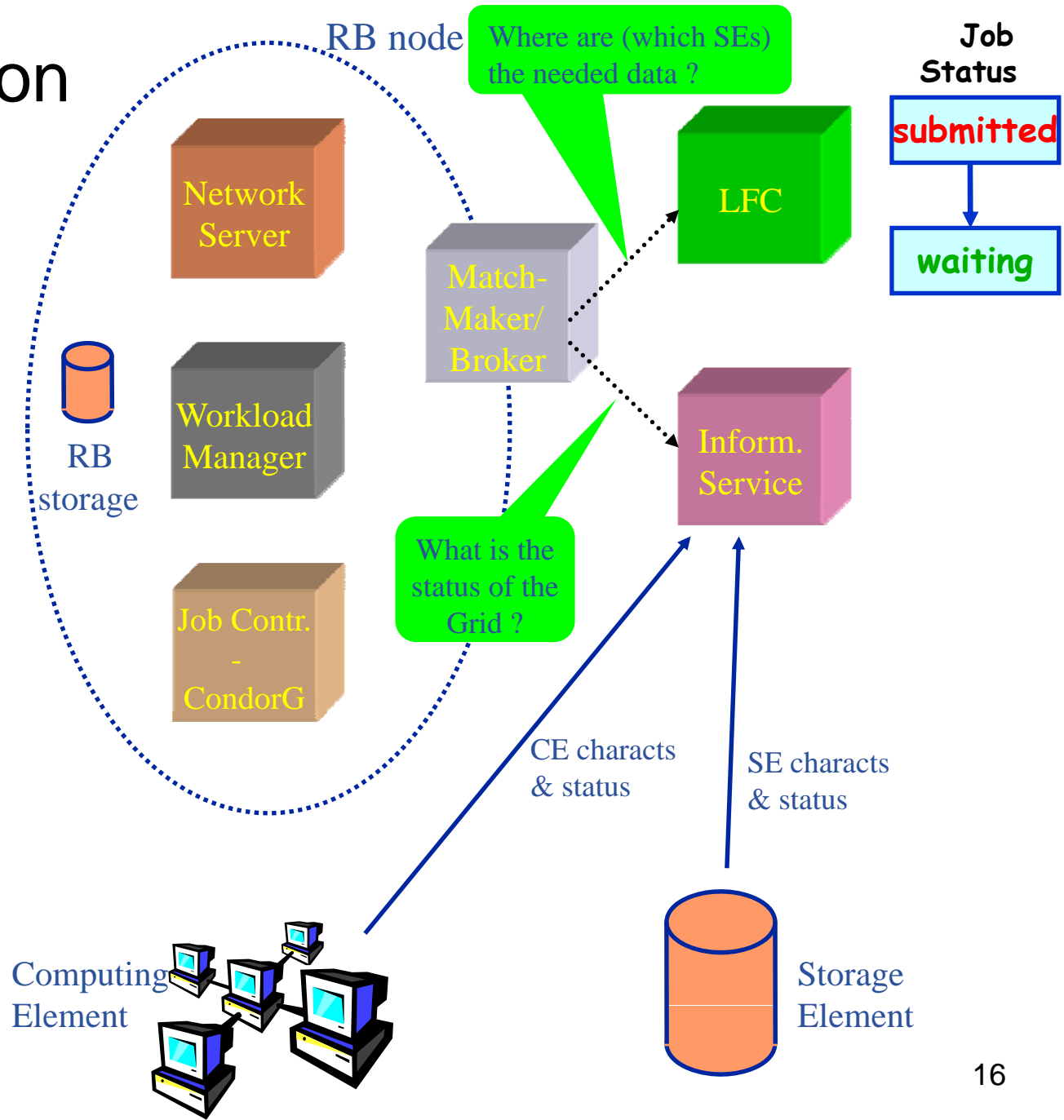
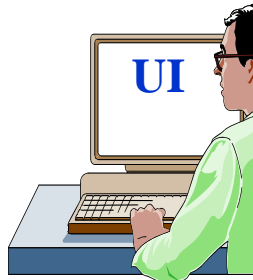




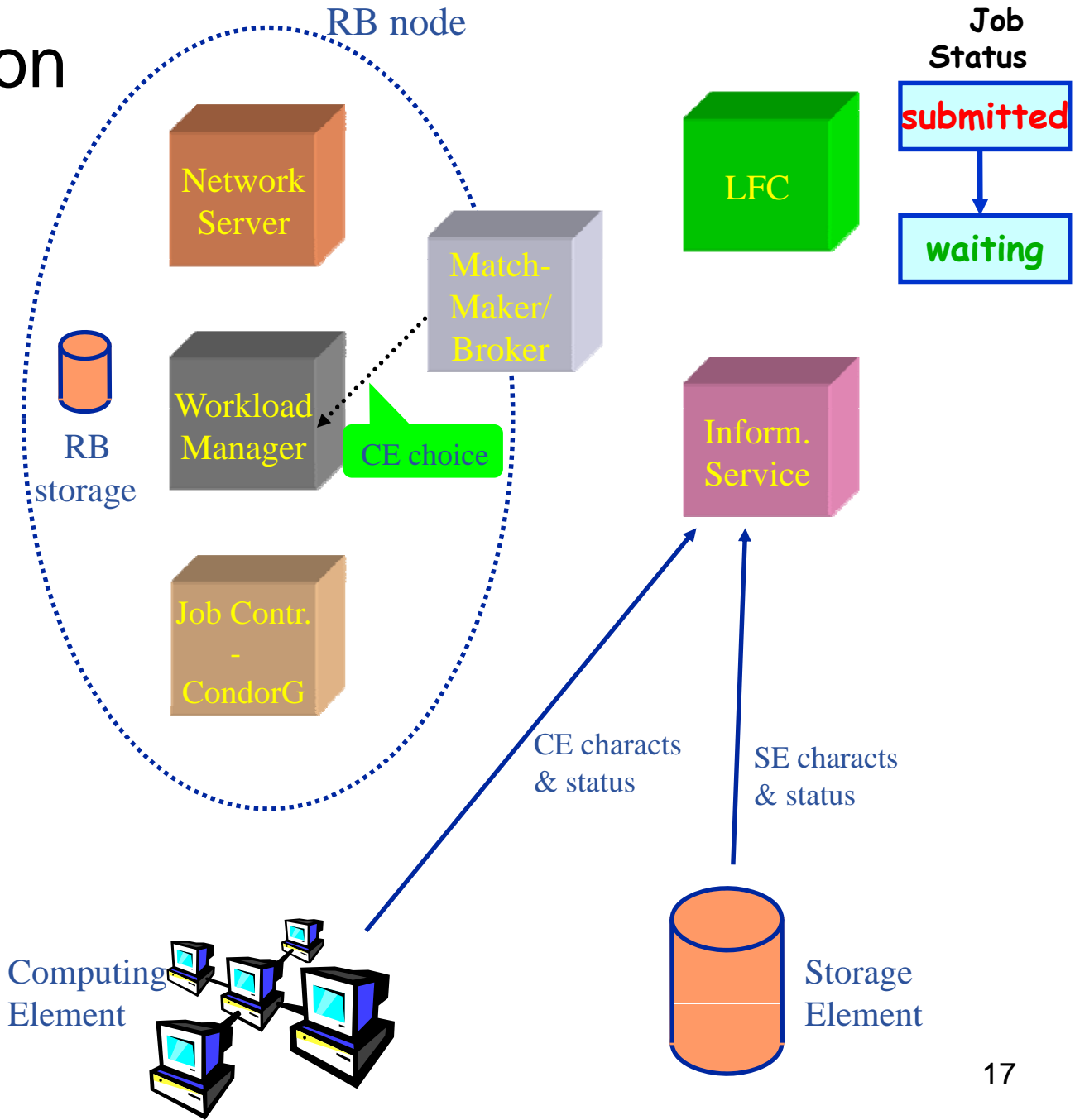
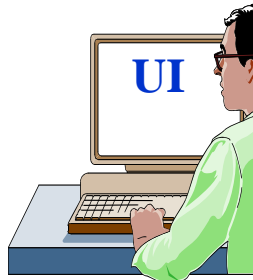
Job submission



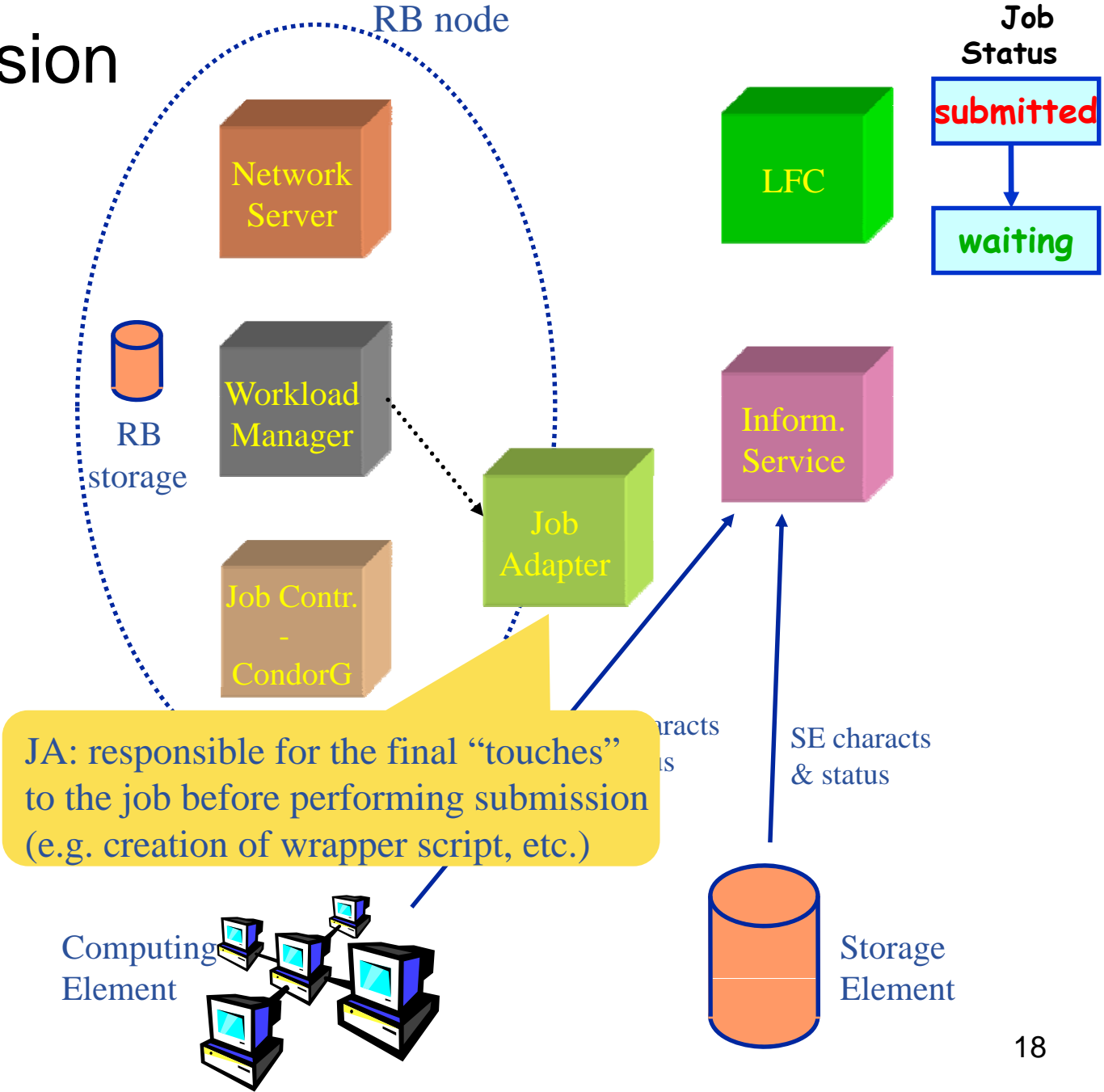
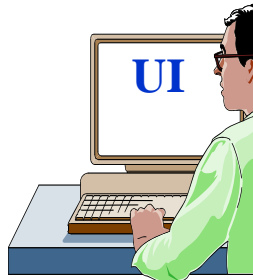
Job submission



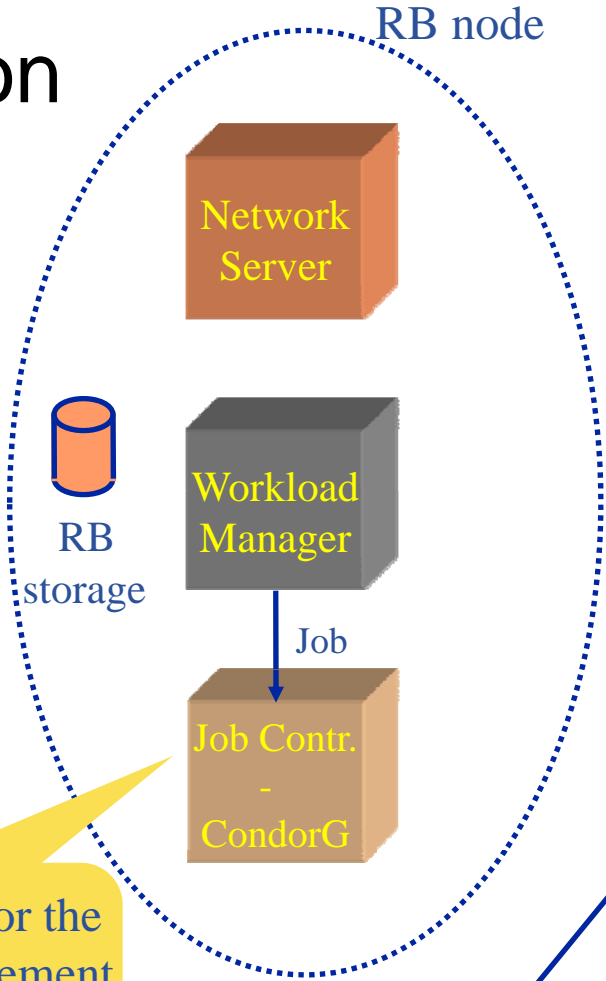
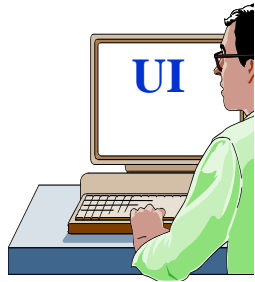
Job submission



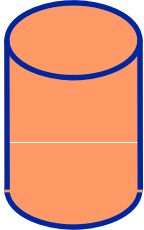
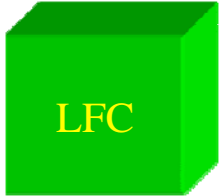
Job submission



Job submission



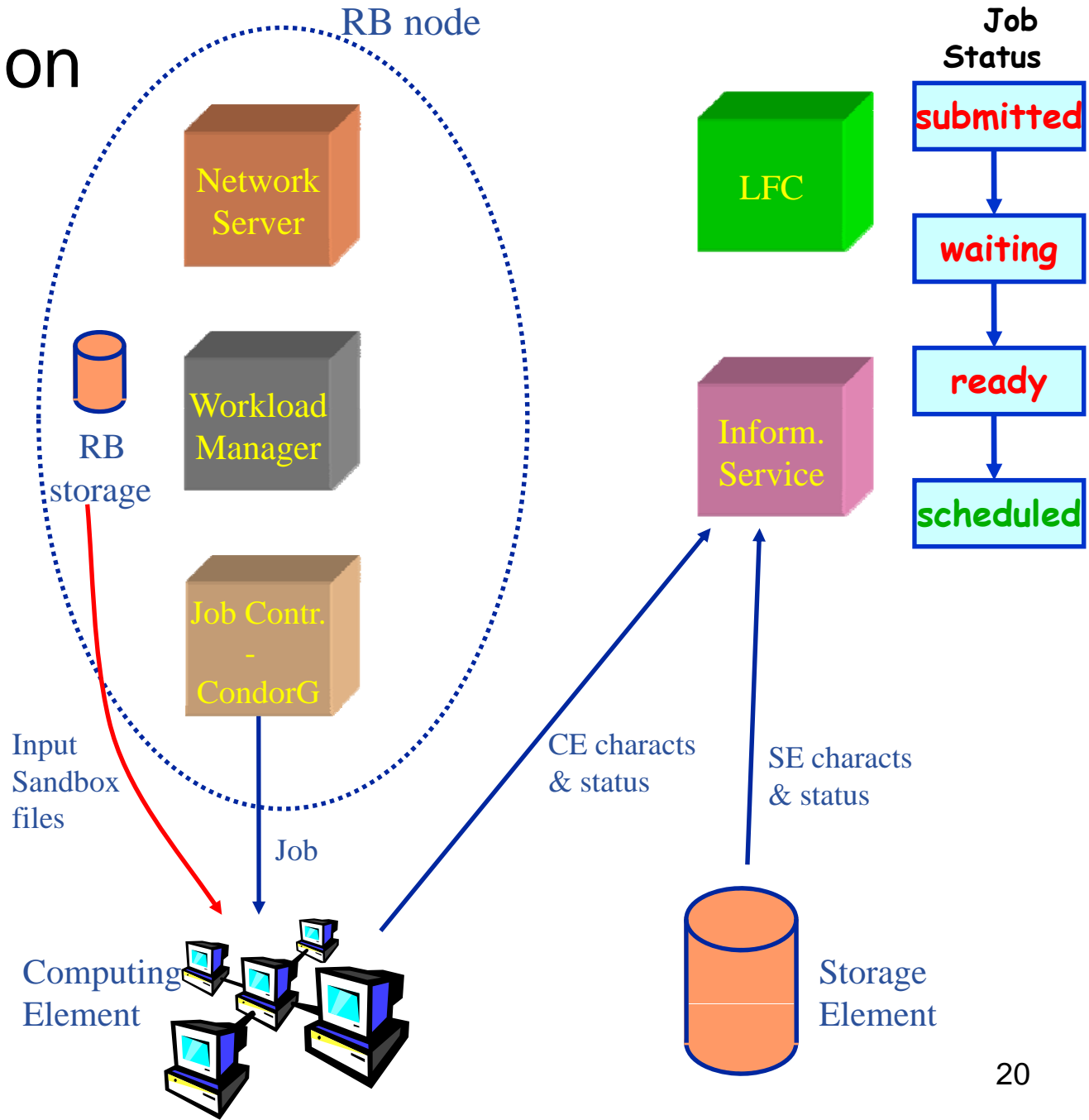
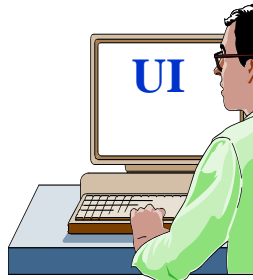
JC: responsible for the actual job management operations (done via CondorG)

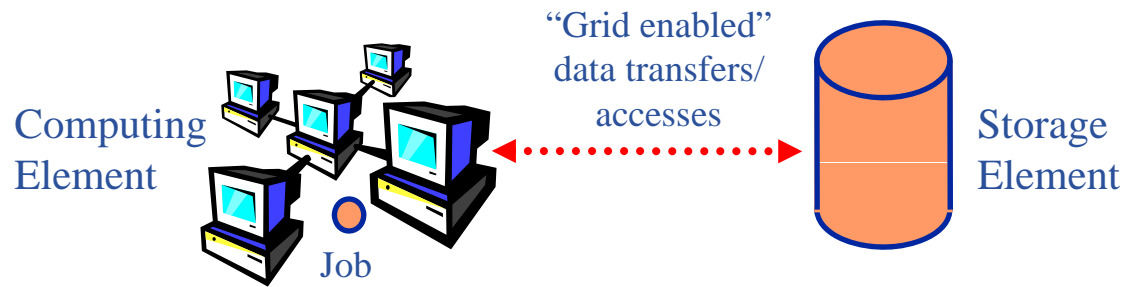
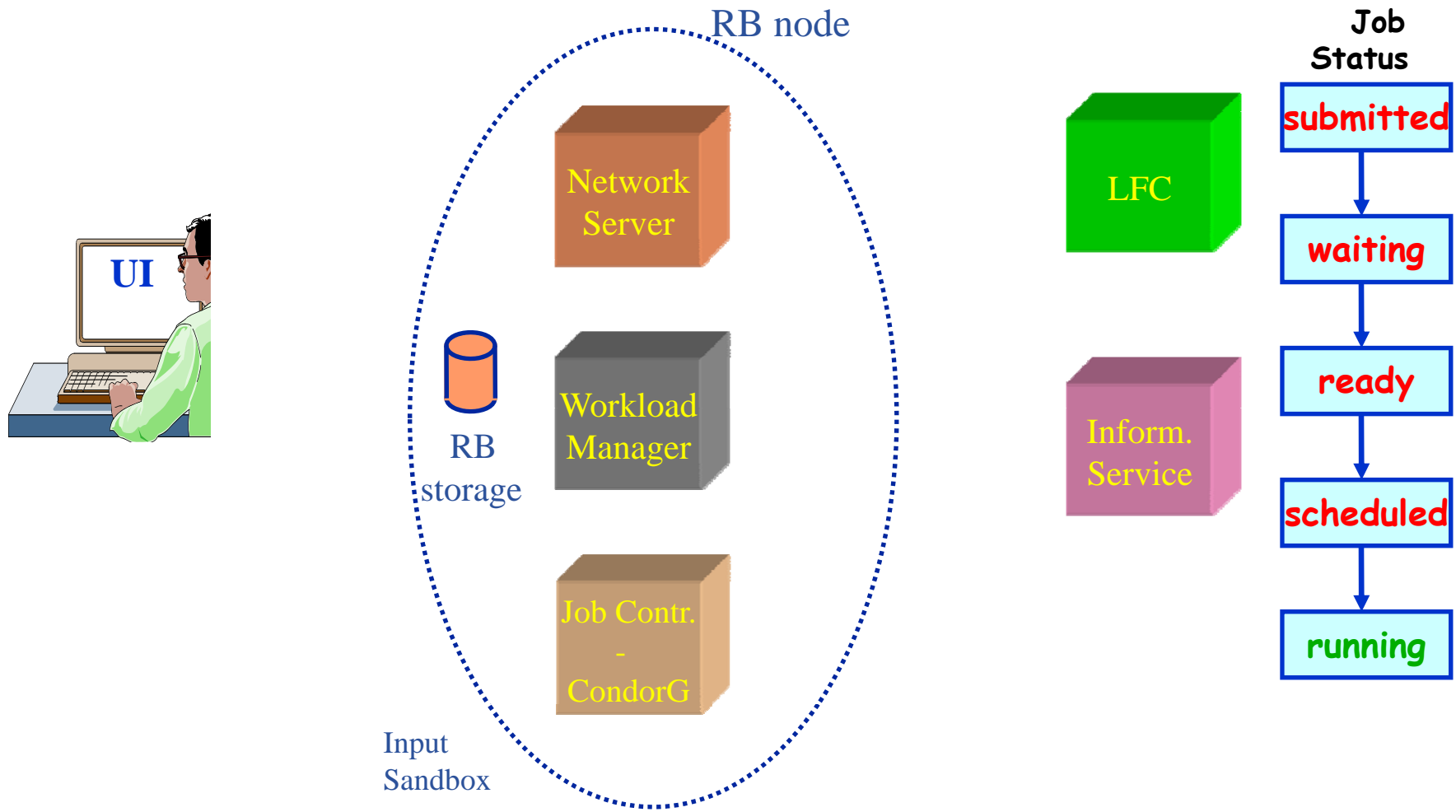


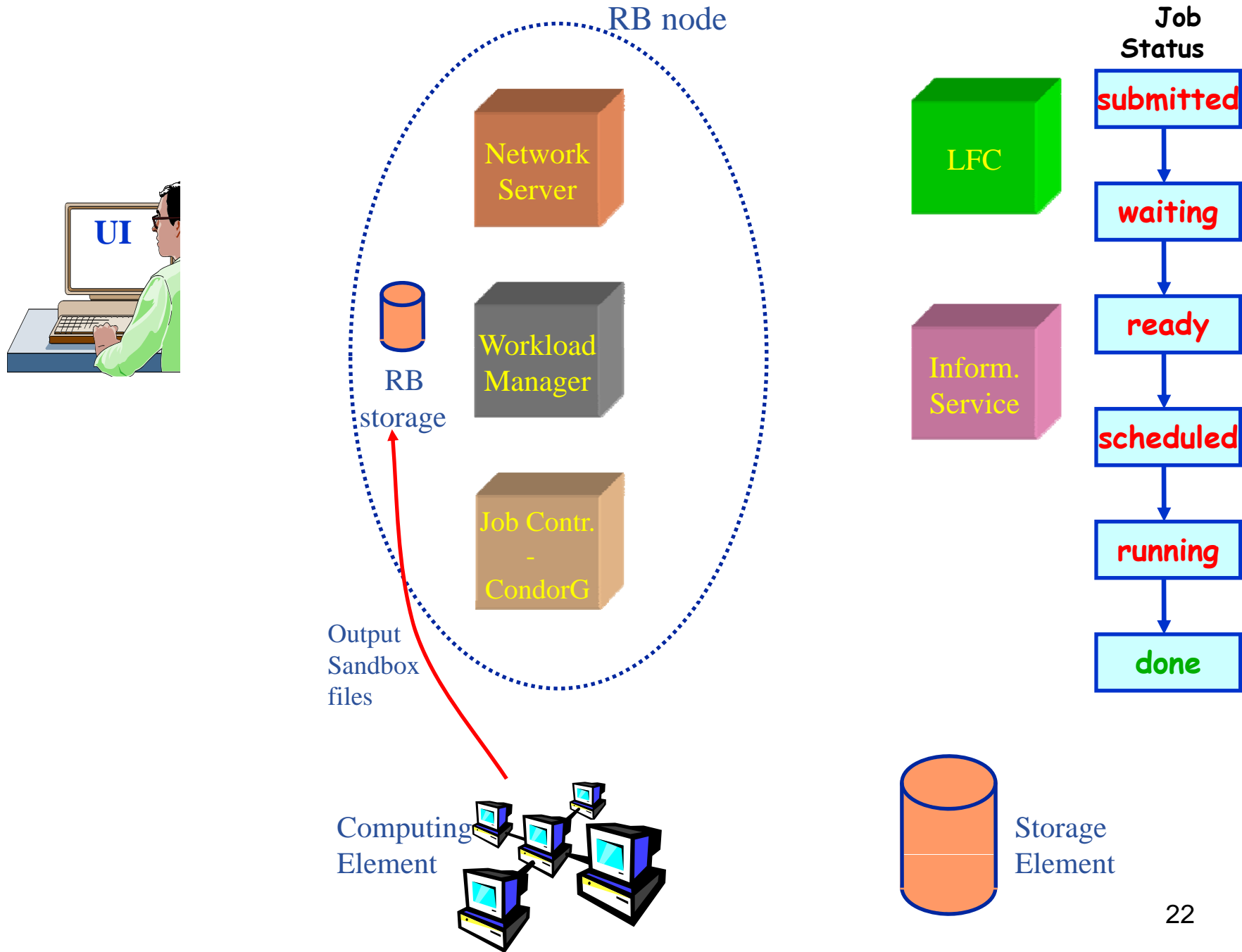
CE characts & status

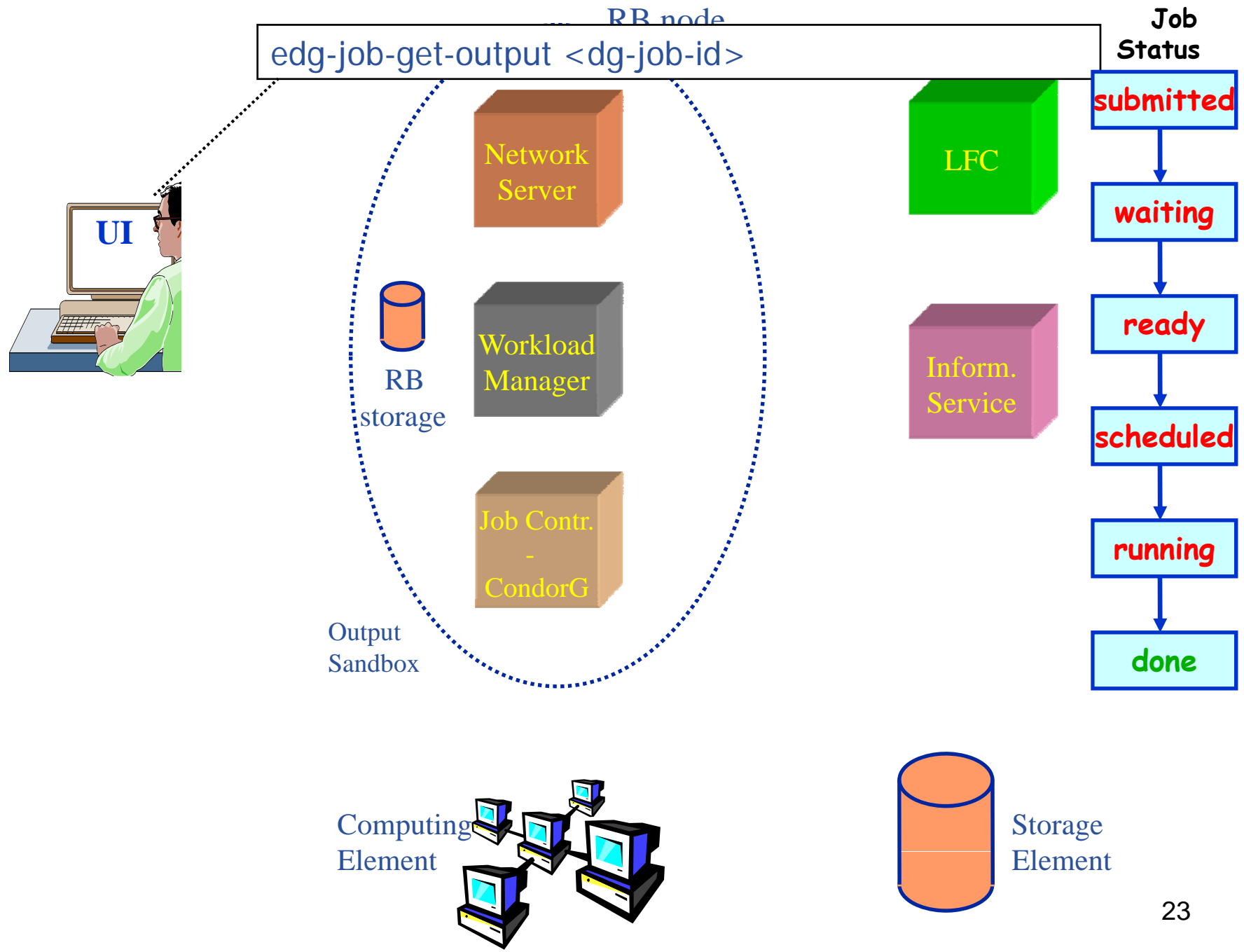
SE characts & status

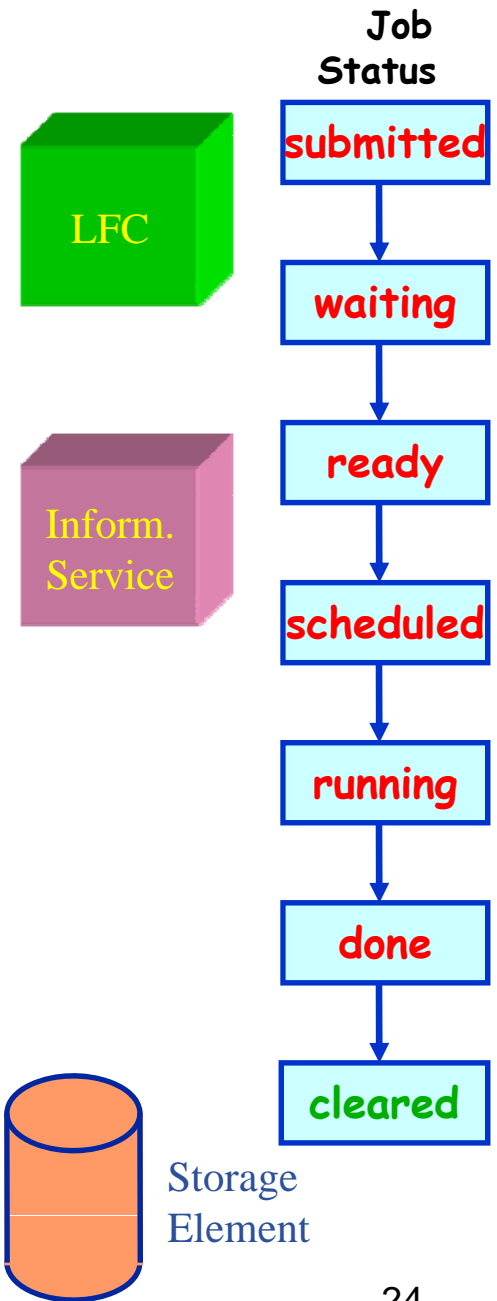
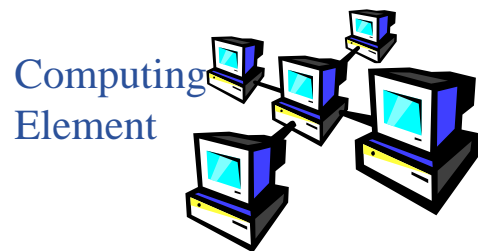
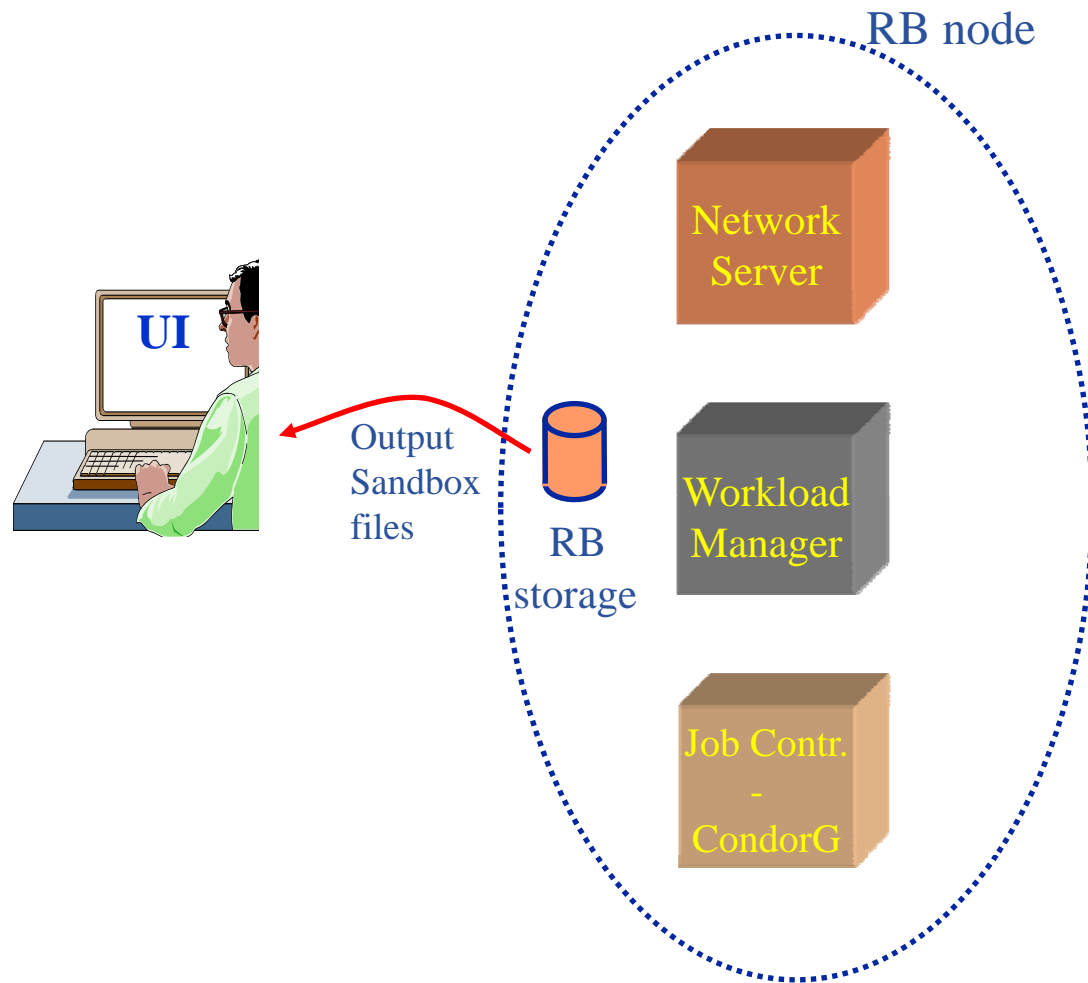
Job submission











Flag	Meaning
SUBMITTED	submission logged in the LB
WAIT	job match making for resources
READY	job being sent to executing CE
SCHEDULED	job scheduled in the CE queue manager
RUNNING	job executing on a WN of the selected CE queue
DONE	job terminated without grid errors
CLEARED	job output retrieved
ABORT	job aborted by middleware, check <i>reason</i>

- `[singapore40@glite-tutor HC]$ edg-job-submit hostname.jdl`

Selected Virtual Organisation name (from proxy certificate extension): gilda

Connecting to host glite-rb.ct.infn.it, port 7772

Logging to host glite-rb.ct.infn.it, port 9002

JOB SUBMIT OUTCOME

The job has been successfully submitted to the Network Server.

Use `edg-job-status` command to check job current status. Your job identifier (`edg_jobId`) is:

- <https://glite-rb.ct.infn.it:9000/tm1iaJeCxEjD2cmd0-Df6A>

- **[singapore40@glite-tutor HC]\$ edg-job-status <https://glite-rb.ct.infn.it:9000/tm1iaJeCxEjD2cmd0-Df6A>**

BOOKKEEPING INFORMATION:

Status info for the Job : <https://glite-rb.ct.infn.it:9000/tm1iaJeCxEjD2cmd0-Df6A>

Current Status: Scheduled

Status Reason: Job successfully submitted to Globus

Destination: trigriden00.unime.it:2119/jobmanager-lcgpbs-infinite

reached on: Mon Jun 4 02:20:14 2007
