


Virtualization of Grid Working Nodes for Processing of Jobs Prepared for Various Runtime Environments

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Motivation

- Grid systems are used for calculations and data processing in various applied areas
- applied jobs are developed for definite runtime environments (RE) = OS, libraries, FS, etc.
- Grid WNs operate offer a fixed RE
-  if applied jobs were not developed initially for the particular RE of the WNs, they cannot be directly processed in the Grid

Objective & Approach

- Main objective is to propose a method for batch processing in grid of jobs prepared for various RE
 - in particular, jobs developed for OS Windows, should be able to be processed by WNs operating under OS Linux.
- The method is based on virtualization of WNs by using virtual machines (VM)
- The work is intended mainly for EGEE/RDIG grid infrastructure → implementation should be based on gLite MW

VM Choice

- Types of virtualization:
 - Hardware emulation
 - Full virtualization
 - Paravirtualization
 - Operating system-level virtualization
- Paravirtualization – a good matching of functional abilities (with the hardware support: Intel VT / AMD-V) & low overheads
- Most attractive VMM of this type: Xen (<http://www.xen.org>)

Necessary gLite modification

- In our approach enabling job processing in various RE requires a *minimal* gLite modification – only WNs must be modified:
 - wrapping script `jobwrapper` must be modified
 - 2 new scripts must be added
 - `jobwrapper-vee`
 - `xenrun`
 - VMM must be installed
 - Disk images with REs must be available in WN's (N)FS
- CE configuration peculiarity:
 - `/opt/edg/var/info/host/host.list` with content:
`VEE-REname1`
`VEE-REname2`
`...`

General Scenario

- A user in the JDL-file specifies required RE by using the Glue schema attribute *GlueHostApplicationSoftwareRunTimeEnvironment*
- WMS with the help of IS finds an appropriate RC with CE matching the requirement in the JDL-file and submits the job to this CE
- The CE processes the job in the usual (gLite) manner and transfers it to the local batch system and eventually to a modified WN

Sample of JDL-file

```
Executable = "testJob.exe";
```

```
StdOutput = "testJob.out";
```

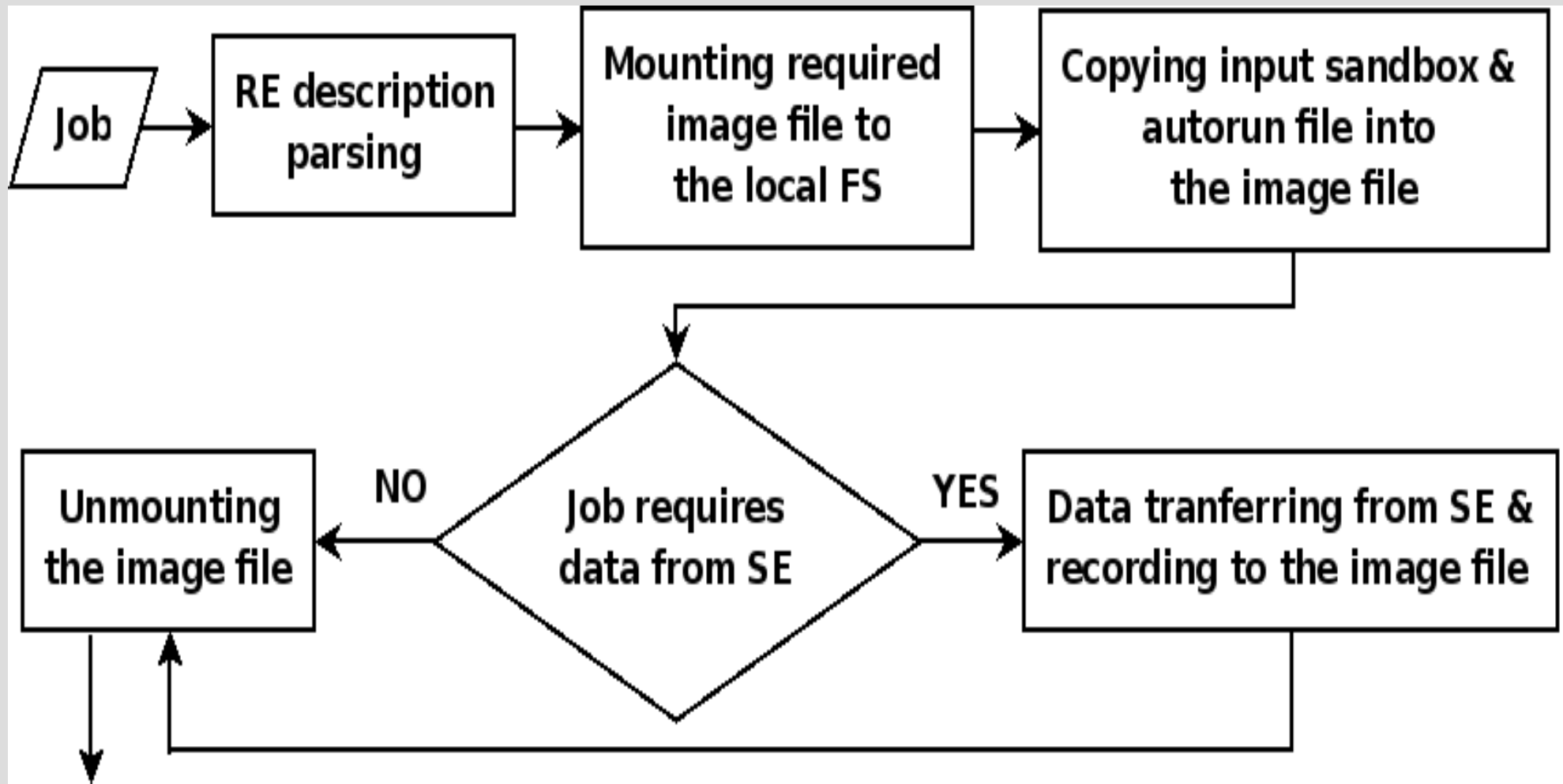
```
StdError = "testJob.err";
```

```
InputSandbox = {"/testJob.exe", "job.jdl"};
```

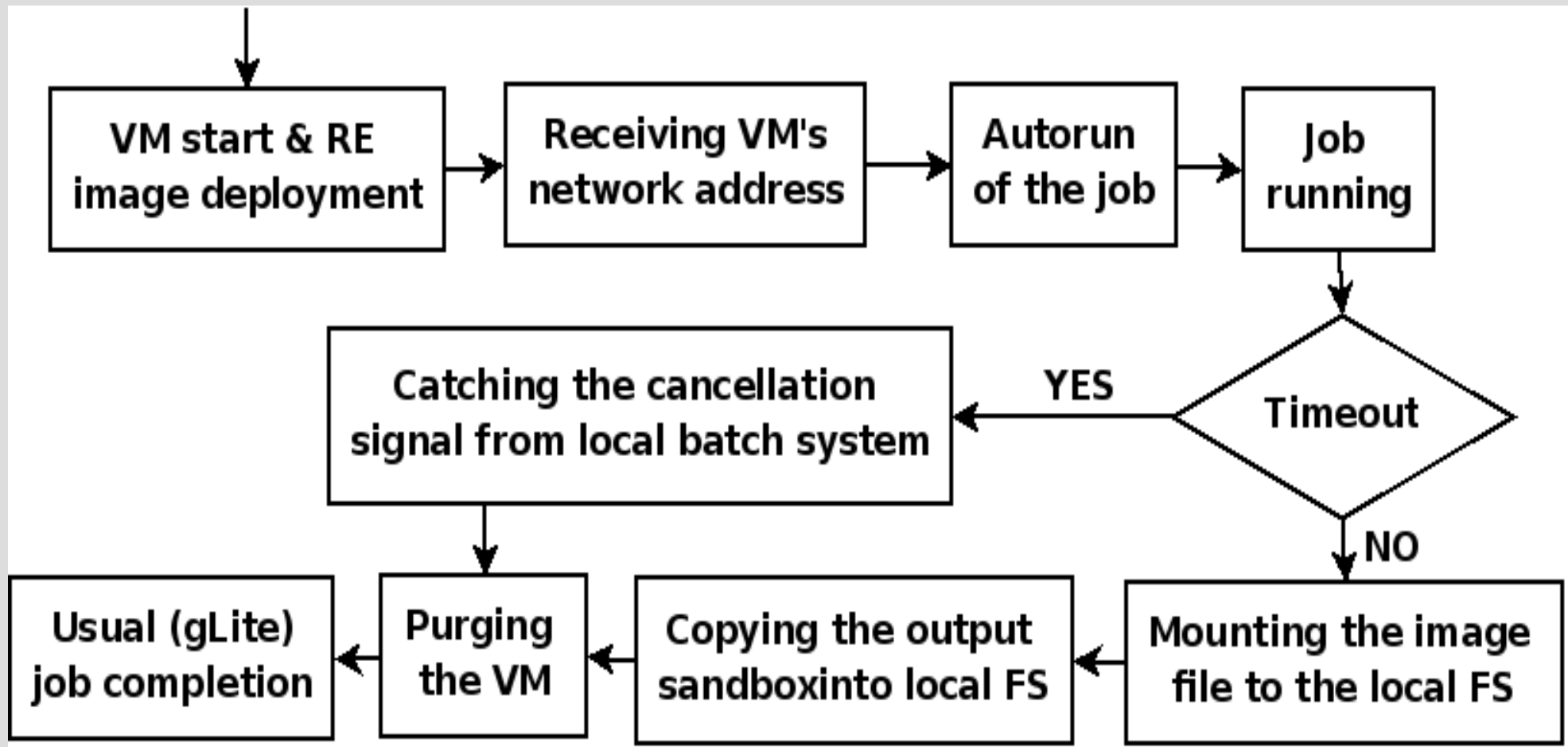
```
OutputSandbox = {"testJob.out", "testJob.err"};
```

```
Requirements = Member("VEE-REname1",  
    other.GlueHostApplicationSoftwareRunTime  
    Environment);
```

Algorithm of Job Processing by a modified WN



Algorithm of Job Processing by a modified WN (2)



Conclusion

- The approach suggested provides a substantial extension of the class of applied problems that can be solved with the aid of global grid-infrastructures
- Some functionalities should be added to the current realization (custom REs, data transfer while job running)

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