



**NORDUGRID**

*Grid Solution For Wide Area  
Computing and Data Handling*

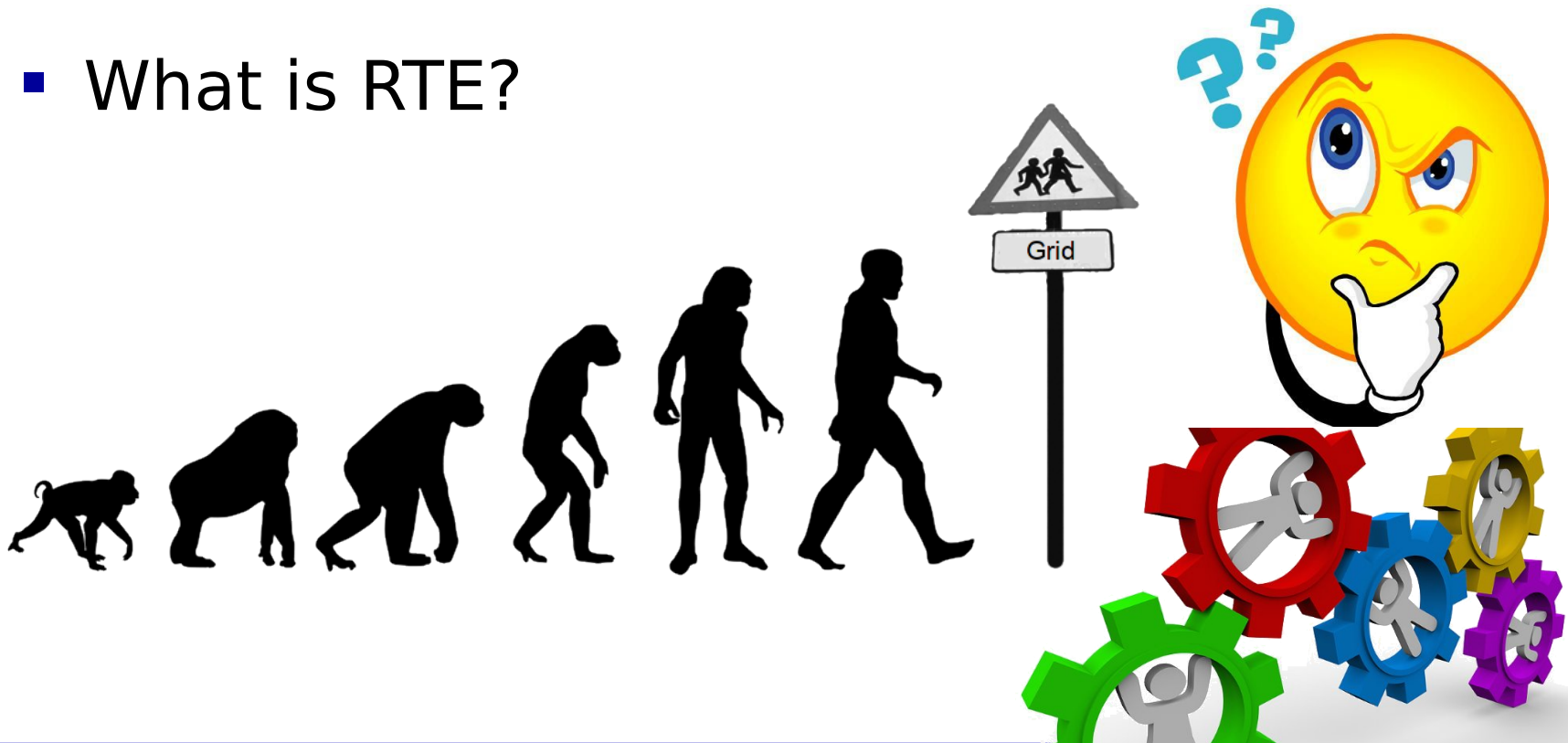
# **Working with RunTime Environments**

Understanding RTEs in ARC6

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# RunTime Environments

- What is RTE?



# RunTime Environments

The **named reference** to the same

- feature (ENV/PROXY)
- resource (ENV/GPU)
- software (APPS/HEP/ATLAS)
- etc

that is ***available*** on the resource providers ***using the same interface*** despite ***possibly different internal implementation***

# RTEs Functions

- Advertising
  - indicate the available environment to be requested by end-users
- Modifying job environment
  - flexibly contextualize job execution environment
    - software or workflow-specific paths
    - tools
    - libraries
    - environmental variables
    - dynamic content
    - etc

# Advertising RTEs

<b>Comment</b>	U of Oslo Abel cluster - A; GLUE2ServiceID=
<b>Contact string</b>	gsiftp://ce01.grid.uio.no:2811/jobs
<b>Certificate issuer's hash</b>	e523eeaa
<b>Postal code</b>	NO-0316
<b>Cluster alias</b>	Abel C1(UiO/USIT)
<b>Authorised VOs</b>	VO:atlas
<b>Owner</b>	University of Oslo (USIT)

## Runtime environment

```

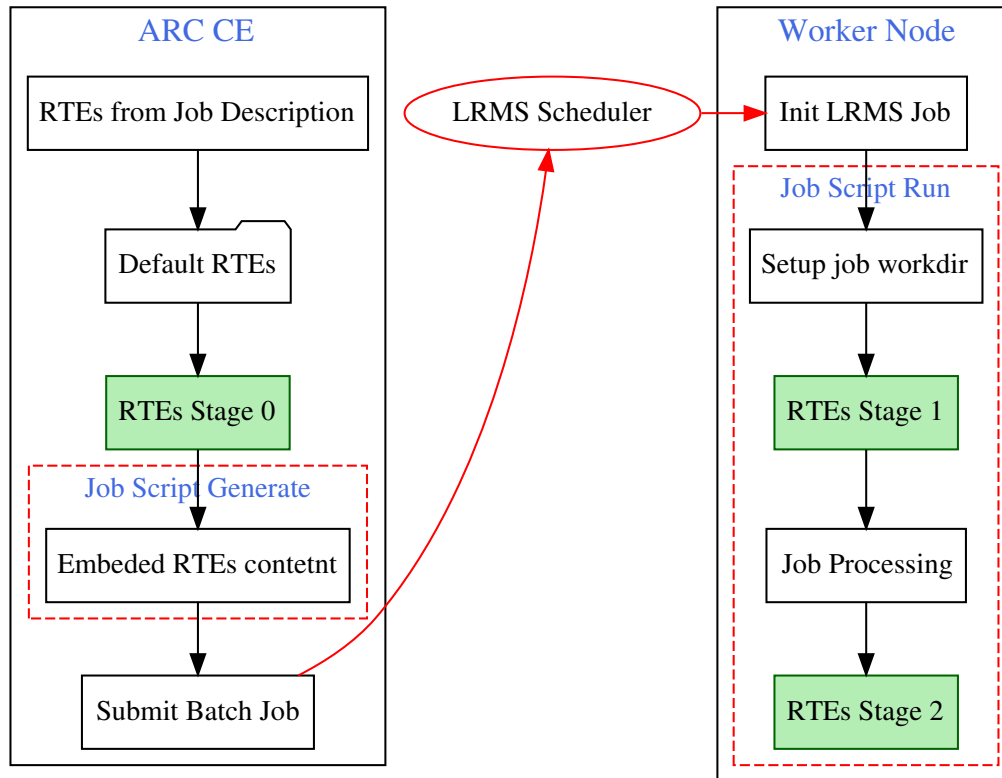
SLC6-GCC49-OPT
APPS/HEP/ATLAS-TRIGMC-20.7.9.8.3-X86_64-
SLC6-GCC49-OPT
APPS/HEP/ATLAS-WZBENCHMARKS-15.5.1.1.2-
I686-SLC4-GCC34-OPT
APPS/HEP/ATLAS-WZBENCHMARKS-15.5.4.1.1-
I686-SLC4-GCC34-OPT
APPS/HEP/ATLAS-WZBENCHMARKS-15.6.10.4.2-
I686-SLC5-GCC43-OPT
APPS/HEP/ATLAS-WZBENCHMARKS-15.6.5.5.1-
I686-SLC5-GCC43-OPT
APPS/HEP/ATLAS-WZBENCHMARKS-15.6.8.2.1-
I686-SLC5-GCC43-OPT
APPS/HEP/ATLAS-WZBENCHMARKS-15.6.8.2.2-
I686-SLC5-GCC43-OPT
APPS/HEP/ATLAS-WZBENCHMARKS-15.6.8.2.2-
I686-SLC5-GCC43-OPT
ENV/DYNAMIC-SCRATCH
ENV/FULLNODE
ENV/PROXY
ENV/RUNTIME/ALIEN-2.17
  
```

```

<ActivityIdentification>
  <Name>org.nordugrid.ARC-CE-
result-ops</Name>
</ActivityIdentification>
<Application>
  <Executable>
    <Path>job.sh</Path>
  </Executable>
  <Output>stdout.txt</Output>
  <Error>stderr.txt</Error>
</Application>
<Resources>
  <RuntimeEnvironment>
    <Name>ENV/PROXY</Name>
    <Version/>
  </RuntimeEnvironment>
  <QueueName>grid_rt</QueueName>
  <WallTime>600</WallTime>
  <IndividualPhysicalMemory>
    536870912
  </IndividualPhysicalMemory>
  
```

**Versioning:** (runtimeEnvironment>="APPS/HEP/ATLAS-20.1.0.1")

# Modifying job environment

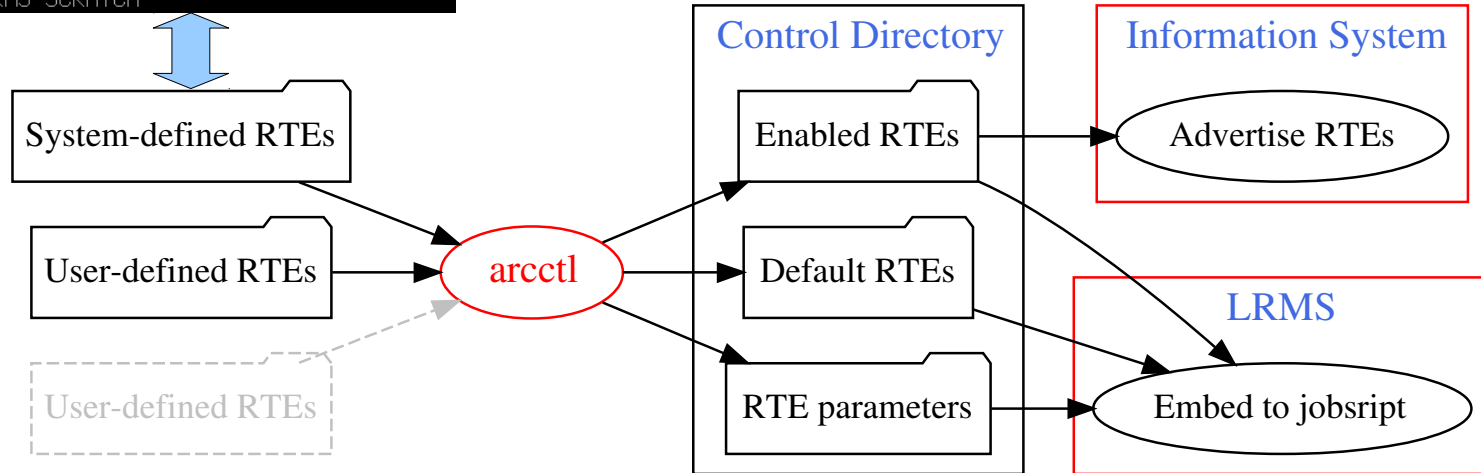


- BASH script
- **\$1** used to indicate stage
  - 0 (ARC CE)
  - 1 (pre WN)
  - 2 (post WN)
- *Pre-* and *post-* invocations are embedded into jobscript

# Operating RTEs

```

KNU:SERVICES:arc6.univ [root rte]# pwd
/usr/share/arc/rte
KNU:SERVICES:arc6.univ [root rte]# find .
./ENV/PROXY
./ENV/RTE
./ENV/LRMS-SCRATCH
  
```



- RTE name is derived from file path
- RTE directories **are local** to ARC CE and **SHOULD NOT be shared** with WNs
- User-defined: **runtimeidir** in **[arex]** block (multivalued)

# Enabling RTEs

- All installed RTEs are **disabled by default**
- Enable to **advertise** and **use on-demand**
- Enable:
  - by name:
    - `arcctl rte enable ENV/PROXY`
  - by path:
    - `arcctl rte enable /usr/share/arc/rte/ENV/PROXY`
  - by wildcard name:
    - `arcctl rte enable APPS/HEP/ATLAS-* -X86_64-* -*`



# Dummy RTEs

- **Advertising only** case
- RTE name not limited to installed files
- Enable:
  - using “--dummy” argument
    - `arcctl rte enable APPS/MYAPP --dummy`



# Default RTEs

- **Modifying job environment only** case
- Added to **EVERY job** coming to ARC CE
- No advertising
- Make RTE default:
  - `arcctl rte default ENV/LRMS-SCRATCH`
- The same *by-name*, *by-path* and *by-wildcard* can be used

# RTE Parameters

- Address heterogeneity in the simple cases
- Example: **ENV/PROXY** RTE transfers the **proxy-certificate** (and **optionally CA certificates**) to the WN

```
[root ~]# arcctl rte params-get ENV/PROXY
```

```
COPY_CACERT_DIR=No
```

```
[root ~]# arcctl rte params-get ENV/PROXY --long
```

```
COPY_CACERT_DIR = No          If set to Yes, CA certificate dir  
will be copied to the session directory along with proxy  
certificate (allowed values are: Yes,No)
```

```
[root ~]# arcctl rte params-set ENV/PROXY COPY_CACERT_DIR Yes
```

# List available RTEs

```
[root ~]# arcctl rte list
```

```
<output omitted>
APPS/HEP/ATLAS-20.8.0-X86_64-SLC6-GCC48-OPT (user, enabled)
APPS/HEP/ATLAS-20.8.1-X86_64-SLC6-GCC48-OPT (user, enabled)
APPS/HEP/ATLAS-20.8.2-X86_64-SLC6-GCC49-OPT (user, enabled)
<output omitted>
ENV/LRMS-SCRATCH (system, default)
ENV/PROXY (system, masked, disabled)
ENV/PROXY (user, enabled)
ENV/RTE (system, disabled)
ENV/RUNTIME/ALIEN-2.17 (user, enabled)
VO-biomed-CVMFS (dummy, enabled)
```

```
[root ~]# arcctl rte list --enabled
```

```
<output omitted>
APPS/HEP/ATLAS-20.8.2-X86_64-SLC6-GCC49-OPT
ENV/PROXY
ENV/RUNTIME/ALIEN-2.17
VO-biomed-CVMFS
```

```
[root ~]# arcctl rte list --long
```

```
System pre-defined RTEs in /usr/share/arc/rte:
```

```
ENV/PROXY # copy proxy certificate to the job session directory
ENV/RTE # copy RunTimeEnvironment scripts to the job session directory
ENV/LRMS-SCRATCH # enables the usage of local to WN scratch directory defined by LRMS
```

```
User-defined RTEs in /etc/arc/rte:
```

```
ENV/RUNTIME/ALIEN-2.17 # RTE Description is Not Available
ENV/PROXY # RTE Description is Not Available
```

```
Enabled RTEs:
```

```
ENV/RUNTIME/ALIEN-2.17 -> /etc/arc/rte/ENV/RUNTIME/ALIEN-2.17
ENV/PROXY -> /etc/arc/rte/ENV/PROXY
VO-biomed-CVMFS -> /dev/null
```

```
Default RTEs:
```

```
ENV/LRMS-SCRATCH -> /usr/share/arc/rte/ENV/LRMS-SCRATCH
```

# System-defined RTEs in ARC6

- ENV/PROXY
  - copy proxy and CA certs (optionally) to WN
- ENV/RTE
  - copy RTE scripts to WN
- ENV/LRMS-SCRATCH
  - define local scratch (move files to local to WN disk) that created dynamically by LRMS

```
[root ~]# arcctl rte cat ENV/LRMS-SCRATCH
SCRATCH_VAR="LOCALTMP"
# description: enables the usage of local to WN scratch directory defined by LRMS
# param:SCRATCH_VAR:string:WORKDIR:Variable name that holds the path to job-specific WN scratch directory
SCRATCH_VAR="${SCRATCH_VAR:-WORKDIR}"
if [ "x$1" = "x0" ]; then
    RUNTIME_LOCAL_SCRATCH_DIR="\${${SCRATCH_VAR}}"
```

# Disable and Undefault

- Enabled RTEs can be disabled:
  - `arcctl rte disable ENV/PROXY`
- Similar operation for default RTEs:
  - `arcctl rte undefault ENV/LRMS-SCRATCH`
- The same *by-name*, *by-path* and *by-wildcard* can be used

# Thank you for your attention!

