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The CREAM-CE: first experiences, results and requirements of the 4 LHC experiments

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Outlook

- This talk will concentrate on the CREAM-CE perspective from the applications point of view
  1. Migration plan in WLCG: from lcg-CE to CREAM-CE
  2. Implementation of the CREAM-CE into the experiment computing models
  3. First experiences by using the service
- The talk does not contain technical specifications about the CREAM-CE service itself
  - Follow: [143] *« Using CREAM and CEMON for job submission and management in the gLite middelware »* (Massimo Sgaravatto et al.). 26th March in the session: Grid Middleware and Networking Technologies

The CREAM-CE

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- CREAM (Computing Resource Execution And Management) ➔lightweight service for job management operations at the CE level
- Planned as replacement of the current LCG-CE
- Submission procedures allowed by CREAM:
  - Submissions to CREAM via WMS
  - Direct submission via generic clients
- The submission method depends basically on the experiment computing model
  - Normally pilot based follows the direct submission mode approach (ALICE, ATLAS, CMS, LHCb)
  - Bulk submissions of real jobs follow the WMS submission approach (also CMS is requiring this approach)

WLCG Statement

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- Nov 2008 (WLCG GDB Meeting). CREAM Status:
  - WMS submission via ICE to CREAM was still not available
  - Proxy renewal mechanism of the system not optimized
  - In addition: Condor-G submission to CREAM was not enabled
- At that point, these factors were preventing the setup of the system in production (also in testing) for ATLAS and CMS, but not for ALICE and LHCb
  - The highest priorities for LHCb were (and are) **glexec and SLC5** (independent of CREAM but included in their testing schedule)
  - The highest priority for ALICE was (and is) CREAM
    - The experiment began to put CREAM in production in Summer 2008
  - One experiment was ready to stress the system
    - Good oportunity for the experiment, developers and site admins to gain experience with the new system

WLCG encouraged sites to provide a CREAM-CE system in parallel to the current LCG-CE

The Migration Plan

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- (Some) Technical issues
  - Condor-G submission to CREAM must be in production (ATLAS and CMS)
    - Status: Tests ongoing (CMS)
  - ICE enabled WMS must be in production (CMS)
    - Status: The patch is ready for certification
  - Robust proxy renewal mechanism (sites admins)
    - Status: Already in production
- (Some) Scalability aspects (still to be checked)
  - At least 5000 simultaneous jobs per CE node
  - Unlimited number of user/role/submission node combinations from many VO's (at least 50), up to the limit of the number of jobs supported on a CE node
  - Job failure rates (<0.1% due to CE normal operations, restart and reboot)
  - 1 month unattended running without significant performance degradation (ALICE experience)

Implementation and Experiences in ALICE

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- ALICE is interested in the deployment of the CREAM-CE service at all sites which provide support to the experiment
  - **GOAL: Deprecation of the WMS use in benefit of the direct CREAM-CE submission**
  - WMS submission mode to CREAM-CE not required
    - The experiment is not limited by the issues observed while using the WMS submission mode
  - In addition the proxy renewal feature was neither required
    - 48h voms extensions ensured by the security team@CERN
    - Enough to run production/analysis jobs without any addition extension
- ALICE has began to test the CREAM-CE since the beginning of Summer 2008 into the real production environment
- ALICE testing priority list:
  - CREAM-CE
  - SLC5 (DONE)
  - glexec/SCAS (Beginning of the summer 2009)

} Independent of CREAM

Implementation and Experiences in ALICE

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- The 1st test phase of the CREAM-CE
  - Performed in summer 2008 at FZK (T1 site, Germany)
  - Tests operated through a second VOBOX parallel to the already existing service at the T1 (operating in WMS submission mode)
  - Access to the local CREAM-CE was ensured through the PPS infrastructure
    - Initially 30 CPUs
    - Moved to the ALICE production queue in few weeks (production setup)
  - Intensive functionality and stability tests from July to September 2008
    - Production stopped to create an ALICE CREAM module into AliEn and to allow the site to upgrade their system
  - Results:
    - More than 55000 jobs successfully executed through the CREAM-CE in the mentioned period
    - No interventions in the VOBOX required during the testing phase

Implementation and Experiences in ALICE

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- The 2nd test phase of the CREAM-CE
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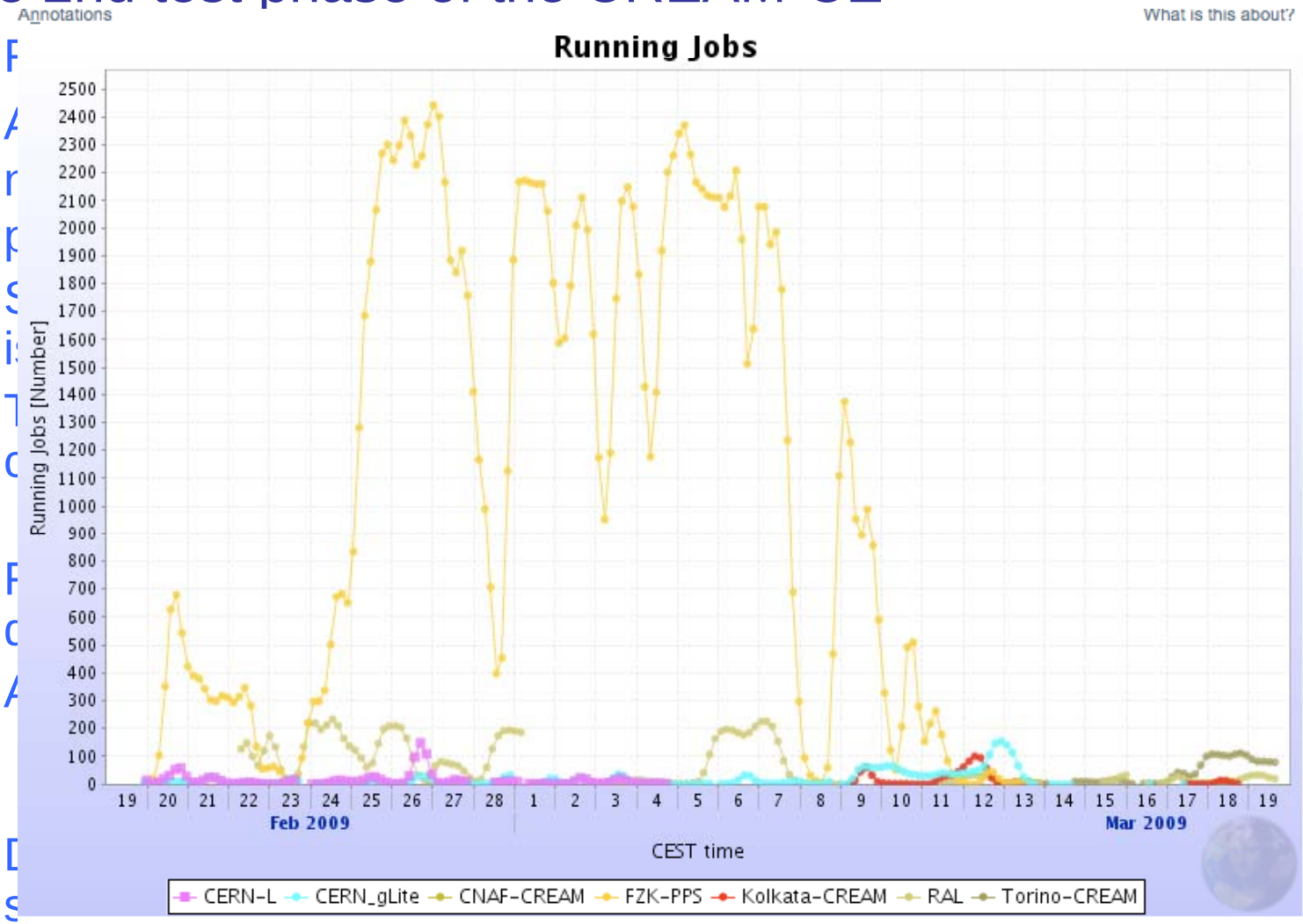

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Implementation and Experiences in ATLAS

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- The experiment is interested in the **direct submission** feature of the system
- ATLAS requires the **Condor-G submission enabled** to the CREAM-CE
  - At this point the implementation of CREAM-CE into the ATLAS environment will be transparent
  - We will see the same requirement in CMS
- ATLAS backends
  - **PANDA** (main backend for production and analysis jobs) will implement the direct submission to CREAM-CE via Condor-G
    - Using Pathena as UI
  - **WMS or local batch system** and also PANDA
    - Using Ganga as UI

Implementation and Experiences in ATLAS

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- ATLAS has not yet performed any test with the CREAM-CE system
- The CREAM-CE testing is not scheduled as the highest priority ATLAS
  - Assuming no decrease of available resources
    - Parallel LCG-CE vs. CREAM-CE setup at the sites ensures the maintenance of the resources
  - ATLAS assumes a transparent transition to CREAM-CE once the Condor-G submission is enabled

Implementation and Experiences in CMS

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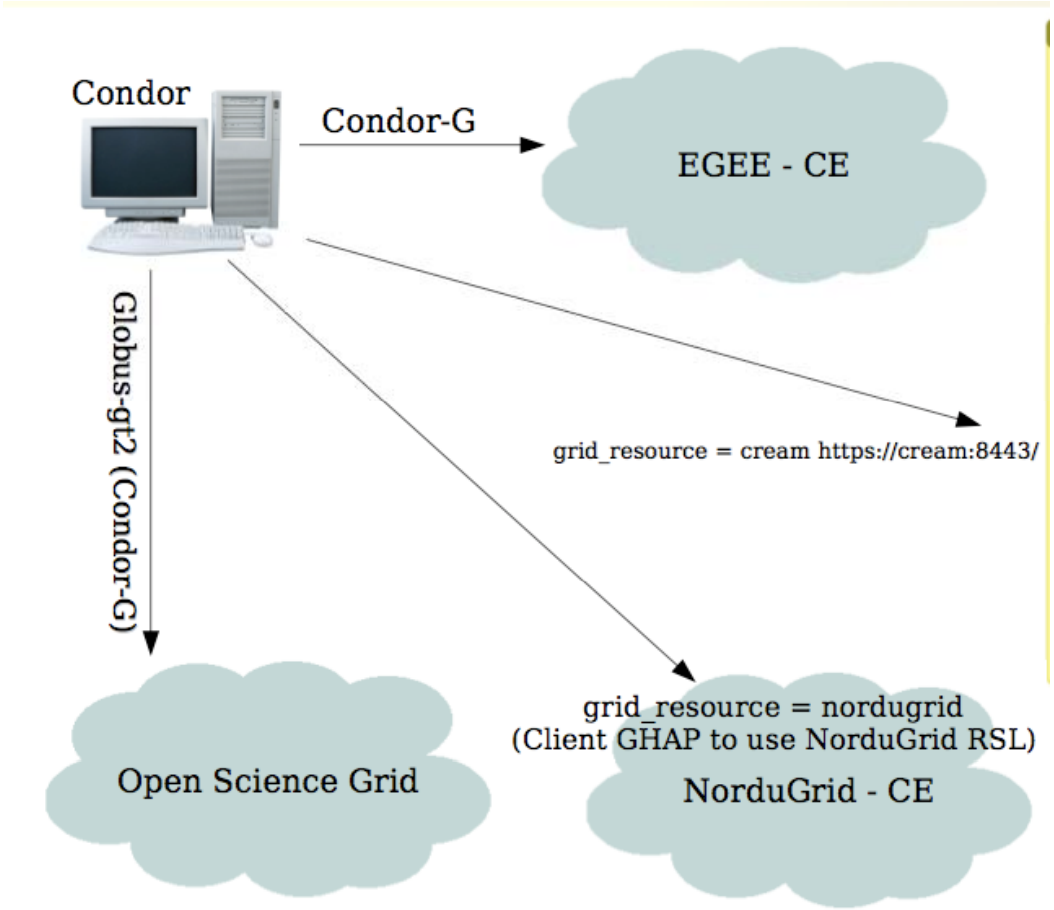
- Condor is able to submit to any Globus CE
  - This procedure **currently** excludes: NorduGrid and CREAM
  - GAHP (Globus/Grid Ascii Helper Programs) is used in both cases to as translator between NorduGrid/CREAM-Condor



Implementation and Experiences in CMS

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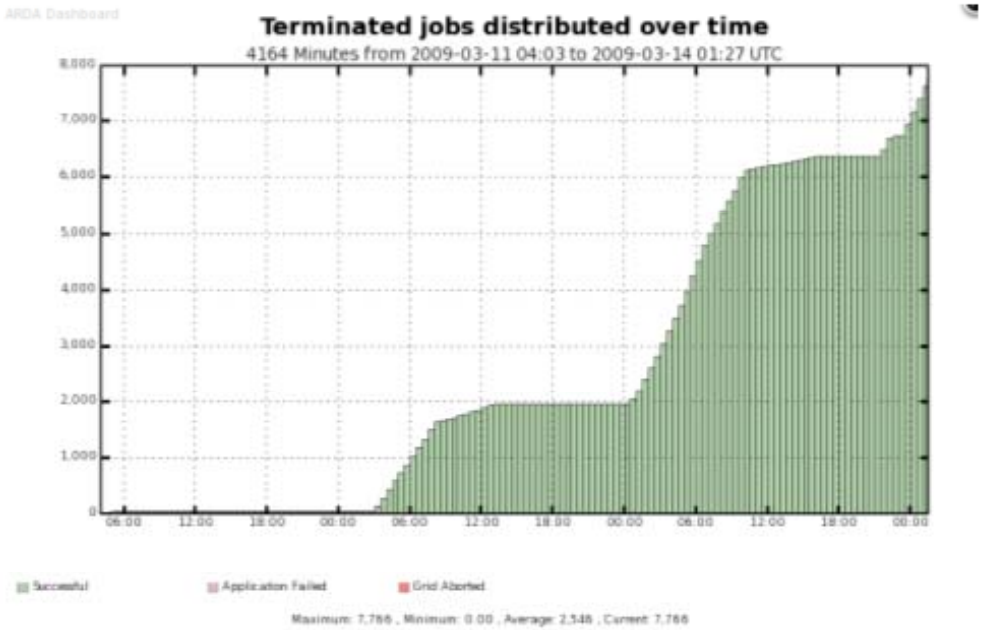
Summary : Condor tests with CREAM CE



385 LastHoldReason = "CREAM error: CREAM_Job_Cancel Error: job status does not match"
100 LastHoldReason = "CREAM error: CREAM_Job_Purge Error: EOF detected during communication"
234 LastHoldReason = "CREAM error: CREAM_Job_Register Error: EOF detected during communication. "
1 LastHoldReason = "CREAM error: CREAM_Job_Status Error: EOF detected during communication. "
2000 LastHoldReason = "Failed to create proxy delegation"
165 LastHoldReason = "Unspecified gridmanager error"

About 25% of the jobs failed – Major source of errors are due to proxy renewal/delegation

Implementation and Experiences in CMS

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- CMS test schedule:

http://hepuser.ucsd.edu/twiki2/bin/view/HEPProjects/CMS-Cream

  - 1st Phase (01 Nov - 30 Nov 2008):
    - Initial goal: Initial communication and states translantion performing well
  - 2nd Phase (01 Feb - 28 Feb 2009):
    - Objective: to ensure the functionalities of Phase 1 with respect to any change in the software version CE
      - Input, output sandbox inclusion, Prototype the Integration with the glideinWMS, Small scale user jobs with glideinWMS + CRAB/Crabserver
  - 3rd Phase (15 April - Summer 2009):
    - Based on how EGEE moves from Pre-Production sites to Production/Certification of the software and the status of ICE-based WMS, this phase can have a wide range of goals
      - In terms of production implementation

Implementation and Experiences in LHCb

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- LHCb priority list:
  - glexec tests
  - SLC5
  - CREAM-CE
- Successfull glexec and SLC5 tests can allow an start up of the CREAM-CE tests in about 1 month
  - LHCb faces a similar situation to ALICE
    - Direct job submission mode
    - Implementation of APIs into DIRAC
    - No requirements in terms of ICE/WMS, Condor-G, proxy renewal….
  - DIRAC was therefore ready to begin the implementation of CREAM-CE at the same time that ALICE was
- The CREAM-CE implementation in Dirac only when CREAM-CE is distributed (at least) through all T1 sites
  - Dirac will not maintain different implementation for different sites and backends

Implementation and Experiences in LHCb

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- LHCb requirement for CEMon:
  - LHCb requires the CEMon architecture available in CREAM (DONE)
    - General framework for managing and publishing information
    - Allows synchronous and asynchronous connections
  - CEMon architecture foresees a core component and one or more sensors:
    - CREAM job sensor
    - CE sensor
    - OSG sensor
  - When submitting to CREAM via WMS, CEMon with the CREAM job sensor is used
    - CREAM includes the CEMon core and the CREAM and CE sensors
  - When submiting in direct mode, CEMon is not used **by default**
    - However the use of CEMon also in direct submission mode is not prevented:
    - With the CREAM job sensor to be notified about job status changes
    - With the CREAM CE sensor to be notified about the CE status ➔ Use case of LHCb

Summary and Conclusions

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- All LHC VO experiments expressed their interest to use the CREAM-CE in direct submission mode
  - CMS foresees also the usage of the system via WMS
- Condor-G interfaced with CREAM-CE is required by ATLAS and CMS
  - CMS is currently testing the setup with quite promissing results
    - The proxy renewal feature of CREAM is the only pending issue in terms of patch distribution to all sites
  - ATLAS will wait until its full deployment
- ALICE and LHCb can already use the current setup of CREAM-CE
  - ALICE is succesfully testing the system since Summer 2008
  - LHCb foresees the testing of the sysem in bout 1 month
- WLCG encourages all LHC sites to provide CREAM-CE services to all experiments in parallel mode to the LCG-CE
  - This procedure will give experiments the oportunity tocheck the system
    - Provide good feedbacks to developers and site admins
    - Speeding up therefore the migration phase