

CREAM: A simple, Grid-accessible, Job Management System for local Computational Resources



Primary Authors:
 ANDRETTA, Paolo (INFN Padova)¹ (andre@pd.infn.it), BORGIA, Antonino Stefano¹ (borgia@pd.infn.it), DORIGO, Alvise¹ (dorigo@pd.infn.it)
 GIANELLE, Alessio¹ (gianelle@pd.infn.it), MARZOLLA, Moreno¹ (marzolla@pd.infn.it), MORDACCHINI, Matteo¹ (mordacchini@pd.infn.it)
 SGARAVATTO, Massimo¹ (sgaravatto@pd.infn.it), ZANGRANDO, Luigi¹ (zangrand@pd.infn.it)

Co-Authors:
 DVORAK, F.² - KOURIL, D.² - KRENEK, A.² - MATYSKA, L.² - MULAC, M.² - POSPISIL, J.² - RUDA, M.² - SALVET, Z.² - SITERA, J.² - SKRABAL, J.² - VOCI, M.²
 AVELLINO, G.³ - BECO, S.³ - CAVALLINI, A.³ - MARASCHINI, A.³ - PACINI, F.³ - PARRINI, A.³ - SCARCELLA, C.³ - OTTILARO, M.³ - TERRACINA, A.³ - MONFORTE, S.⁴ - PAPPALARDO, M.⁴
 ANDREOZZI, S.⁵ - CECCHI, M.⁵ - CIASCHINI, V.⁵ - FERRARI, T.⁵ - GIACOMINI, F.⁵ - LOPS, R.⁵ - RONCHIERI, E.⁵ - VENTURI, V.⁵
 FIORENTINO, G.⁶ - MARTELLI, V.⁶ - MEZZADRI, M.⁶ - MOLINARI, E.⁶ - PRELZ, F.⁶ - REBATTO, D.⁶ - GUARISE, A.⁷ - PATANIA, G.⁷ - PIRO, R.⁷ - WERBROUCK, A.⁷

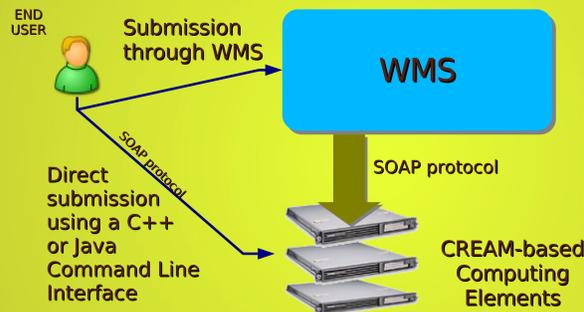
¹INFN Padova - ²CESNET - ³DATAMAT - ⁴INFN Catania - ⁵INFN CNAF - ⁶INFN Milano - ⁷INFN Torino



CREAM Service:

Computing Resource Execution And Management service

A lightweight service that implements all the operations at the Computing Element (CE) level; its well-defined WebService-based interface and its implementation as an extension of the Java-Axis servlet (running inside the Apache Tomcat container) provide interoperability with clients written in any programming language and running on any computer platform.



Main Features:

- **Job Submission**
 - possibility of direct staging of input sandbox files
 - GLITE WMS JDL compliance (with CREAM-specific extensions)
 - support for batch and MPI jobs
 - support for bulk jobs being integrated
- **Manual and automatic proxy delegation**
- **Job Cancellation**
- **Job Info** with configurable level of verbosity and filtering based on submission time and/or job status
- **Job List**
- **Job Suspension and Resume**
- **GSI based authentication**
- **VOMS based authorization**
- **Job Purge** for terminated jobs

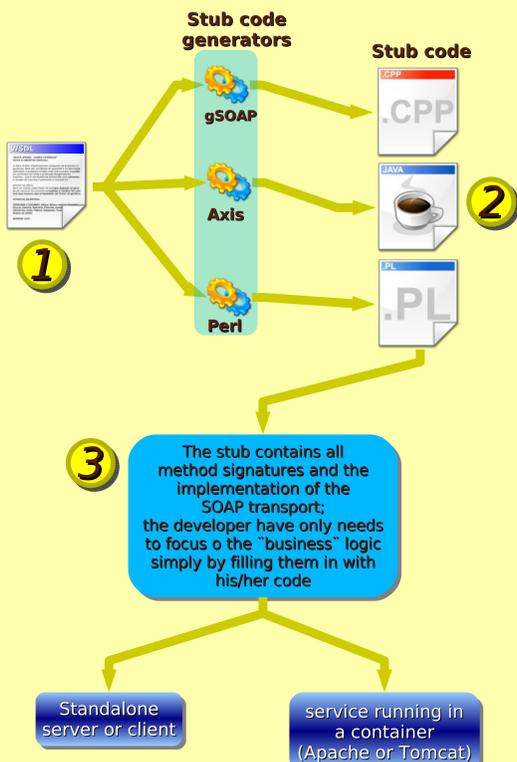
CREAM API

The CREAM interface is well-defined using the Web Service Description Language (WSDL); anyone can generate his/her CREAM client by simply filling in the stub code generated by WSDL parser (gSOAP for C/C++, Axis for Java, Perl module for perl).

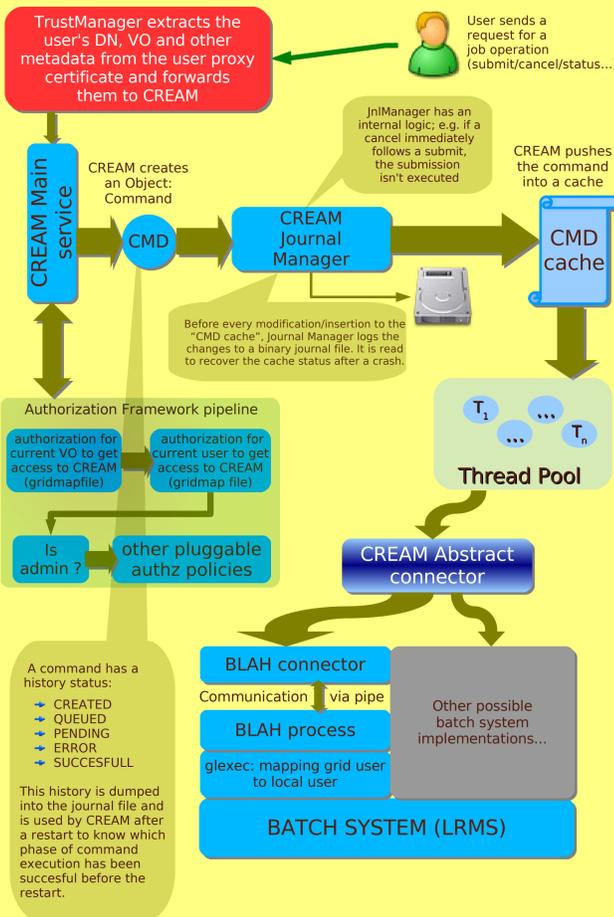
Here is a fragment of the WSDL describing the service:

```

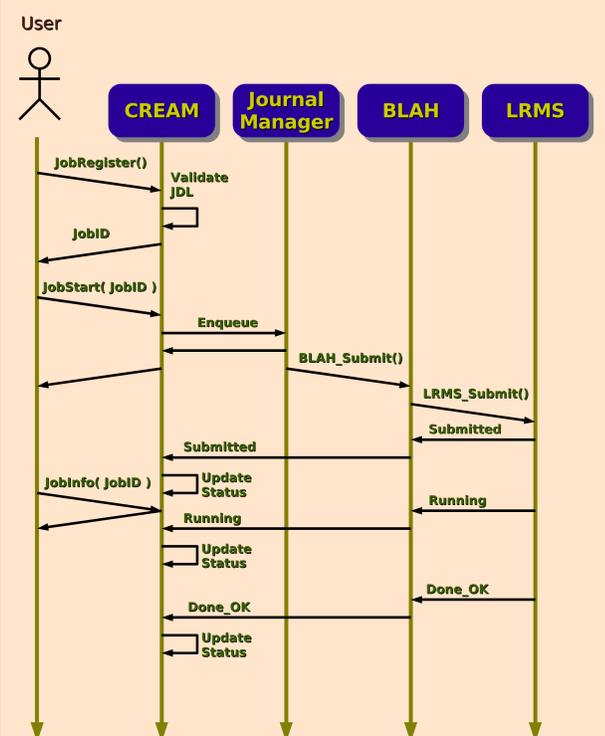
<wsdl:operation name="JobList">
  <wsdl:documentation>
    Returns the list of jobIDs referring to
    all active jobs belonging to that user.
  </wsdl:documentation>
  <wsdl:input message="JobList" />
  <wsdl:output message="JobListResponse">
    <wsdl:documentation>A list of jobIDs.
    </wsdl:documentation>
  </wsdl:output>
  <wsdl:fault name="authenticationFault"
    message="Authentication_Fault">
    <wsdl:documentation>
      Thrown in case of authentication problems.
    </wsdl:documentation>
  </wsdl:fault>
  <wsdl:fault name="authorizationFault"
    message="Authorization_Fault">
    <wsdl:documentation>
      Thrown in case of authorization problems.
    </wsdl:documentation>
  </wsdl:fault>
  <wsdl:fault name="genericFault"
    message="Generic_Fault">
    <wsdl:documentation>
      Thrown if any other possible error occurs.
    </wsdl:documentation>
  </wsdl:fault>
</wsdl:operation>
  
```



CREAM Architecture



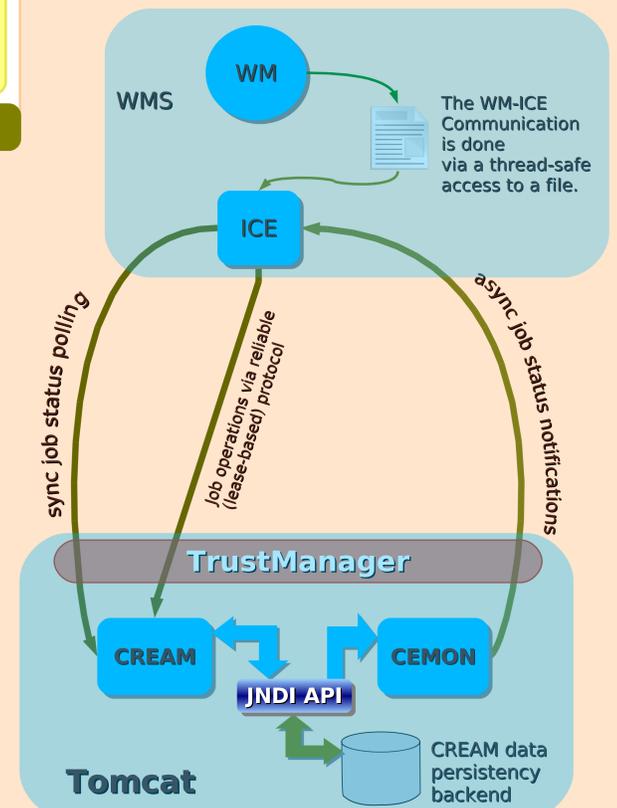
CREAM Sequence Diagram



WMS-CREAM INTEGRATION

Thanks to ICE (a gSOAP/C++ intermediate layer) CREAM can receive job operations directly from a Grid WMS (Resource Broker). The ICE layer subscribes to the CEMon service in order to asynchronously receive notifications about job status changes. In case some notifications are lost, ICE performs synchronous status polling for jobs for which it hasn't received status for some time. To maintain its subscriptions ICE periodically checks them and renews the expiring ones. The status notification is sent by the component named CEMon[itor]. It is a general purpose notification framework working in synchronous and asynchronous mode, that virtually supports any kind of monitoring thanks to its plug-in architecture. Everyone can develop a sensor using CEMon's APIs, to be hot-plugged into the CEMon service. CEMon gets informations about job status from the CREAM data persistency backend through JNDI APIs.

All communication with CREAM/CEMon in any direction is **authenticated** using **SSL/TLS technology** modified to support the grid proxies and implemented in the TrustManager running in the Tomcat container.



CREAM Web Site:

<http://grid.pd.infn.it/cream/field.php>