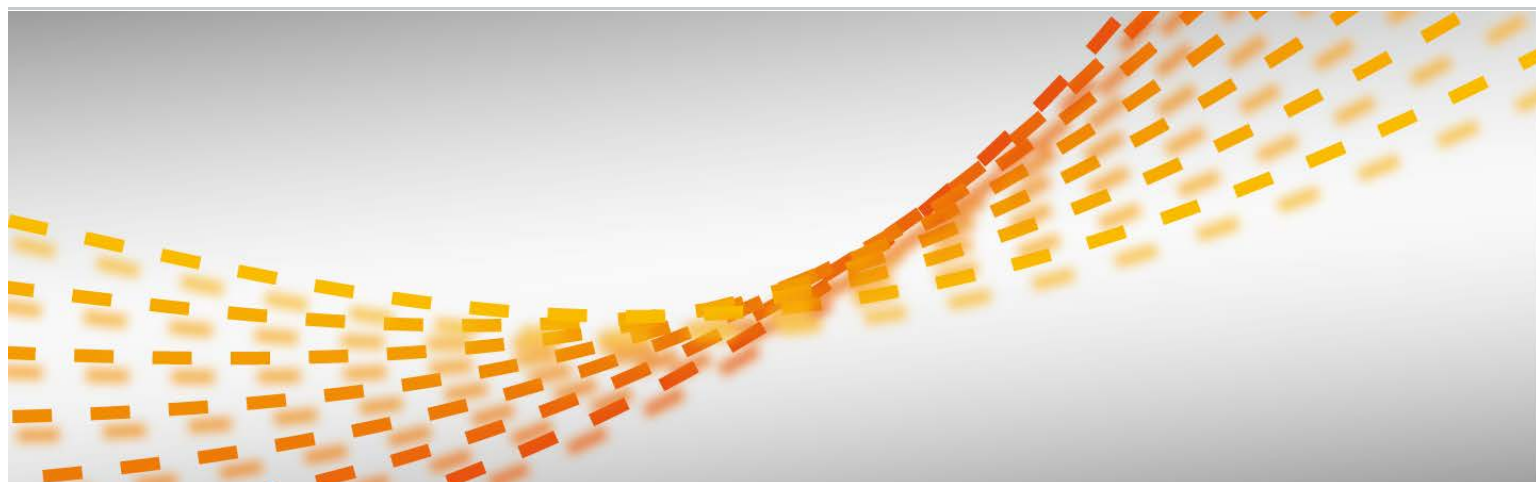




elasticLM - License as a Service (LaaS)



License as a Service (LaaS)

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[Homepage](#) . License as a Service

elasticLM

elasticLM is a novel technology for creating and managing software licenses designed for distributed computing environments like Grids, Clouds or SOA. Of course, the benefits of elasticLM are also available when using elasticLM for applications running on local resources, e.g. workstations or clusters.

elasticLM overcomes the limitations of existing software license management solutions making the use of license protected applications on resources outside of the own administrative domain as easy as running them locally.

License usage is authorised through negotiation of Service Level Agreements between the license service and the user taking into account availability, policies defined locally, policies of the ISV or attributes defined for user in a virtual organisation.

The negotiation allows to inform the user about the price of the license before executing the application. The price information can also be used to check the request against budget constraints defined, e.g. for user or department.

The result of a successful negotiation is a mobile token which can be used e.g. in a IaaS environment to execute an application with the agreed features.

Tokens can move to the environment where needed, can be combined with other tokens or licenses created on the fly by an ASP.

Software licenses are treated and implemented as services, thus providing platform independent access just like any other virtualized resources.

- Licenses as services overcome the limitations of current monolithic licensing models
- Licenses will be managed as agreements, extending the conventional Service Level Agreements (SLAs) which are made today between sellers and buyers in the market.
- Licenses will be dynamic in order to support agreements that may change over time and where the dynamic negotiation between service provider and consumer is needed.

In addition to licensing and license management elasticLM offers additional capabilities like monitoring the use of applications (license protected or not) and creating usage records for later evaluation.

Moreover, elasticLM may also be used in SaaS or PaaS environments - e.g., where the license is available locally and no tokens are needed for application execution - to create Service Level Agreements with the SaaS user and create usage records for accounting and billing.

Security

Aspects of security have been examined with special care. We identified relevant issues related to both the different actors and the license mechanism itself. These issues relate to

- authentication and authorization of users, services, and servers, security and confidentiality of the communication between different actors or components,
- security of the delegation process, when using a portal or an orchestrator, for example,
- disclosure of sensitive information, e.g. compromise of licenses
- integrity of the process to inhibit non-repudiation
- security of the licensing mechanism itself, e.g. the license generators, manipulation of the executables, or clock tweaking

Sophisticated measures have been taken either employing standards like X.509 certificates or XACML and other state-of-the-art technologies for code protection.

Use-cases

The following list depicts selected use-cases for elasticLM:

- Run license protected applications on (remote) Grid or Cloud resources using licenses from your local license pool
- ASP outsourcing
- Outsource application execution to an ASP using licenses of the local license pool

- One ASP is forwarding large jobs to another ASP
- Reuse of existing licenses
- Use of Test licenses in virtualised environments
- Provide infrastructure for freelance software developers
- Aggregation of licenses from different license pools, e.g. local ones, ASP ones or from a Broker to run an application exceeding the locally available licenses
- License brokering
- Local use in (multi-)cluster environments without Grid or Cloud infrastructure
- Advance reservation of licenses, co-scheduling of licenses and other computational resources
- Extend/Reduce license terms when job is running.

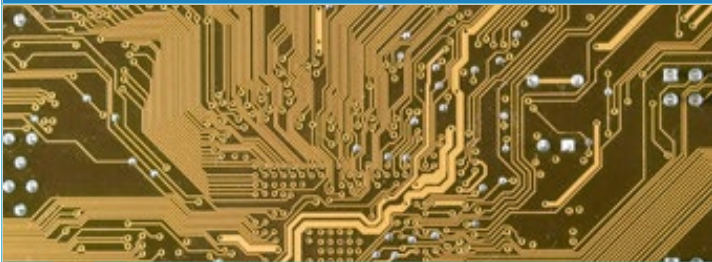
Scenarios

Basic Scenario

No bi-directional network available ... [read more](#)

Advanced Scenario

Bi-directional network available ... [read more](#)



Benefits using elasticLM

The elasticLM solution is beneficial for all parties involved ... [read more](#)

Elastic License Management

elasticLM provides a number of features for increasing the flexibility of license management ... [read more](#)

News

April 2011: Multiple APIs available for evaluation ... [read more](#)



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[Homepage](#) . Basic Scenario

Basic Scenario

While Grid and Cloud environments provide the opportunity extending own local resources with external resources the connection to this additional resources often is not available in both directions.

A reason for this often being restrictions imposed by the firewall policy of an organisation. Thus, while it is in general possible to submit an application to Grid or Cloud resources from the intranet of an organisation a communication channel from the execution environment of the application back to the environment of the submitter most often is not available.

The elasticLM solution enables the application to evaluate the authorisation for the execution locally, without any network connection to the license management system of the submitter. All necessary information for a policy decision is in the token, which is sent to the execution environment prior to launching the application.

Additional mechanisms ensure that re-using the token multiple times for different application executions is not possible.

Related Links:

[Advanced Scenario](#)
[Benefits using elasticLM](#)
[elasticLM News](#)

[Use- case](#)
[Elastic License](#)
[Management](#)



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[Homepage](#) . Advanced Scenario

Advanced Scenario

In environments where bi-directional network connectivity is available elasticLM provides additional capabilities.

The most important advantage is the possibility of renegotiation the license terms during run-time, e.g. when more time is needed or when additional features are required dynamically. This allows the application to continue the execution in cases where it would be aborted due to time constraints or unavailable features otherwise.

Additionally, the possibility to adjust the accounting information at the end of the application runs. Thus, it is possible to store the exact usage information for accounting and billing.

Pay-per-use business models can be easily realised.

Like in the basic scenario additional mechanisms ensure that re-using the token multiple times for different application executions is not possible.



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[Homepage](#) . Benefits using elasticLM

Benefits using elasticLM

The elasticLM solution is beneficial for all parties involved:

For the ISV

- Providing more flexibility to the trusted customer while increasing the level of security.
- Easy to deploy in Grid, Cloud and SOA environments.
- ISVs may extend their customer base by supporting new business models, thus generating additional economical benefit

For the end-user

- Flexibility for the user embedding the licensing mechanism into his workflows.
- Select the most appropriate resources depending on actual requirements and have the necessary licenses available.
- Licenses can be reserved for later use, and coordinated with the availability of computational resources.
- Allows application execution completely decoupled from the site that hosts the license server.
- Allows re-negotiation at run-time, e.g. giving up a license before the reservation period is over, trying to extend a reservation period, or adding new features. Thus, the license usage may be adapted to the real need. This allows reducing the cost either by not paying for times where the license is unused, or by avoiding an application crashing because the license was no longer valid.

For the home organisation of the end-use or the computing centre

- Better control of the license portfolio in an institution or company. Always up-to-date information on all purchased licenses, e.g. used and free licenses.
- Thus, less unused or barely used licenses, no duplicate licenses in different departments.
- Fine grained steering of license usage for all groups and individual users.
- Licenses can be used to run applications on the most appropriate or idle resources.

For the ASP

- Better control of the license portfolio in an institution or company. Always up-to-date information on all purchased licenses, e.g. used and free licenses. Thus, less unused or barely used licenses.
- ASP can provide the customer with access to applications without buying additional licenses.
- Customers' licences may be combined with the ones owned by the ASP for running complex jobs with different applications. This allows making better usage of the ASPs' computational resources while reducing the overhead of maintaining additional licenses for customers.



elasticLM - License as a Service (LaaS)

[Homepage](#) . Elastic License Management

Elastic License Management

elasticLM provides a number of features for increasing the flexibility of license management:

- Advance reservation of licenses ∅ licenses for applications waiting in a queue are not blocked during waiting but guaranteed to be available when the application starts
- Renegotiation of license terms during execution of the application
- Local authorisation of license usage by the license server of the users home organisation - all authorization for the use of a license is done locally taking into account policies of the ISV, site-specific policies defined locally or user-specific attributes as e.g. retrieved from a Virtual Organisation. Signed and encrypted terms of a license are scheduled to the (remote) execution environment
- An integrated Accounting and Billing System - allowing price determination and budget control when the license is requested
- Own local licenses can be used in an ASP environment - Tokens created by a local license service can be used in an ASP environment. They can even be combined with licenses of the ASP.



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elasticLM News

April 2011:

Multiple APIs available for evaluation

Windows C

Linux C

JAVA

To receive an evaluation copy of the elasticLM API for inclusion in your application please contact [Wolfgang Ziegler](#).



Related Links:

[Basic Scenario](#)

[Use-case](#)

[Elastic License](#)

[Management](#)

[Advanced Scenario](#)

[Benefits using elasticLM](#)



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[Homepage](#) . Use-case

Use-case

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Related Links:

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[Benefits using elasticLM](#)

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[Advanced Scenario](#)

[Elastic License Management](#)



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[Homepage](#) . Innovations

Main innovations of elasticLM

elasticLM licenses are mobile objects that may move as applications to different execution environments. Use of protected applications is granted through Service Level Agreements resulting from negotiation of license terms prior to application execution. Using elasticLM allows advance reservation of licenses. Thus, licenses are available when needed but not blocked when the application is waiting for execution.

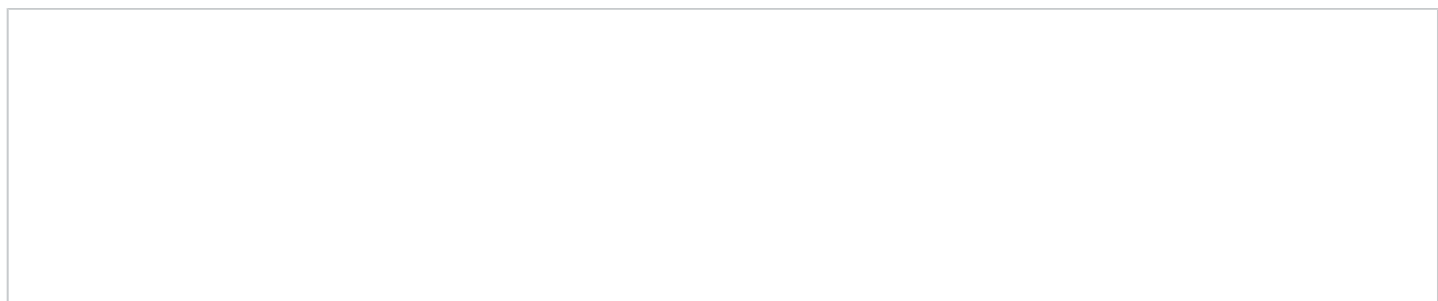
All authorization for the use of a license is done locally at the home organisation of a user, taking into account policies of the ISV, site-specific policies defined locally or user-specific attributes as e.g. retrieved from a Virtual Organisation. Signed and encrypted terms of a license are scheduled to the (remote) execution environment.

Integration of an Accounting and Billing System allows price determination and budget control when the license is requested.

In the following table the major features of the elasticLM product are shown compared to the limitations in current license management:

CURRENT SITUATION	INNOVATION OF ELASTICLM
Software licenses allow little flexibility in terms of location independent use. Thus, license protected applications may hardly be used in Grid or Cloud environments.	With elasticLM, licenses may be used to run applications in Grid and Cloud environments no matter whether during the application run there is network connectivity to access the site that hosts the license server that issued the license.
Licenses are often spread across departments making it difficult to track license usage.	elasticLM provides access to and management of all licenses owned by a site.
All license usage policies are embedded in the license of the ISV.	elasticLM allows the definition of local policies for license usage addressing the site-specific needs. These policies are evaluated in addition to the embedded policies of the ISVs.

<p>Before starting an application a user has only limited information about the cost incurred most often estimated based on wall-clock time of usage only.</p>	<p>With elasticLM, an accurate, user-specific price is calculated beforehand based on a large number of configurable parameters, like the time of usage, the features, the history of usage, local policies that define different prices for different users or user groups.</p>
<p>Accounting of license usage more often than not is statically bound to usage times.</p>	<p>elasticLM comes with an advanced accounting and billing system that allows to adapt the accounting information after license usage, taking into account the effective usage, e.g. run-time information, hardware capabilities.</p>
<p>License usage control in terms of budget for different users or groups is done independently from the process of granting licenses.</p>	<p>In elasticLM budget limitations are checked and enforced when a user requests a license.</p>
<p>Illegal usage of licenses can be achieved through hacked license servers or hacked versions of the license supplied by the ISV.</p>	<p>elasticLM realises a number of sophisticated, state-of-the-art security mechanisms that render illegal use almost impossible.</p>
<p>License terms are immutable once checked out from the license server.</p>	<p>elasticLM offers re-negotiation of license terms at run-time, e.g. giving up a license before the reservation period is over, trying to extend a reservation period, or adding new features.</p>
<p>License servers only support first come first served schema.</p>	<p>elasticLM allows advance reservation of licences for later use, e.g. coordinated with the availability of computational resources.</p>
<p>Customer owned licenses managed in his administrative domain usually can not be used for running applications using an ASP's computational resources.</p>	<p>Through elasticLM an ASP can temporarily host the customer's licenses allowing the execution of applications using the customer's own licenses. Customers' licences may be combined with ASP owned licenses for running complex jobs, e.g. exceeding the number of processors a single license grants to use, with different applications or application features.</p>





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Integration in Applications

A single module implements the application's elasticLM interface. In the basic scenario, this API acts as a policy decision point decrypting the license terms, verifying the signature and analysing the terms. The result is provided to the application for further processing as usual.

In the advanced scenario the trusted entity is in charge of decrypting the license terms, verifying the signature and analysing the terms and forwards the results to the API. Moreover, the elasticLM API may provide advanced capabilities when connected to a trusted entity, e.g.

- trusted clock
- re-negotiation of license terms at run-time
- providing actual usage information to update the initial usage record

Since the elasticLM API implements the interface of the existing policy enforcement point in the application, there is no need to change the existing policy enforcement point in the application. elasticLM provides different language bindings depending on the application.



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Background information

elasticLM is developed and maintained by three partners of the previous European funded project [SmartLM](#) : ATOS Origin, the Fraunhofer Institute SCAI and Gridcore.



The objective of the European funded project [SmartLM](#) was to develop the prototype of a licensing solution suitable for both traditional computing environments and evolving distributed computing infrastructures like Grids and Clouds .

Within the context of SmartLM a number of publications have been produced, some of them being public deliverables, some of them publications in proceedings of conferences or other printed media. Many of them can be accessed through the links below.

Booklets

[The Business Side of Software Licensing](#) [PDF, 296 KB]

[SmartLM & Grid-friendly software licensing for location independent application execution](#) [PDF, 2.5 M]

Public Deliverables

[D1.1 Functional requirements of the new licensing architecture for Grids](#) [PDF, 605 KB]

Executive Summaries of Deliverables

[D2.1 Software Licensing Panorama Today](#) [PDF, 180 K]

[D2.2 Report on business impact in adoption of Grid licensing mechanisms and suggested Business Models](#) [PDF, 184 K]

[D3.1 Design of the license service, specification of WS-Negotiation protocol](#) [PDF, 251 K]

[D4.1 Process-Model for Accounting](#) [PDF, 165 K]

[D6.1 Scenarios, criteria and methodology for evaluation V1.0.pdf](#) [PDF, 191 K]

[D7.3 Product description and Market context analysis for exploitation_v1.0.pdf](#) [PDF, 193 K]

[D7.4 Preliminary exploitation plan v1.0.pdf](#) [PDF, 246 K]



Further Project



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