



# EGI-InSPIRE

## UMD QUALITY CRITERIA v5

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### Abstract

This document describes the Quality Criteria that all software of the UMD distribution must meet.



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### Document Log

Issue	Date	Comment	Author/Partner
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v1.1	03/11/2010	Added Probe description in GEN_MON_1	Enol Fernández
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v1.3	31/01/2011	Better test specification	Enol Fernández
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2 DRAFT 1	24/06/2011	Preparation of new release	Enol Fernández
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3 DRAFT 1	13/10/2011	First draft of release 3	Enol Fernández
3 DRAFT 2	24/01/2012	Second draft of release 3	Enol Fernández
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4 DRAFT 2	23/07/2012	Second public draft of release 4	Enol Fernández
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## 1 DOCUMENTATION

Services in UMD must include a comprehensive documentation written in a uniform and clear style. All Quality Criteria described below may be met by a single document that contains all the requested sections.

<b>Functional Description</b>	
<b>ID</b>	<b>GENERIC_DOC_1</b>
<b>Description</b>	All products must provide a document with a brief functional description of the product.
<b>Mandatory</b>	NO
<b>Applicability</b>	All products
<b>Input from Technology Provider</b>	Document (or link) with a general description of the product that includes: <ul style="list-style-type: none"><li>• Purpose of the product</li><li>• Capabilities meet by the product</li></ul>
<b>Pass/Fail Criteria</b>	The document should exist and contain the requested information.
<b>Related Information</b>	
<b>Revision Log</b>	V2: clarified the required documentation

<b>Release Notes</b>	
<b>ID</b>	<b>GENERIC_DOC_2</b>
<b>Description</b>	All products must provide a document with the release notes.
<b>Mandatory</b>	YES
<b>Applicability</b>	All products
<b>Input from Technology Provider</b>	Document (or link) with release notes of the product. They must include major the changes in the product: bug fixes, new features.
<b>Pass/Fail Criteria</b>	The document should exist and contain the requested information.
<b>Related Information</b>	
<b>Revision Log</b>	

<b>User Documentation</b>	
<b>ID</b>	<b>GENERIC_DOC_3</b>
<b>Description</b>	All products must provide a document describing how to use it.
<b>Mandatory</b>	NO
<b>Applicability</b>	All products with end-user tools and services.
<b>Input from Technology Provider</b>	Document (or link) with user guide describing the functionality of the software and how to use it.
<b>Pass/Fail Criteria</b>	The document should exist and contain the requested information.
<b>Related Information</b>	
<b>Revision Log</b>	

<b>Online help (man pages)</b>	
<b>ID</b>	<b>GENERIC_DOC_4</b>
<b>Description</b>	All products with end user command line tools must include man pages or online help.
<b>Mandatory</b>	NO
<b>Applicability</b>	All products with command line tools.
<b>Input from Technology Provider</b>	Man pages with information about the usage of commands. If man pages are not available, comprehensive help options must be included with the command with information about the usage (i.e. -h/--help option)
<b>Pass/Fail Criteria</b>	Online help should be available (man pages or command line help). Command line help should give meaningful cues (i.e., only a list of single-letter options is not sufficient) If both command line help (-h option) and man pages are provided they <b>must</b> be mutually consistent (describe the same set of options and their meaning).
<b>Related Information</b>	GGUS ticket # 73214
<b>Revision Log</b>	V3: Tighten wording to avoid situations as described in GGUS #73214

<b>API Documentation</b>	
<b>ID</b>	<b>GENERIC_DOC_5</b>
<b>Description</b>	Public API of product/appliances must be documented.
<b>Mandatory</b>	NO
<b>Applicability</b>	All products with public API.
<b>Input from Technology Provider</b>	Documentation (or link) of the API of the product. The documentation <i>should</i> cover all the existing public functionality of the API.
<b>Pass/Fail Criteria</b>	The document should exist and contain the API documentation. If the product implements a well-known or standard API, any missing functionality must be documented.
<b>Related Information</b>	
<b>Revision Log</b>	V2: review of the description



<b>Administrator Documentation</b>	
<b>ID</b>	<b>GENERIC_DOC_6</b>
<b>Description</b>	Products must provide an administrator guide describing installation, configuration and operation of the system.
<b>Mandatory</b>	NO
<b>Applicability</b>	All products managed by an administrator.
<b>Input from Technology Provider</b>	Documentation (or link) with requested documentation.
<b>Pass/Fail Criteria</b>	The document should exist and contain the requested information.
<b>Related Information</b>	
<b>Revision Log</b>	

<b>Service Reference Card</b>																			
<b>ID</b>	<b>GENERIC_DOC_7</b>																		
<b>Description</b>	For each of the services that a product runs, document its characteristics with a reference card.																		
<b>Mandatory</b>	NO																		
<b>Applicability</b>	All products that need services for operation.																		
<b>Input from Technology Provider</b>	Documentation (or link) with requested documentation.																		
<b>Pass/Fail Criteria</b>	<p>The document must exist and contain the following information for each service:</p> <table border="1"> <thead> <tr> <th colspan="2"><b>ServiceName</b></th> </tr> </thead> <tbody> <tr> <td>Description</td> <td>Description of the service</td> </tr> <tr> <td>Init scripts</td> <td>List of init scripts for the service, expected run levels</td> </tr> <tr> <td>Daemons</td> <td>List of daemons needed for the service</td> </tr> <tr> <td>Configuration</td> <td>List of configuration files used by the service</td> </tr> <tr> <td>Logs</td> <td>List of log files used by the service</td> </tr> <tr> <td>Open ports</td> <td>List of ports the service uses</td> </tr> <tr> <td>Cron</td> <td>List of crons used by the service</td> </tr> <tr> <td>Other information</td> <td>Any other relevant information about the service.</td> </tr> </tbody> </table>	<b>ServiceName</b>		Description	Description of the service	Init scripts	List of init scripts for the service, expected run levels	Daemons	List of daemons needed for the service	Configuration	List of configuration files used by the service	Logs	List of log files used by the service	Open ports	List of ports the service uses	Cron	List of crons used by the service	Other information	Any other relevant information about the service.
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<b>Revision Log</b>																			

<b>Software License</b>	
<b>ID</b>	<b>GENERIC_DOC_8</b>
<b>Description</b>	Products must have a compatible license for using them in the EGI Infrastructure
<b>Mandatory</b>	YES
<b>Applicability</b>	All products.
<b>Input from Technology Provider</b>	Product License (link or document).
<b>Pass/Fail Criteria</b>	<p>Pass: if the license is available and is compatible with the EGI infrastructure.</p> <p>For Open Source products, compatible licenses are those accepted by the Open Source Initiative and categorized as “Popular and widely used or with strong communities”:</p> <ul style="list-style-type: none"> <li>- Apache License, 2.0 (Apache-2.0)</li> <li>- BSD 3-Clause "New" or "Revised" license (BSD-3-Clause)</li> <li>- BSD 3-Clause "Simplified" or "FreeBSD" license (BSD-2-Clause)</li> <li>- GNU General Public License (GPL)</li> <li>- GNU Library or "Lesser" General Public License (LGPL)</li> <li>- MIT license (MIT)</li> <li>- Mozilla Public License 1.1 (MPL-1.1)</li> <li>- Common Development and Distribution License (CDDL-1.0)</li> <li>- Eclipse Public License (EPL-1.0)</li> </ul> <p>Other licenses accepted by the Open Source Initiative and listed as “Special Purpose” are compatible with the infrastructure (when applicable):</p> <ul style="list-style-type: none"> <li>- Educational Community License</li> <li>- IPA Font License (IPA)</li> <li>- NASA Open Source Agreement 1.3 (NASA-1.3)</li> <li>- Open Font License 1.1 (OFL-1.1)</li> </ul> <p>Any other license, and non Open Source products will be evaluated by the verification team in coordination with the Operations Community.</p>
<b>Related Information</b>	Open Source Initiative Licenses by Category: <a href="http://www.opensource.org/licenses/category">http://www.opensource.org/licenses/category</a>
<b>Revision Log</b>	V2: Moved from Software Release to documentation.

<b>Release changes testing</b>	
<b>ID</b>	<b>GENERIC_DOC_9</b>
<b>Description</b>	Changes in a release of a product must be tested.
<b>Mandatory</b>	NO
<b>Applicability</b>	All Products.
<b>Input from Technology Provider</b>	Tests (or documentation for the test results) for relevant changes described in the product release notes, including bug fixes and any new features.
<b>Pass/Fail Criteria</b>	<p>Pass if the TP provides documentation of the tests performed to certify the release quality. The documentation <i>should</i> describe tests (and tests results) for all the changes included, especially bug fixes.</p> <p>The granularity of the testing documentation will be determined per release basis. In the case of missing tests, the verifier will decide if the provided information is enough to trust quality of the changes introduced in the software.</p>
<b>Related Information</b>	MS503: Software Provisioning Process
<b>Revision Log</b>	<p>V2: Better specification of the pass/fail criteria. Moved to documentation criteria</p> <p>V3: improvement of the pass/fail criteria.</p> <p>V4: better wording after IGE review, turned into NOT mandatory.</p>

## 2 SOFTWARE DISTRIBUTION

Source Code Availability	
<b>ID</b>	<b>GENERIC_DIST_1</b>
<b>Description</b>	Open Source Products should provide their source code.
<b>Mandatory</b>	NO
<b>Applicability</b>	All Open Source Products.
<b>Input from Technology Provider</b>	Source code repository or source distribution of product with building documentation.
<b>Pass/Fail Criteria</b>	Open source products <b>must</b> publicly offer their source code and the license with the binaries. Build documentation (or link to it) should be available. Ideally, automatic or continuous build procedures exist.
<b>Related Information</b>	
<b>Revision Log</b>	V2: Changed ID (previously GENERIC_REL_2) V4: Merged GENERIC_DIST_1 and GENERIC_DIST_2 & Turned into not mandatory

<b>Binary Distribution</b>	
<b>ID</b>	<b>GENERIC_DIST_3</b>
<b>Description</b>	Products must be available in the native packaging format of the supported platform.
<b>Mandatory</b>	YES
<b>Applicability</b>	All Products.
<b>Input from Technology Provider</b>	Binary distribution of product in the native packaging format of the supported platform (RPM, DEB, ...)
<b>Pass/Fail Criteria</b>	<ul style="list-style-type: none"> <li>- Binary packages using the standard packaging format of the OS (i.e. RPM, DEB...) must be provided for all the supported OS and/or architectures.</li> <li>- Packages <b>must</b> be signed by the TP</li> <li>- Packages <i>should</i> follow OS packaging policies (e.g. names of packages, <u>use of filesystem hierarchy</u>, init scripts). Any deviance from the policies must be documented.</li> <li>- Second level dependencies (i.e. software not provided by the TP in their repository) <b>must</b> be provided by the OS distribution or standard OS repositories (EPEL in SL5 &amp; SL6). In the case of needing a different version for a specific package or packages from other repositories, the verifier will decide whether to accept or not the packages depending on the reason given for such dependencies on external packages.</li> </ul>
<b>Related Information</b>	Verification reports from EMI release 1. #1357: Middleware use standard file locations GGUS #82417: <a href="https://ggus.eu/ws/ticket_info.php?ticket=82417">https://ggus.eu/ws/ticket_info.php?ticket=82417</a>
<b>Revision Log</b>	V2: Turn to mandatory, better description to avoid problems found in verification. Changed ID (previously GENERIC_REL_5) V4: Added requirement for signed packages.

### 3 SOFTWARE FEATURES

Backwards Compatibility	
<b>ID</b>	<b>GENERIC_SOFT_1</b>
<b>Description</b>	Minor/Revision releases of a product must be backwards compatible.
<b>Mandatory</b>	YES
<b>Applicability</b>	All Products.
<b>Input from Technology Provider</b>	Products must maintain backwards compatibility between releases of the same major version. Ideally, TP provides tests to assure the backwards compatibility of the product.
<b>Pass/Fail Criteria</b>	All the changes in a minor or revision release <i>must</i> be backward compatible (test should be done with previous releases of clients within the same major version). Any new features should not introduce changes in the previous features.
<b>Related Information</b>	MS503: Software Provisioning Process IGE QC
<b>Revision Log</b>	

<b>New features testing</b>	
<b>ID</b>	<b>GENERIC_SOFT_2</b>
<b>Description</b>	Verification should cover testing of new features and bug fixes.
<b>Mandatory</b>	YES
<b>Applicability</b>	All Products.
<b>Input from Technology Provider</b>	Release notes with changes in the software. The verifier will review each of the changes and check its correctness (whenever possible)
<b>Pass/Fail Criteria</b>	New features and bug fixes specified in the release notes work as documented. Some new features may not be tested if they are not relevant to the main capability of the product.
<b>Related Information</b>	MS503: Software Provisioning Process IGE QC
<b>Revision Log</b>	



## 4 SERVICE CRITERIA

### 4.1 Service Configuration

Automatic Configuration	
<b>ID</b>	<b>GENERIC_SERVICE_5</b>
<b>Description</b>	Products that provide tools for configuration (yaim) that covers typical deployments must assure tools work as documented.
<b>Mandatory</b>	NO
<b>Applicability</b>	Products with automatic configuration tools
<b>Input from Technology Provider</b>	Tests of the automatic configuration tool (yaim) in typical deployment scenario.
<b>Pass/Fail Criteria</b>	Pass if the product can be configured as documented with the provided tool. Resulting configuration must prepare the product for operation without extra manual configuration steps (unless clearly documented).
<b>Related Information</b>	Yaim: <a href="https://twiki.cern.ch/twiki/bin/view/EGEE/YAIM">https://twiki.cern.ch/twiki/bin/view/EGEE/YAIM</a> UMD 1.0.0 Verification Reports.
<b>Revision Log</b>	V3: Removed the requirement for keeping manual configurations.

<b>Default Password Configuration</b>	
<b>ID</b>	<b>GENERIC_SERVICE_6</b>
<b>Description</b>	Products should not use default passwords. If the service needs a password, it must be generated randomly or force the admin to introduce one.
<b>Mandatory</b>	YES
<b>Applicability</b>	All products with passwords.
<b>Input from Technology Provider</b>	Configuration should never have default passwords. If there is an automated configuration generator (e.g. yaim) it must request the user to set one or generate a random one.
<b>Pass/Fail Criteria</b>	No default passwords are used for configuration of services.
<b>Related Information</b>	SVG Advisory 1414: <a href="https://wiki.egi.eu/wiki/SVG:Advisory-SVG-2011-1414">https://wiki.egi.eu/wiki/SVG:Advisory-SVG-2011-1414</a>
<b>Revision Log</b>	

<b>Default Configuration</b>	
<b>ID</b>	<b>GENERIC_SERVICE_7</b>
<b>Description</b>	Default configuration of the service should be <i>usable</i> .
<b>Mandatory</b>	YES
<b>Applicability</b>	All Products.
<b>Input from Technology Provider</b>	Documentation on the default values of any optional configuration parameters. Default values for those values reasonable for the normal operation of the service in a standard installation.
<b>Pass/Fail Criteria</b>	Pass if the documentation of the default values of the optional configuration parameters is available and the service runs with those default values (in a standard installation).
<b>Related Information</b>	VOMS mass user suspension (RT #3585)
<b>Revision Log</b>	

## 5 SECURITY

World Writable Files	
<b>ID</b>	<b>GENERIC_SEC_1</b>
<b>Description</b>	Products must not create world-writable files or directories.
<b>Mandatory</b>	YES
<b>Applicability</b>	All products.
<b>Input from Technology Provider</b>	World-writable files and directories are dangerous since they allows anyone to modify them, several vulnerabilities in recent years have been due to world writable files and directories being present when they should not be. Technology Provider must assure that they software do not produce world writable files in order to prevent new vulnerabilities being introduced in the future. Ideally a test that checks that those files do not exist should be provided.
<b>Test Description</b>	<p><b>Pre-condition</b> Service correctly configured and started</p> <p><b>Test</b> Check the existence of world writable or unowned files in the system.</p> <p><b>Expected Outcome</b> No world writable or unowned files exist.</p>
<b>Pass/Fail Criteria</b>	The product should not create world-writable files or directories. If any world-writable files are needed for the normal operation of the service, these should be documented. Logs and config files <b>must</b> not be world-writable.
<b>Related Information</b>	Proposed by the EGI SVG RAT to prevent new vulnerabilities in the future.
<b>Revision Log</b>	V1.3 Changed test description. V4: improved pass/fail criteria.

<b>Passwords in world readable files</b>	
<b>ID</b>	<b>GENERIC_SEC_3</b>
<b>Description</b>	Service password must not be stored in world readable files.
<b>Mandatory</b>	YES
<b>Applicability</b>	All products with passwords.
<b>Input from Technology Provider</b>	If the product uses passwords stored in files, those files must not be world readable.
<b>Pass/Fail Criteria</b>	No passwords are stored in world readable files.
<b>Related Information</b>	SVG Advisory 1414: <a href="https://wiki.egi.eu/wiki/SVG:Advisory-SVG-2011-1414">https://wiki.egi.eu/wiki/SVG:Advisory-SVG-2011-1414</a>
<b>Revision Log</b>	

## 6 MISCELLANEOUS

<b>Bug Tracking System</b>	
<b>ID</b>	<b>GENERIC_MISC_1</b>
<b>Description</b>	TP must enrol as 3 <sup>rd</sup> level support in the EGI Helpdesk.
<b>Mandatory</b>	YES
<b>Applicability</b>	All Products.
<b>Input from Technology Provider</b>	Technology Providers must enrol in GGUS as 3 <sup>rd</sup> level support for the products verified by the Quality Assurance team of EGI. Any further integration with TP-specific bug tracking software is entirely up to the Technology Provider.
<b>Pass/Fail Criteria</b>	Pass if Technology Provider enlisted as 3 <sup>rd</sup> level support in GGUS.
<b>Related Information</b>	IGE QC
<b>Revision Log</b>	

## 7 AUTHENTICATION

An authentication token that is strongly bound to an individual must be applied consistently across the software used within the production infrastructure. The authentication system should be capable of supporting a delegation model.

### 7.1 Authentication Credentials

<b>X.509 Certificate support</b>	
<b>ID</b>	<b>AUTHN_CRED_1</b>
<b>Description</b>	Primary authentication token within the infrastructure is the X.509 certificate and its proxy derivatives.
<b>Mandatory</b>	YES
<b>Applicability</b>	Authentication Appliances.
<b>Input from Technology Provider</b>	Support for X.509 certificate (and proxy derivatives) as credential token for authentication.
<b>Pass/Fail Criteria</b>	Pass if the appliance is able to use X.509 certificates as authentication token. The appliance <i>should</i> also support proxy derivatives.
<b>Related Information</b>	UMD Roadmap [R 1]
<b>Revision Log</b>	

<b>SHA-2 Certificate support</b>	
<b>ID</b>	<b>AUTHN_CRED_2</b>
<b>Description</b>	SHA-2 certificates should be accepted by middleware.
<b>Mandatory</b>	NO
<b>Applicability</b>	Authentication Appliances.
<b>Input from Technology Provider</b>	Support for certificates and proxies with SHA-2 cryptographic hash functions.
<b>Pass/Fail Criteria</b>	Pass if the appliance is able to use SHA-2 certificates as authentication token. Information on how to get and test with SHA-2 certificates is available at [R 2]
<b>Related Information</b>	UMD Roadmap [R 1] Support for SHA2 proxies RT #3078
<b>Revision Log</b>	



<b>RFC Proxy support</b>	
<b>ID</b>	<b>AUTHN_CRED_3</b>
<b>Description</b>	RFC proxies should be accepted by middleware.
<b>Mandatory</b>	NO
<b>Applicability</b>	Authentication Appliances that
<b>Input from Technology Provider</b>	Support for RFC proxies as credential tokens for authentication.
<b>Pass/Fail Criteria</b>	Pass if the appliance is able to use RFC proxies as authentication token. Information on how to create RFC proxies is available at [R 2]
<b>Related Information</b>	UMD Roadmap [R 1]
<b>Revision Log</b>	

## 7.2 Authentication Protocols

TLS/SSLv3 Support	
<b>ID</b>	<b>AUTHN_PROTO_1</b>
<b>Description</b>	TLS/SSLv3/v2 with client-side authentication must be supported.
<b>Mandatory</b>	YES
<b>Applicability</b>	Authentication Appliances.
<b>Input from Technology Provider</b>	Support for accessing resources through protocols that are secured using SSL or TLS (e.g. plain socket, or https connections). If the component exposes a WebService that requires authentication, it should use the X.509 certificates/proxies with the https protocol.
<b>Pass/Fail Criteria</b>	Pass if the product uses SSL or TLS for accessing it. For the current releases of UMD, products still using GSI authentication (with httpg for WebServices) may be accepted, <u>this exception may be dropped</u> in future releases of the criterion.
<b>Related Information</b>	UMD Roadmap [R 1]
<b>Revision Log</b>	V2: Added GSI (httpg) exception for products that have not yet transitioned V4: changed from AUTH_IFACE_1 to AUTH_PROTO_1.

## 8 CLIENT TOOLS

### 8.1 Generic client tools criteria

Command line options coherency	
<b>ID</b>	<b>CLIENT_TOOLS_1</b>
<b>Description</b>	Client commands for the same product should have a coherent set of options.
<b>Mandatory</b>	NO
<b>Applicability</b>	Client Tools
<b>Input from Technology Provider</b>	Client command tools for a given product with coherent options between them (e.g. configuration file is always specified with <code>-c</code> option, <code>vo</code> with <code>-vo</code> option) Ideally, coherency with other product command line clients.
<b>Pass/Fail Criteria</b>	All the command tools for a given product must have a coherent command line options. Semantically common options for two commands must have the same syntax.
<b>Related Information</b>	Requirement #1780
<b>Revision Log</b>	

<b>Error Messages</b>	
<b>ID</b>	<b>CLIENT_TOOLS_2</b>
<b>Description</b>	Error messages provided by the service should be clear and facilitate the solution of those errors by users or service administrators
<b>Mandatory</b>	NO
<b>Applicability</b>	Client tools.
<b>Input from Technology Provider</b>	Any error in the client tools must produce a clear error message. A possible solution/cause for it should be given.
<b>Pass/Fail Criteria</b>	<p>Pass if the errors provided by the client tools always produce a descriptive message. Errors without any message (unless a quiet option is specified) will make the criterion to fail.</p> <p>Ideally the following info is also documented/shown for all errors:</p> <ul style="list-style-type: none"> <li>• Error code</li> <li>• Error source (internal module or remote resource (specify it explicitly))</li> <li>• Cause of error (syntax error, module malfunctioning, configuration problem, network error, other (specify it explicit))</li> <li>• Type (critical, informative)</li> <li>• Possible solution</li> </ul>
<b>Related Information</b>	Requirements gathered in MS305 related to resubmission of jobs, and information provided in error messages.
<b>Revision Log</b>	

## 9 REFERENCES

<b>R 1</b>	UMD roadmap: <a href="https://documents.egi.eu/public/ShowDocument?docid=100">https://documents.egi.eu/public/ShowDocument?docid=100</a>
<b>R 2</b>	QC Test Notes: <a href="https://wiki.egi.eu/w/index.php?title=EGI_Quality_Criteria_Testing">https://wiki.egi.eu/w/index.php?title=EGI_Quality_Criteria_Testing</a>
<b>R 3</b>	Web Services Data Access and Integration – The Relational Realisation (WS-DAIR) Specification, Version 1.0
<b>R 4</b>	Web Services Data Access and Integration – The XML Realization (WS-DAIX) Specification, Version 1.0
<b>R 5</b>	OGSA-DAI: <a href="http://www.ogsadai.org.uk/">http://www.ogsadai.org.uk/</a>
<b>R 6</b>	gLite LFC: <a href="https://twiki.cern.ch/twiki/bin/view/EGEE/GliteLFC">https://twiki.cern.ch/twiki/bin/view/EGEE/GliteLFC</a>
<b>R 7</b>	AMGA: <a href="http://amga.web.cern.ch/amga/">http://amga.web.cern.ch/amga/</a>
<b>R 8</b>	AMGA WSDL: <a href="http://amga.web.cern.ch/amga/soap_wsdaire.html">http://amga.web.cern.ch/amga/soap_wsdaire.html</a>
<b>R 9</b>	AMGA streaming API: <a href="http://amga.web.cern.ch/amga/protocol.html">http://amga.web.cern.ch/amga/protocol.html</a>
<b>R 10</b>	AMGA Metadata Queries: <a href="http://amga.web.cern.ch/amga/queries.html">http://amga.web.cern.ch/amga/queries.html</a>
<b>R 11</b>	A. Konstantinov, ARC Computational Job Management Component – A-REX, NORDUGRID-TECH-14
<b>R 12</b>	CREAM: <a href="http://grid.pd.infn.it/cream/">http://grid.pd.infn.it/cream/</a>
<b>R 13</b>	EMI-ES: <a href="https://twiki.cern.ch/twiki/bin/view/EMI/EmiExecutionService">https://twiki.cern.ch/twiki/bin/view/EMI/EmiExecutionService</a>
<b>R 14</b>	GRAM5: <a href="http://www.globus.org/toolkit/docs/latest-stable/execution/gram5/">http://www.globus.org/toolkit/docs/latest-stable/execution/gram5/</a>
<b>R 15</b>	OGF DRMAA: <a href="http://www.drmaa.org/">http://www.drmaa.org/</a>
<b>R 16</b>	OGSA Basic Execution Service v1.0: <a href="http://www.ogf.org/documents/GFD.108.pdf">http://www.ogf.org/documents/GFD.108.pdf</a>
<b>R 17</b>	QCG-Broker: <a href="http://www.qoscosgrid.org/trac/qcg-broker">http://www.qoscosgrid.org/trac/qcg-broker</a>
<b>R 18</b>	UNICORE UAS: <a href="http://www.unicore.eu/unicore/architecture/service-layer.php#anchor_uas">http://www.unicore.eu/unicore/architecture/service-layer.php#anchor_uas</a>
<b>R 19</b>	gLite WMS: <a href="http://web.infn.it/gLiteWMS/">http://web.infn.it/gLiteWMS/</a>
<b>R 20</b>	SAGA-CORE-WG: A Simple API for Grid Applications (SAGA) v1.0 (GFD.90)
<b>R 21</b>	SAGA (A Simple API for Grid Applications): <a href="http://saga.cct.lsu.edu/">http://saga.cct.lsu.edu/</a>
<b>R 22</b>	Instrument Element: <a href="http://www.dorii.eu/resources/adaptation:middleware:IE">http://www.dorii.eu/resources/adaptation:middleware:IE</a>

<b>R 23</b>	DORII (Deployment of Remote Instrumentation Infrastructure) Project: <a href="http://www.dorii.eu/">http://www.dorii.eu/</a>
<b>R 24</b>	GlueSchema Specification v1.3: <a href="http://glueschema.forge.cnaf.infn.it/Spec/V13">http://glueschema.forge.cnaf.infn.it/Spec/V13</a>
<b>R 25</b>	GlueSchema Specification v2.0: <a href="http://www.ogf.org/documents/GFD.147.pdf">http://www.ogf.org/documents/GFD.147.pdf</a>
<b>R 26</b>	Glue Validator: <a href="https://tomtools.cern.ch/confluence/display/IS/GLUEValidator">https://tomtools.cern.ch/confluence/display/IS/GLUEValidator</a>
<b>R 27</b>	JMS (Java Message Service Specification) 1.1: <a href="http://www.oracle.com/technetwork/java/jms/index.html">http://www.oracle.com/technetwork/java/jms/index.html</a>
<b>R 28</b>	AMQP (Advanced Message Queuing Protocol): <a href="http://www.amqp.org/confluence/display/AMQP/Advanced+Message+Queuing+Protocol">http://www.amqp.org/confluence/display/AMQP/Advanced+Message+Queuing+Protocol</a>
<b>R 29</b>	OASIS WS-Notification: <a href="https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=wsn">https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=wsn</a>
<b>R 30</b>	Nagios Config Generator: <a href="https://tomtools.cern.ch/confluence/display/SAM/NCG">https://tomtools.cern.ch/confluence/display/SAM/NCG</a>
<b>R 31</b>	My EGI portal: <a href="https://tomtools.cern.ch/confluence/display/SAM/MyEGI">https://tomtools.cern.ch/confluence/display/SAM/MyEGI</a>
<b>R 32</b>	SAM Probes Documentation: <a href="https://tomtools.cern.ch/confluence/display/SAM/Probes">https://tomtools.cern.ch/confluence/display/SAM/Probes</a>
<b>R 33</b>	Accounting Portal: <a href="http://accounting.egi.eu/">http://accounting.egi.eu/</a>
<b>R 34</b>	GridSite Delegation Protocol: <a href="http://www.gridsite.org/wiki/Delegation_protocol">http://www.gridsite.org/wiki/Delegation_protocol</a>
<b>R 35</b>	Globus Delegation Service: <a href="http://www.globus.org/toolkit/docs/4.0/security/delegation/">http://www.globus.org/toolkit/docs/4.0/security/delegation/</a>
<b>R 36</b>	European Policy Management Authority for Grid Authentication (EuGridPMA): <a href="http://www.eugridpma.org/">http://www.eugridpma.org/</a>
<b>R 37</b>	ARGUS Authorization Service: <a href="https://twiki.cern.ch/twiki/bin/view/EGEE/AuthorizationFramework">https://twiki.cern.ch/twiki/bin/view/EGEE/AuthorizationFramework</a>
<b>R 38</b>	XACML: <a href="http://docs.oasis-open.org/xacml/2.0/access_control-xacml-2.0-core-spec-os.pdf">http://docs.oasis-open.org/xacml/2.0/access_control-xacml-2.0-core-spec-os.pdf</a>
<b>R 39</b>	Hydra encrypted file storage: <a href="https://twiki.cern.ch/twiki/bin/view/EGEE/DMEDS">https://twiki.cern.ch/twiki/bin/view/EGEE/DMEDS</a>
<b>R 40</b>	gLite FTS: <a href="https://twiki.cern.ch/twiki/bin/view/EGEE/GLiteFTS">https://twiki.cern.ch/twiki/bin/view/EGEE/GLiteFTS</a>
<b>R 41</b>	SRM v2.2: <a href="http://www.ggf.org/documents/GFD.129.pdf">http://www.ggf.org/documents/GFD.129.pdf</a>
<b>R 42</b>	S2 Test: <a href="http://s-2.sourceforge.net/">http://s-2.sourceforge.net/</a>
<b>R 43</b>	SRM-Tester: <a href="https://sdm.lbl.gov/twiki/bin/view/Software/SRMTester/WebHome">https://sdm.lbl.gov/twiki/bin/view/Software/SRMTester/WebHome</a>
<b>R 44</b>	Lcg-utils: <a href="http://grid-deployment.web.cern.ch/grid-deployment/documentation/LFC_DPM/lcg_util/">http://grid-deployment.web.cern.ch/grid-deployment/documentation/LFC_DPM/lcg_util/</a>
<b>R 45</b>	Lcg-utils test suite: <a href="http://glite.cvs.cern.ch/cgi-">http://glite.cvs.cern.ch/cgi-</a>



	<a href="http://bin/glite.cgi/org.glite.testsuites.ctb/UI/tests/test-lcg-utils.sh?view=markup">bin/glite.cgi/org.glite.testsuites.ctb/UI/tests/test-lcg-utils.sh?view=markup</a>
<b>R 46</b>	Open Cloud Computing Interface WG, OGF, <a href="http://www.ggf.org/gf/group_info/view.php?group=occi-wg">http://www.ggf.org/gf/group_info/view.php?group=occi-wg</a>
<b>R 47</b>	Virtualization Management (VMAN), DMTF <a href="http://www.dmtf.org/standards/vman">http://www.dmtf.org/standards/vman</a>
<b>R 48</b>	StratusLab <a href="http://stratuslab.eu/">http://stratuslab.eu/</a>
<b>R 49</b>	StratusLab MarketPlace Technical Note TN-Marketplace (V3.0)