



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
v0.1	02/11/2010	First draft	Enol Fernández
v1.0	03/11/2010	Changed Management, Traceability and Monitoring section	Enol Fernández
v1.1	03/11/2010	Added Probe description in GEN_MON_1	Enol Fernández
v1.2	11/11/2010	Some formatting update	Enol Fernández
v1.3	31/01/2011	Better test specification	Enol Fernández
1.4	09/02/2011	Review of criteria	Enol Fernández
2 DRAFT 1	24/06/2011	Preparation of new release	Enol Fernández
2	02/08/2011	Reorganisation, added new criteria.	Enol Fernández
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
4 DRAFT 1	21/05/2012	First public draft of release 4	Enol Fernández
4 DRAFT 2	23/07/2012	Second public draft of release 4	Enol Fernández
5	10/20/2013	Release 5	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.

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

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

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

Online help (man pages)	
ID	GENERIC_DOC_4
Description	All products with end user command line tools must include man pages or online help.
Mandatory	NO
Applicability	All products with command line tools.
Input from Technology Provider	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)
Pass/Fail Criteria	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 must be mutually consistent (describe the same set of options and their meaning).
Related Information	GGUS ticket # 73214
Revision Log	V3: Tighten wording to avoid situations as described in GGUS #73214

API Documentation	
ID	GENERIC_DOC_5
Description	Public API of product/appliances must be documented.
Mandatory	NO
Applicability	All products with public API.
Input from Technology Provider	Documentation (or link) of the API of the product. The documentation <i>should</i> cover all the existing public functionality of the API.
Pass/Fail Criteria	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.
Related Information	
Revision Log	V2: review of the description

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

Service Reference Card																			
ID	GENERIC_DOC_7																		
Description	For each of the services that a product runs, document its characteristics with a reference card.																		
Mandatory	NO																		
Applicability	All products that need services for operation.																		
Input from Technology Provider	Documentation (or link) with requested documentation.																		
Pass/Fail Criteria	<p>The document must exist and contain the following information for each service:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center;">ServiceName</th> </tr> </thead> <tbody> <tr> <td style="width: 30%;">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>	ServiceName		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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Related Information																			
Revision Log																			

Software License	
ID	GENERIC_DOC_8
Description	Products must have a compatible license for using them in the EGI Infrastructure
Mandatory	YES
Applicability	All products.
Input from Technology Provider	Product License (link or document).
Pass/Fail Criteria	<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"> - Apache License, 2.0 (Apache-2.0) - BSD 3-Clause "New" or "Revised" license (BSD-3-Clause) - BSD 3-Clause "Simplified" or "FreeBSD" license (BSD-2-Clause) - GNU General Public License (GPL) - GNU Library or "Lesser" General Public License (LGPL) - MIT license (MIT) - Mozilla Public License 1.1 (MPL-1.1) - Common Development and Distribution License (CDDL-1.0) - Eclipse Public License (EPL-1.0) <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"> - Educational Community License - IPA Font License (IPA) - NASA Open Source Agreement 1.3 (NASA-1.3) - Open Font License 1.1 (OFL-1.1) <p>Any other license, and non Open Source products will be evaluated by the verification team in coordination with the Operations Community.</p>
Related Information	Open Source Initiative Licenses by Category: http://www.opensource.org/licenses/category
Revision Log	V2: Moved from Software Release to documentation.

Release changes testing	
ID	GENERIC_DOC_9
Description	Changes in a release of a product must be tested.
Mandatory	NO
Applicability	All Products.
Input from Technology Provider	Tests (or documentation for the test results) for relevant changes described in the product release notes, including bug fixes and any new features.
Pass/Fail Criteria	<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>
Related Information	MS503: Software Provisioning Process
Revision Log	<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	
ID	GENERIC_DIST_1
Description	Open Source Products should provide their source code.
Mandatory	NO
Applicability	All Open Source Products.
Input from Technology Provider	Source code repository or source distribution of product with building documentation.
Pass/Fail Criteria	Open source products must 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.
Related Information	
Revision Log	V2: Changed ID (previously GENERIC_REL_2) V4: Merged GENERIC_DIST_1 and GENERIC_DIST_2 & Turned into not mandatory

Binary Distribution	
ID	GENERIC_DIST_3
Description	Products must be available in the native packaging format of the supported platform.
Mandatory	YES
Applicability	All Products.
Input from Technology Provider	Binary distribution of product in the native packaging format of the supported platform (RPM, DEB, ...)
Pass/Fail Criteria	<ul style="list-style-type: none"> - 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. - Packages must be signed by the TP - 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. - Second level dependencies (i.e. software not provided by the TP in their repository) must be provided by the OS distribution or standard OS repositories (EPEL in SL5 & 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.
Related Information	Verification reports from EMI release 1. #1357: Middleware use standard file locations GGUS #82417: https://ggus.eu/ws/ticket_info.php?ticket=82417
Revision Log	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	
ID	GENERIC_SOFT_1
Description	Minor/Revision releases of a product must be backwards compatible.
Mandatory	YES
Applicability	All Products.
Input from Technology Provider	Products must maintain backwards compatibility between releases of the same major version. Ideally, TP provides tests to assure the backwards compatibility of the product.
Pass/Fail Criteria	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.
Related Information	MS503: Software Provisioning Process IGE QC
Revision Log	

New features testing	
ID	GENERIC_SOFT_2
Description	Verification should cover testing of new features and bug fixes.
Mandatory	YES
Applicability	All Products.
Input from Technology Provider	Release notes with changes in the software. The verifier will review each of the changes and check its correctness (whenever possible)
Pass/Fail Criteria	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.
Related Information	MS503: Software Provisioning Process IGE QC
Revision Log	

4 SERVICE CRITERIA

4.1 Service Configuration

Automatic Configuration	
ID	GENERIC_SERVICE_5
Description	Products that provide tools for configuration (yaim) that covers typical deployments must assure tools work as documented.
Mandatory	NO
Applicability	Products with automatic configuration tools
Input from Technology Provider	Tests of the automatic configuration tool (yaim) in typical deployment scenario.
Pass/Fail Criteria	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).
Related Information	Yaim: https://twiki.cern.ch/twiki/bin/view/EGEE/YAIM UMD 1.0.0 Verification Reports.
Revision Log	V3: Removed the requirement for keeping manual configurations.

Default Password Configuration	
ID	GENERIC_SERVICE_6
Description	Products should not use default passwords. If the service needs a password, it must be generated randomly or force the admin to introduce one.
Mandatory	YES
Applicability	All products with passwords.
Input from Technology Provider	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.
Pass/Fail Criteria	No default passwords are used for configuration of services.
Related Information	SVG Advisory 1414: https://wiki.egi.eu/wiki/SVG:Advisory-SVG-2011-1414
Revision Log	

Default Configuration	
ID	GENERIC_SERVICE_7
Description	Default configuration of the service should be <i>usable</i> .
Mandatory	YES
Applicability	All Products.
Input from Technology Provider	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.
Pass/Fail Criteria	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).
Related Information	VOMS mass user suspension (RT #3585)
Revision Log	

5 SECURITY

World Writable Files	
ID	GENERIC_SEC_1
Description	Products must not create world-writable files or directories.
Mandatory	YES
Applicability	All products.
Input from Technology Provider	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.
Test Description	<p>Pre-condition Service correctly configured and started</p> <p>Test Check the existence of world writable or unowned files in the system.</p> <p>Expected Outcome No world writable or unowned files exist.</p>
Pass/Fail Criteria	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 must not be world-writable.
Related Information	Proposed by the EGI SVG RAT to prevent new vulnerabilities in the future.
Revision Log	V1.3 Changed test description. V4: improved pass/fail criteria.

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

6 MISCELLANEOUS

Bug Tracking System	
ID	GENERIC_MISC_1
Description	TP must enrol as 3 rd level support in the EGI Helpdesk.
Mandatory	YES
Applicability	All Products.
Input from Technology Provider	Technology Providers must enrol in GGUS as 3 rd 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.
Pass/Fail Criteria	Pass if Technology Provider enlisted as 3 rd level support in GGUS.
Related Information	IGE QC
Revision Log	

7 PARALLEL JOB

7.1 MPI support

Precompiled MPI job Execution	
ID	PARALLEL_MPI_1
Description	Parallel Job Appliances must support the execution of MPI jobs.
Mandatory	YES
Applicability	Parallel Job Appliances.
Input from Technology Provider	Support for the submission of a MPI job with pre-existing binary.
Test Description	<p>Pre-condition Valid User proxy and valid delegation in the service. MPI Binary</p> <p>Test Submission of a MPI job requesting more than one execution slot with MPI Binary included in input sandbox of job or already installed in the system (description of job depending on Job Execution interface)</p> <p>Expected Outcome Job is submitted and executed without errors; the requested slots are allocated. Unique Identifier for the submitted jobs, status log of the job.</p>
Pass/Fail Criteria	Pass if the test is provided and passes for all the MPI implementations supported. Support for Open MPI and MPICH2 should be included
Related Information	User requirements: #672: MPI support
Revision Log	

MPI job Execution from source.	
ID	PARALLEL_MPI_2
Description	Parallel Job Appliances must support the execution of MPI jobs that are compiled at submission time.
Mandatory	YES
Applicability	Parallel Job Appliances.
Input from Technology Provider	Support for the submission of a MPI job compiled from source during its execution.
Test Description	<p>Pre-condition Valid User proxy and valid delegation in the service. Source code for MPI application.</p> <p>Test Submission of a MPI job requesting more than one execution slot with MPI source code included in input sandbox of job (description of job depending on Job Execution interface). Prior to the execution of the application, the source must be compiled with the available compiler at the site.</p> <p>Expected Outcome Job is submitted, compiled and executed without errors; the requested slots are allocated. Unique Identifier for the submitted jobs, status log of the job.</p>
Pass/Fail Criteria	Pass if the test is provided and passes for all the MPI implementations supported. Support for Open MPI and MPICH2 should be included
Related Information	User requirements: #672: MPI support
Revision Log	

7.2 OpenMP support

Precompiled OpenMP job Execution	
ID	PARALLEL_OMP_1
Description	Parallel Job Appliances must support the execution of OpenMP jobs.
Mandatory	YES
Applicability	Parallel Job Appliances.
Input from Technology Provider	Support for the submission of an OpenMP job with pre-existing binary.
Test Description	<p>Pre-condition Valid User proxy and valid delegation in the service. OpenMP Binary</p> <p>Test Submission of an OpenMP job requesting more than one execution slot with OpenMP Binary included in input sandbox of job (description of job depending on Job Execution interface)</p> <p>Expected Outcome Job is submitted and executed without errors; the requested slots are allocated. Unique Identifier for the submitted jobs, status log of the job.</p>
Pass/Fail Criteria	Pass if the test is provided and passes for all the OpenMP implementations supported.
Related Information	
Revision Log	

OpenMP job Execution from source	
ID	PARALLEL_OMP_2
Description	Parallel Job Appliances must support the execution of OpenMP jobs that are compiled at submission time.
Mandatory	YES
Applicability	Parallel Job Appliances.
Input from Technology Provider	Support for the submission of an OpenMP job that gets compiled at the remote site.
Test Description	<p>Pre-condition Valid User proxy and valid delegation in the service. Source code for OpenMP application.</p> <p>Test Submission of an OpenMP job requesting more than one execution slot with OpenMP source code included in input sandbox of job (description of job depending on Job Execution interface). Prior to the execution of the application, the source must be compiled with the available compiler at the site.</p> <p>Expected Outcome Job is submitted, compiled and executed without errors; the requested slots are allocated. Unique Identifier for the submitted jobs, status log of the job.</p>
Pass/Fail Criteria	Pass if the test is provided and passes for all the OpenMP implementations supported.
Related Information	
Revision Log	

8 MONITORING PROBES

The Monitoring Capability executes a set of probes defined by the operations community. These probes *should* be provided by the TP for each product.

8.1 Service Probes

Service Probe	
ID	MON_PROBE_GENERIC_2
Description	Provide monitoring probes that test the functionality of the service
Mandatory	NO
Applicability	All Services
Input from Technology Provider	Monitoring probe that tests that the service provides the expected functionality. The probe should only use the public interface of the service and run integrated in the monitoring infrastructure of EGI. The exact tests to perform for each service are determined by the operations community. For the current probes specification check the SAM documentation [R 32]
Pass/Fail Criteria	Probes must exist, they must be integrated with the EMI monitoring infrastructure and provide the expected functionality.
Related Information	SAM documentation [R 32]
Revision Log	

9 CLIENT TOOLS

9.1 Generic client tools criteria

Command line options coherency	
ID	CLIENT_TOOLS_1
Description	Client commands for the same product should have a coherent set of options.
Mandatory	NO
Applicability	Client Tools
Input from Technology Provider	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.
Pass/Fail Criteria	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.
Related Information	Requirement #1780
Revision Log	

Error Messages	
ID	CLIENT_TOOLS_2
Description	Error messages provided by the service should be clear and facilitate the solution of those errors by users or service administrators
Mandatory	NO
Applicability	Client tools.
Input from Technology Provider	Any error in the client tools must produce a clear error message. A possible solution/cause for it should be given.
Pass/Fail Criteria	<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"> • Error code • Error source (internal module or remote resource (specify it explicitly)) • Cause of error (syntax error, module malfunctioning, configuration problem, network error, other (specify it explicit)) • Type (critical, informative) • Possible solution
Related Information	Requirements gathered in MS305 related to resubmission of jobs, and information provided in error messages.
Revision Log	

10 REFERENCES

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

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



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