



# EGI-InSPIRE

## UMD QUALITY CRITERIA GENERIC CRITERIA V3

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|                      |   |
|----------------------|---|
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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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| v1.0      | 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 |



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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).<br>Command line help should give meaningful cues (i.e., only a list of single-letter options is not sufficient)<br>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" 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. |
| 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.   |             |  |             |                            |              |   |         |  |               |   |      |                                       |            |                                |      |                                   |                   |   |
| <b>Related Information</b>            |   |             |  |             |                            |              |   |         |  |               |   |      |                                       |            |                                |      |                                   |                   |   |
| <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:<br><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>                      | YES   |
| <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>             | All the changes in a release <i>should</i> be tested, especially bug fixes. The granularity of testing 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. |
| <b>Related Information</b>            | MS503: Software Provisioning Process  |
| <b>Revision Log</b>                   | V2: Better specification of the pass/fail criteria. Moved to documentation criteria<br>V3: improvement of the pass/fail criteria.   |

## 2 SOFTWARE DISTRIBUTION

| Source Code Availability              |   |
|---------------------------------------|---|
| <b>ID</b>                             | <b>GENERIC_DIST_1</b>   |
| <b>Description</b>                    | Products should provide their source code.  |
| <b>Mandatory</b>                      | YES   |
| <b>Applicability</b>                  | All Open Source Products.   |
| <b>Input from Technology Provider</b> | Source code repository or source distribution of product. The source code of each product of the UMD middleware should follow a coherent and clear programming style that helps in the readability of the code and eases maintenance, testing, debugging, fixing, modification and portability of the software. |
| <b>Pass/Fail Criteria</b>             | Open source products <b>must</b> publicly offer their source code and the license with the binaries.  |
| <b>Related Information</b>            |   |
| <b>Revision Log</b>                   | V2: Changed ID (previously GENERIC_REL_2)   |

| <b>Source Distribution</b>            |   |
|---------------------------------------|---|
| <b>ID</b>                             | <b>GENERIC_DIST_2</b>   |
| <b>Description</b>                    | Technology Providers should provide buildable source distributions of products.   |
| <b>Mandatory</b>                      | YES   |
| <b>Applicability</b>                  | All Open Source Products.   |
| <b>Input from Technology Provider</b> | Source code distribution (repository or tar.gz/zip or source package) with building documentation. Ideally continuous building server should be in place.   |
| <b>Pass/Fail Criteria</b>             | Open source products must publicly offer their source code and the license.<br>Build documentation (or link to it) should be available.<br>Ideally, automatic or continuous build procedures exist. |
| <b>Related Information</b>            |   |
| <b>Revision Log</b>                   | V2: Merged all source related criteria into this one and Changed ID (previously GENERIC_REL_x). Turned into 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>             | <p>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.</p> <p>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.</p> <p>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).</p> <p>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.</p> |
| <b>Related Information</b>            | <p>Verification reports from EMI release 1.</p> <p>#1357: Middleware use standard file locations</p>   |
| <b>Revision Log</b>                   | V2: Turn to mandatory, better description to avoid problems found in verification.<br>Changed ID (previously GENERIC_REL_5)  |



### 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<br>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<br>IGE QC  |
| <b>Revision Log</b>                   |   |

## 4 SERVICE CRITERIA

### 4.1 Service Management

UMD products should have mechanisms for managing them, monitoring their status and tracing actions they perform on the system. Ideally, these should be also available remotely, allowing operators to react timely to problems in the infrastructure. This generic criteria for services is the minimum set of service related

| Service control and status |  |
|----------------------------|--|
| <b>ID</b>                  | <b>GENERIC_SERVICE_1</b>   |
| <b>Description</b>         | Services run by the product must provide a mechanism for starting, stopping and querying the status of the services. |
| <b>Mandatory</b>           | YES  |
| <b>Applicability</b>       | All products that use services for operations.   |

|   |  |   |                    |                      |                         |   |   |
|---|--|---|--------------------|----------------------|-------------------------|---|---|
| <b>Input from Technology Provider</b>   | Start/stop mechanism for each of the services following OS conventions. Ideally, provide a test suite for the mechanism as described below.  |   |                    |                      |                         |   |   |
| <b>Test Description</b>   | <table border="0"> <tr> <td><b>Pre-condition</b></td> <td>Service is started</td> </tr> <tr> <td><b>Test</b></td> <td>Start service</td> </tr> <tr> <td><b>Expected Outcome</b></td> <td>No action taken, show a message stating the service is already started.</td> </tr> </table> | <b>Pre-condition</b>  | Service is started | <b>Test</b>          | Start service           | <b>Expected Outcome</b>   | No action taken, show a message stating the service is already started. |
|   | <b>Pre-condition</b>   | Service is started  |                    |                      |                         |   |   |
|   | <b>Test</b>  | Start service   |                    |                      |                         |   |   |
|   | <b>Expected Outcome</b>  | No action taken, show a message stating the service is already started. |                    |                      |                         |   |   |
|   | <table border="0"> <tr> <td><b>Pre-condition</b></td> <td>Service is stopped</td> </tr> <tr> <td><b>Test</b></td> <td>Start service</td> </tr> <tr> <td><b>Expected Outcome</b></td> <td>Service is started, show a message when it is started.</td> </tr> </table>                  | <b>Pre-condition</b>  | Service is stopped | <b>Test</b>          | Start service           | <b>Expected Outcome</b>   | Service is started, show a message when it is started.                  |
|   | <b>Pre-condition</b>   | Service is stopped  |                    |                      |                         |   |   |
|   | <b>Test</b>  | Start service   |                    |                      |                         |   |   |
|   | <b>Expected Outcome</b>  | Service is started, show a message when it is started.                  |                    |                      |                         |   |   |
|   | <table border="0"> <tr> <td><b>Pre-condition</b></td> <td>Service is started</td> </tr> <tr> <td><b>Test</b></td> <td>Stop service</td> </tr> <tr> <td><b>Expected Outcome</b></td> <td>Service is stopped, show a message stating the service is stopped.</td> </tr> </table>       | <b>Pre-condition</b>  | Service is started | <b>Test</b>          | Stop service            | <b>Expected Outcome</b>   | Service is stopped, show a message stating the service is stopped.      |
|   | <b>Pre-condition</b>   | Service is started  |                    |                      |                         |   |   |
|   | <b>Test</b>  | Stop service  |                    |                      |                         |   |   |
|   | <b>Expected Outcome</b>  | Service is stopped, show a message stating the service is stopped.      |                    |                      |                         |   |   |
| <table border="0"> <tr> <td><b>Pre-condition</b></td> <td>Service is stopped</td> </tr> <tr> <td><b>Test</b></td> <td>Stop service</td> </tr> <tr> <td><b>Expected Outcome</b></td> <td>No action taken, show a message stating the service is already stopped.</td> </tr> </table> | <b>Pre-condition</b>   | Service is stopped  | <b>Test</b>        | Stop service         | <b>Expected Outcome</b> | No action taken, show a message stating the service is already stopped. |   |
| <b>Pre-condition</b>  | Service is stopped   |   |                    |                      |                         |   |   |
| <b>Test</b>   | Stop service   |   |                    |                      |                         |   |   |
| <b>Expected Outcome</b>   | No action taken, show a message stating the service is already stopped.  |   |                    |                      |                         |   |   |
| <table border="0"> <tr> <td><b>Pre-condition</b></td> <td>Service is stopped</td> </tr> <tr> <td><b>Test</b></td> <td>Check service status</td> </tr> <tr> <td><b>Expected Outcome</b></td> <td>Show a message stating the service is stopped.</td> </tr> </table>                  | <b>Pre-condition</b>   | Service is stopped  | <b>Test</b>        | Check service status | <b>Expected Outcome</b> | Show a message stating the service is stopped.                          |   |
| <b>Pre-condition</b>  | Service is stopped   |   |                    |                      |                         |   |   |
| <b>Test</b>   | Check service status   |   |                    |                      |                         |   |   |
| <b>Expected Outcome</b>   | Show a message stating the service is stopped.   |   |                    |                      |                         |   |   |

|                            |  |
|----------------------------|--|
| <b>Test Description</b>    | <b>Pre-condition</b> Service is started<br><b>Test</b> Check service status<br><b>Expected Outcome</b> Show a message stating the service is started.  |
| <b>Pass/Fail Criteria</b>  | Services run by the product must provide a mechanism for starting, stopping and querying the status of the services following the OS init scripts conventions (e.g. for Linux Distributions, check <a href="http://refspecs.freestandards.org/LSB_3.1.0/LSB-Core-generic/LSB-Core-generic/inisrptact.html">http://refspecs.freestandards.org/LSB_3.1.0/LSB-Core-generic/LSB-Core-generic/inisrptact.html</a> ). They must work properly in <b>all</b> the cases described above.<br>If the OS provides tools for configuring the services (chkconfig in RH based distros), these <i>should</i> work out of the box with the init scripts of the services |
| <b>Related Information</b> | #2274: Service under RH following SystemV init system<br>#1201: Homogeneity in service control.  |
| <b>Revision Log</b>        | V3: Added related information, fix test conditions.  |

## 4.2 Service logs

| Log Files                             |   |
|---------------------------------------|---|
| <b>ID</b>                             | <b>GENERIC_SERVICE_2</b>  |
| <b>Description</b>                    | All services should create log files where the service administrator can trace most relevant actions taken.   |
| <b>Mandatory</b>                      | YES   |
| <b>Applicability</b>                  | All products that use services for operations.  |
| <b>Input from Technology Provider</b> | List of logs generated by the service (the reference card of service should already include them)   |
| <b>Pass/Fail Criteria</b>             | List of logs is provided.<br>They should follow the OS conventions for location and format so they can be treated with the standard tools of the OS (log rotation, collection with syslog, ...)                       |
| <b>Related Information</b>            | This criterion may be further specialized in the specific criteria for each product/capability determining which information must be logged or number/types of logs.<br>#1357: Middleware use standard file locations |
| <b>Revision Log</b>                   | V2: Review of the criteria.<br>V4: Added related information  |

## 4.3 Service Monitoring

All services in the EGI Infrastructure should provide monitoring probes that can be executed automatically by the EGI monitoring framework (based in Nagios). The probes should check the service responsiveness and correctness (good replies for typical requests).

Particular monitoring probes are defined at the Specific Quality Criteria document for Operations tools. The probes that apply to all capabilities (generic probes) are identified as MON\_PROBE\_GENERIC\_xx. For specific capabilities there might exist other probes that are described in the same document.

## 4.4 Service Accounting

All services in the EGI Infrastructure should provide ways of recording the use of resources within the infrastructure. The Accounting Capability described in the Operations Capabilities Criteria document specifies the criteria for the different appliances.

#### 4.5 Availability, Reliability and Scalability.

The EGI Infrastructure depends on the uninterrupted performance of the installed software. All products should provide a reliable operation and should be able to handle growing amounts of work in a graceful manner. Specific criteria for the availability, reliability or scalability of appliances may be also defined in the criteria documents for each of the capabilities.

| <b>Service Reliability</b>            |   |
|---------------------------------------|---|
| <b>ID</b>                             | <b>GENERIC_SERVICE_3</b>  |
| <b>Description</b>                    | Services must maintain a good performance and reliability over long periods of time with normal operation.  |
| <b>Mandatory</b>                      | NO  |
| <b>Applicability</b>                  | All products that use services for operations.  |
| <b>Input from Technology Provider</b> | Long running unattended operation test measuring performance of the product.  |
| <b>Test Description</b>               | <p><b>Pre-condition</b> Product is properly configured.</p> <p><b>Test</b> Start service and measure performance during operations.</p> <p><b>Expected Outcome</b> No significant performance degradation is observed in the system.</p>  |
| <b>Pass/Fail Criteria</b>             | <p>Service must not show performance degradation during a 3-day period. The most important parameters to check are:</p> <ul style="list-style-type: none"> <li>• stable memory usage</li> <li>• throughput and/or response times remain stable during the period of activity (they should be as good or better than at the beginning of the test for similar requests)</li> </ul> |
| <b>Related Information</b>            |   |
| <b>Revision Log</b>                   | V2: detailed pass/fail criteria   |

| <b>Service Robustness</b>             |  |
|---------------------------------------|--|
| <b>ID</b>                             | <b>GENERIC_SERVICE_4</b>   |
| <b>Description</b>                    | Services should not produce unexpected results or become uncontrollable when taxed beyond normal capacity.   |
| <b>Mandatory</b>                      | NO   |
| <b>Applicability</b>                  | All products that use services for operations.   |
| <b>Input from Technology Provider</b> | Assure that the services taxed beyond normal capacity do not produce unexpected results or become uncontrollable.  |
| <b>Pass/Fail Criteria</b>             | Services taxed beyond normal capacity: <ul style="list-style-type: none"> <li>• should not become unresponsive to normal start/stop operations</li> <li>• must be able to start after a forceful stop</li> <li>• must not expose (potentially sensitive) memory contents to other processes</li> <li>• must not leave sensitive data in world-readable files</li> <li>• must not accept connections that would be refused under normal operating conditions</li> </ul> |
| <b>Related Information</b>            | TST_2 from IGE Quality Assurance.  |
| <b>Revision Log</b>                   |  |

#### 4.6 Service Configuration

| <b>Automatic Configuration</b>        |  |
|---------------------------------------|--|
| <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><br>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>                   |  |

## 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<br>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 does not create world-writable files or directories.   |
| <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.   |

| <b>Directory Traversal Attacks testing</b> |  |
|--|--|
| <b>ID</b>                                  | <b>GENERIC_SEC_2</b>   |
| <b>Description</b>                         | Products should assure that directory traversal exploits are not possible using their interfaces. Special care must be taken to products exposing part of the file system (e.g. file access capabilities) and web services.  |
| <b>Mandatory</b>                           | YES  |
| <b>Applicability</b>                       | All products with previous known Directory Traversal exploits (See list at related information), any other product <i>should</i> also include this kind of testing.  |
| <b>Input from Technology Provider</b>      | A directory traversal (or path traversal) consists in exploiting insufficient security validation/sanitization of user-supplied input file names, so that characters representing "traverse to parent directory" are passed through to the file APIs.<br>The Technology Provider should test that directory traversal attacks are not possible using the product interface. Products that need to run as root user, must have special care in this case of attacks, since they may give access to whole file system. |
| <b>Test Description</b>                    | <p><b>Pre-condition</b> Service correctly configured and started</p> <p><b>Test</b> Try to exploit directory traversal in product</p> <p><b>Expected Outcome</b> No directory traversal succeeds.</p>  |
| <b>Pass/Fail Criteria</b>                  | Test for directory traversal exploiting do not successfully access the file system.  |
| <b>Related Information</b>                 | Advisory-SVG-2011-1569 ( <a href="https://wiki.egi.eu/wiki/SVG:Advisory-SVG-2011-1569">https://wiki.egi.eu/wiki/SVG:Advisory-SVG-2011-1569</a> )   |
| <b>Revision Log</b>                        |  |

| <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_2</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 Interface

| <b>X.509 Certificate support</b>      |  |
|---------------------------------------|--|
| <b>ID</b>                             | <b>AUTHN_IFACE_1</b>   |
| <b>Description</b>                    | Primary authentication token within the infrastructure is the X.509 certificate and its proxy derivatives. The certificates and any proxy schemes must follow specifications that are fully integrated into the https protocol.  |
| <b>Mandatory</b>                      | YES  |
| <b>Applicability</b>                  | Authentication Appliances.   |
| <b>Input from Technology Provider</b> | X.509 proxy support for authentication<br>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>             | X.509 proxies are accepted for authentication. WebServices use https.<br>For the major release 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  |

| <b>SAML authentication</b>            |  |
|---------------------------------------|--|
| <b>ID</b>                             | <b>AUTHN_IFACE_2</b>   |
| <b>Description</b>                    | SAML 2.0 can be used as authentication interface within the infrastructure.  |
| <b>Mandatory</b>                      | NO   |
| <b>Applicability</b>                  | Authentication Appliances with SAML 2.0 support.                             |
| <b>Input from Technology Provider</b> | SAML 2.0 support for authentication. Ideally, a test suite for this support. |
| <b>Pass/Fail Criteria</b>             | Pass if SAML2.0 authentication is supported in the appliance.                |
| <b>Related Information</b>            | UMD Roadmap [R 1]  |
| <b>Revision Log</b>                   |  |

## 7.2 Delegation Interface

| Delegation Interface                  |   |
|---------------------------------------|---|
| <b>ID</b>                             | <b>AUTHN_DELEG_1</b>  |
| <b>Description</b>                    | Delegation of credentials must be provided using one of the supported delegation interfaces: GridSite or Globus 4.  |
| <b>Mandatory</b>                      | YES   |
| <b>Applicability</b>                  | Authentication Appliances that provide (require) delegation.  |
| <b>Input from Technology Provider</b> | Delegation interface that includes all functionality of the GridSite WSDL. Correct handling for erroneous input.  |
| <b>Pass/Fail Criteria</b>             | Pass if the delegation interface is tested and works as expected. Appliances must support at least one of the following interfaces: GridSite delegation or Globus 4 delegation. |
| <b>Related Information</b>            | UMD Roadmap [R 1]<br>GridSite Delegation [R 30]<br>Globus Delegation [R 31]   |
| <b>Revision Log</b>                   | V2: Merged AUTHN_DELEG_1 & 2.   |



### 7.3 CAs root certificates Distribution

These QC deal with the distribution of the EuGridPMA [R 32] root certificates.

| CA Checksum                           |   |
|---------------------------------------|---|
| <b>ID</b>                             | <b>AUTHN_CA_1</b>   |
| <b>Description</b>                    | The CA distribution must assure that the distributed CA certificates are correct.   |
| <b>Mandatory</b>                      | YES   |
| <b>Applicability</b>                  | Trust Anchor Distribution   |
| <b>Input from Technology Provider</b> | Checksum test of each of the root certificates distributed.   |
| <b>Test Description</b>               | <p><b>Pre-condition</b> None</p> <p><b>Test</b> Test checksum of the CA certificates.</p> <p><b>Expected Outcome</b> All checksums are correct.</p> |
| <b>Pass/Fail Criteria</b>             | All CA certificates have correct checksum.  |
| <b>Related Information</b>            |   |
| <b>Revision Log</b>                   |   |

| <b>CA valid dates</b>                 |  |
|---------------------------------------|--|
| <b>ID</b>                             | <b>AUTHN_CA_2</b>  |
| <b>Description</b>                    | Dates of the distributed CA certificates are valid for the current date.   |
| <b>Mandatory</b>                      | YES  |
| <b>Applicability</b>                  | Trust Anchor Distribution  |
| <b>Input from Technology Provider</b> | Data validity test of each of the root certificates distributed.   |
| <b>Test Description</b>               | <p><b>Pre-condition</b> None</p> <p><b>Test</b> Check the current date is in the range of the valid dates of the certificate.</p> <p><b>Expected Outcome</b> All dates are valid.</p> <p><b>Sample Test</b></p> <pre>#!/bin/sh check_dates() {   certfile=\$1   start=`openssl x509 -in \$certfile -noout -startdate   cut -f2 -d"="`   if [ \$? -ne 0 ] ; then     echo "Error while processing \$certfile"     return 1   fi   now=`date +%s`   start_sec=`date +%s -d"\$start"`   if [ \$now -lt \$start_sec ] ; then     echo "\$start is before now in \$certfile!"     return 1   fi   end=`openssl x509 -in \$certfile -noout -enddate   cut -f2 -d"="`   if [ \$? -ne 0 ] ; then     echo "Error while processing \$certfile"     return 1   fi   end_sec=`date +%s -d"\$end"`   if [ \$end_sec -lt \$now ] ; then     echo "\$end is after now in \$certfile!"     return 1   fi   return 0 }</pre> |
| <b>Pass/Fail Criteria</b>             | All CA certificates have correct dates.  |
| <b>Related Information</b>            |  |
| <b>Revision Log</b>                   |  |

| CA CRL check                          |  |
|---------------------------------------|--|
| <b>ID</b>                             | <b>AUTHN_CA_3</b>  |
| <b>Description</b>                    | The CRL of the CAs must be available for download and must be valid.   |
| <b>Mandatory</b>                      | YES  |
| <b>Applicability</b>                  | Trust Anchor Distribution  |
| <b>Input from Technology Provider</b> | Test that the CRL of the CA is available for download and it's valid.  |
| <b>Test Description</b>               | <p><b>Pre-condition</b> List of URLs for each CRL is available.</p> <p><b>Test</b> Download CRL and load it.</p> <p><b>Expected Outcome</b> All CRLs can be downloaded and loaded correctly.</p> <p><b>Sample Test</b></p> <pre>#!/bin/sh  check_crl() {     url_file=\$1     url=`cat \$url_file`     crl=`mktemp`     wget -q \$url -O \$crl     if [ \$? -ne 0 ]; then         echo "Unable to download crl from \$url"         rm \$crl         return 1     fi     openssl crl -in \$crl -noout &amp;&gt; /dev/null     if [ \$? -ne 0 ]; then         # try in other format         openssl crl -inform der -in \$crl -noout &amp;&gt; /dev/null         if [ \$? -ne 0 ]; then             echo "Unable to load crl"             rm \$crl             return 1         fi     fi     rm \$crl     return 0 } </pre> |
| <b>Pass/Fail Criteria</b>             | All CRLs can be downloaded and loaded.   |
| <b>Related Information</b>            |  |
| <b>Revision Log</b>                   |  |

## 8 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>  | Web Services Data Access and Integration – The Relational Realisation (WS-DAIR) Specification, Version 1.0   |
| <b>R 3</b>  | Web Services Data Access and Integration – The XML Realization (WS-DAIX) Specification, Version 1.0  |
| <b>R 4</b>  | OGSA-DAI: <a href="http://www.ogsadai.org.uk/">http://www.ogsadai.org.uk/</a>  |
| <b>R 5</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 6</b>  | AMGA: <a href="http://amga.web.cern.ch/amga/">http://amga.web.cern.ch/amga/</a>  |
| <b>R 7</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 8</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 9</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 10</b> | A. Konstantinov, ARC Computational Job Management Component – A-REX, NORDUGRID-TECH-14   |
| <b>R 11</b> | CREAM: <a href="http://grid.pd.infn.it/cream/">http://grid.pd.infn.it/cream/</a>   |
| <b>R 12</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 13</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 14</b> | OGF DRMAA: <a href="http://www.drmaa.org/">http://www.drmaa.org/</a>   |
| <b>R 15</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 16</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 17</b> | gLite WMS: <a href="http://web.infn.it/gLiteWMS/">http://web.infn.it/gLiteWMS/</a>   |
| <b>R 18</b> | SAGA-CORE-WG: A Simple API for Grid Applications (SAGA) v1.0 (GFD.90)  |
| <b>R 19</b> | SAGA (A Simple API for Grid Applications): <a href="http://saga.cct.lsu.edu/">http://saga.cct.lsu.edu/</a>   |
| <b>R 20</b> | Instrument Element: <a href="http://www.dorii.eu/resources/adaptation:middleware:IE">http://www.dorii.eu/resources/adaptation:middleware:IE</a>                            |
| <b>R 21</b> | DORII (Deployment of Remote Instrumentation Infrastructure) Project: <a href="http://www.dorii.eu/">http://www.dorii.eu/</a>   |
| <b>R 22</b> | GlueSchema Specification v1.3: <a href="http://glueschema.forge.cnaif.infn.it/Spec/V13">http://glueschema.forge.cnaif.infn.it/Spec/V13</a>                                 |

|             |   |
|-------------|---|
| <b>R 23</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 24</b> | JMS (Java Message Service Specification) 1.1:<br><a href="http://www.oracle.com/technetwork/java/jms/index.html">http://www.oracle.com/technetwork/java/jms/index.html</a>  |
| <b>R 25</b> | AMQP (Advanced Message Queuing Protocol):<br><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 26</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 27</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 28</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 29</b> | Accounting Portal: <a href="http://accounting.egi.eu/">http://accounting.egi.eu/</a>  |
| <b>R 30</b> | GridSite Delegation Protocol: <a href="http://www.gridsite.org/wiki/Delegation_protocol">http://www.gridsite.org/wiki/Delegation_protocol</a>   |
| <b>R 31</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 32</b> | European Policy Management Authority for Grid Authentication (EuGridPMA):<br><a href="http://www.eugridpma.org/">http://www.eugridpma.org/</a>  |
| <b>R 33</b> | ARGUS Authorization Service:<br><a href="https://twiki.cern.ch/twiki/bin/view/EGEE/AuthorizationFramework">https://twiki.cern.ch/twiki/bin/view/EGEE/AuthorizationFramework</a>   |
| <b>R 34</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 35</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 36</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 37</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 38</b> | S2 Test: <a href="http://s-2.sourceforge.net/">http://s-2.sourceforge.net/</a>  |
| <b>R 39</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 40</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 41</b> | Lcg-utils test suite: <a href="http://glite.cvs.cern.ch/cgi-bin/glite.cgi/org.glite.testsuites.ctb/UI/tests/test-lcg-utils.sh?view=markup">http://glite.cvs.cern.ch/cgi-bin/glite.cgi/org.glite.testsuites.ctb/UI/tests/test-lcg-utils.sh?view=markup</a> |
| <b>R 42</b> | Open Cloud Computing Interface WG, OGF,<br><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 43</b> | Virtualization Management (VMAN), DMTF<br><a href="http://www.dmtf.org/standards/vman">http://www.dmtf.org/standards/vman</a>   |
| <b>R 44</b> | StratusLab <a href="http://stratuslab.eu/">http://stratuslab.eu/</a>  |



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| <b>R 45</b> | StratusLab MarketPlace Technical Note TN-Marketplace (V3.0) |
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