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Technical Specification

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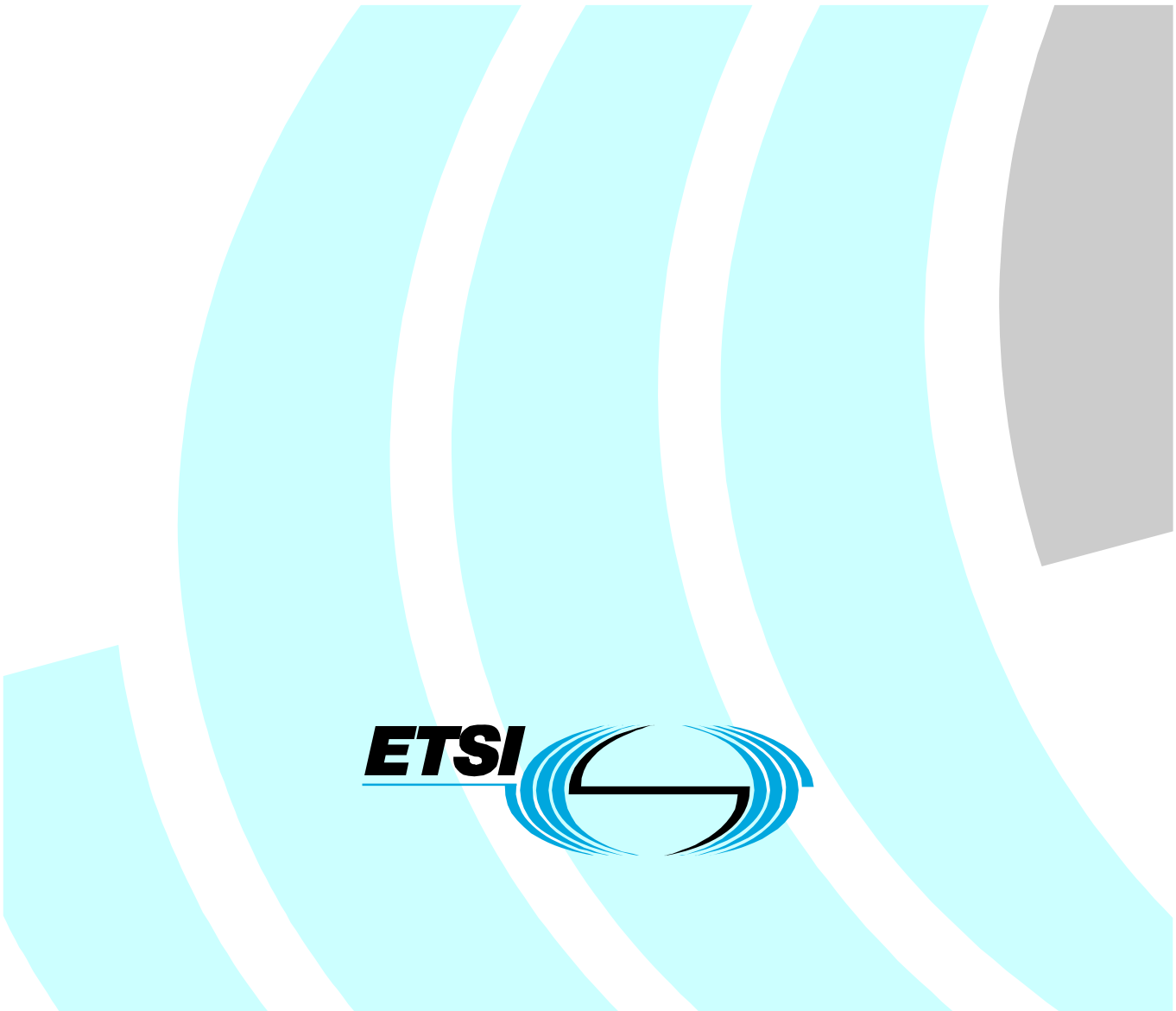
Grid Component Model (GCM);
Interoperability test specification



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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee GRID (GRID).

1 Scope

The present document specifies interoperability tests for ETSI GCM deployment and application descriptor standards.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
  - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
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2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

[1] ETSI TS 102 827 (V1.1.1): "GRID; Grid Component Model (GCM); GCM Interoperability Deployment".

[2] ETSI TS 102 828: "GRID; Grid Component Model (GCM); GCM Application Description".

[3] ETSI TR 102 766: "GRID; ICT Grid Interoperability Testing Framework and survey of existing ICT Grid interoperability solutions".

[4] ETSI EG 202 237: "Methods for Testing and Specification (MTS); Internet Protocol Testing (IPT); Generic approach to interoperability testing".

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies

Not applicable.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

direct resource access: resources of an infrastructure are accessed directly, e.g. via logging into a machine, for the purpose of deploying applications

frontend: in a physical network, single machine acting as a gateway for a set of machines

NOTE: See [1].

indirect resource access: resources of an infrastructure are accessed via a frontend including a job scheduler for the purpose of deploying applications

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AD	Application Descriptor
DD	Deployment Descriptor
EUT	Equipment Under Test
GCM	Grid Component Model
MET	Maximum Execution Time
MiB	MebiByte
VN	Virtual Node
XML	eXtensible Markup Language

4 About GCM Interoperability testing

The present document describes interoperability tests for the Grid Component Model (GCM) standards. The main purpose of the tests is the assessment of the standardized GCM Deployment Descriptor (DD) [1] and Application Descriptor (AD) [2]. The method and criteria how these tests have been derived is explained in detail in the grid interoperability testing framework [3]. The generic approach to interoperability testing described in [4] has been adapted for developing the interoperability tests including the test architecture and tests configurations for the GCM standards.

The GCM DD describes resources requested from one or more different infrastructures for an application. The GCM DD is converted into deployment information. This conversion process should be done in an automated manner by a GCM implementation but may be performed manually in case the use of the interface has not yet been standardized in [1]. The GCM DD is mapped on resources of specified infrastructure(s) and is then used to deploy and establish a communication layer, in the following called GCM infrastructure, needed by an application.

The GCM AD describes the requirements of an application from an underlying infrastructure, e.g. virtual nodes (VNs) required by the application are mapped to resources. An application can utilize the resources specified by the GCM DD it references.

In the present document, the GCM interoperability tests are described with Test Descriptions (TD). TDs are mainly intended for a manual test execution. However, they can also be used as a basis for the development of automated GCM interoperability tests. The tests assess both mandatory as well as optional features of GCM DD and GCM AD.

In each test, a test application is used to assess that GCM information is provided as expected. The test application used in a test is referenced in the TD. Properties of test applications, e.g. their execution time, can be customized via input parameters. Test applications are described in more detail in clause 6.

Prior any test execution, all of the test's pre-conditions should be checked to identify if it is applicable for the equipment participating in the test. Common types of pre-conditions are:

1) GCM descriptor: GCM DD and/or GCM AD specifications must fulfil requirements.

2) Infrastructure requirements: include type of resource access, functionality to be fulfilled, and available amount of resources.

3) Test application parameterization: the parameters provided to the application must fulfil requirements.

A test should be recorded as being not applicable if any of its pre-conditions are not met by the one (or more) equipment used in the test. A test can be executed after its pre-test conditions have been ensured.

NOTE: The TDs assume that basic conditions such as the existence of a user account for the test operator have been fulfilled.

5 Test Configurations

This clause introduces the GCM test configurations used in the TDs described in clause 7. The test configurations include the entities infrastructure, deployment manager and input/output data servers.

5.1 Entities

In this clause, the entities used in the test configurations are explained.

5.1.1 Infrastructure including frontend

In the GCM DD, resources of infrastructures can be requested for deploying the GCM infrastructure. These resources of an infrastructure have to be accessible either in a direct or indirect manner. While infrastructures with indirect resource access offer a frontend that contacts a job scheduler and grants access to resources, infrastructures with direct resource access perform the deployment on the resources without any frontend or manager.

Infrastructures with indirect resource access are mainly clusters and grid middlewares. Examples of infrastructures with direct resource access include a desktop computer and a cloud computing system. A set of desktop computers may also be collected to form a group infrastructure. More information and examples of different types of infrastructures can be found in [3].

5.1.2 Deployment Manager

The deployment manager (which can also be a human being) establishes the GCM infrastructure by converting GCM DD information into specific service calls or commands which are supported by the underlying infrastructure. After that, the test application with its parameters and infrastructure parameters can be submitted, e.g. as a job, using the specific protocol provided by the infrastructure.

5.1.3 Input and output data server(s)

Input and output data servers are used to store input and/or output data of GCM applications independent of the infrastructure on which it runs on. Input and output data servers can be access independently using a supported file access protocol such as http, ftp, sftp, or file. Depending on the protocol, the data is accessed remotely or locally. The file access protocol, the input and/or the output data directories (or files) are defined in the GCM AD.

5.2 Single Infrastructure

In the test configuration depicted in Figure 1, the Equipment Under Test (EUT) [4] contains a single infrastructure and the deployment manager. Access to the deployment manager, the infrastructure, the application, the GCM DD, and the GCM AD are available from one single physical machine. The user uses the deployment manager to load the GCM DD and, in case the test application is a GCM application, also the GCM AD as input. The user is logged into the infrastructure to establish the GCM infrastructure and submit jobs related to the application and the infrastructure.

Depending on the type of the resource access provided by the infrastructure, a frontend may or may not be used to access resources.

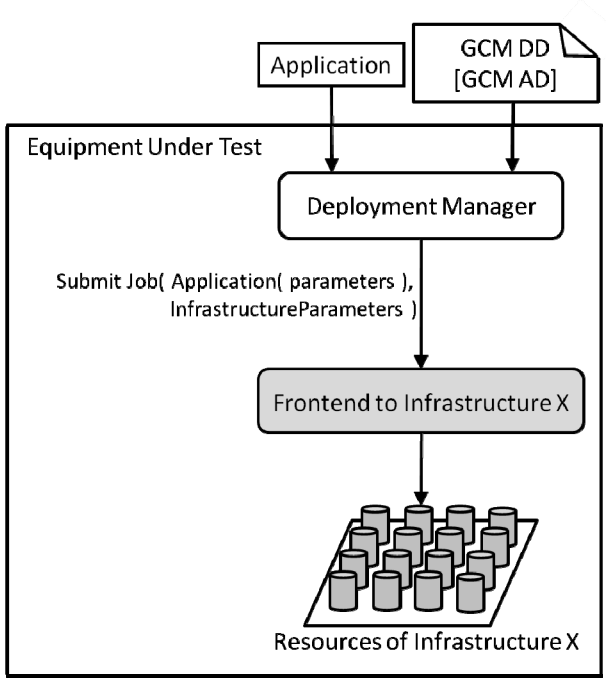

Figure 1: Single Infrastructure

5.3 Single Infrastructure with a bridge

The test configuration depicted in Figure 2 extends the test configuration described in clause 5.2 with a bridge. This test configuration has two EUTs, whereas EUT A contains the deployment manager and EUT B contains a single infrastructure. The deployment manager is only able to access the infrastructure via a bridge. Here, the user submits jobs from a remote machine which is connected to the infrastructure via a bridge. Depending on the type of the resource access provided by the infrastructure, a frontend may or may not be used to access resources.

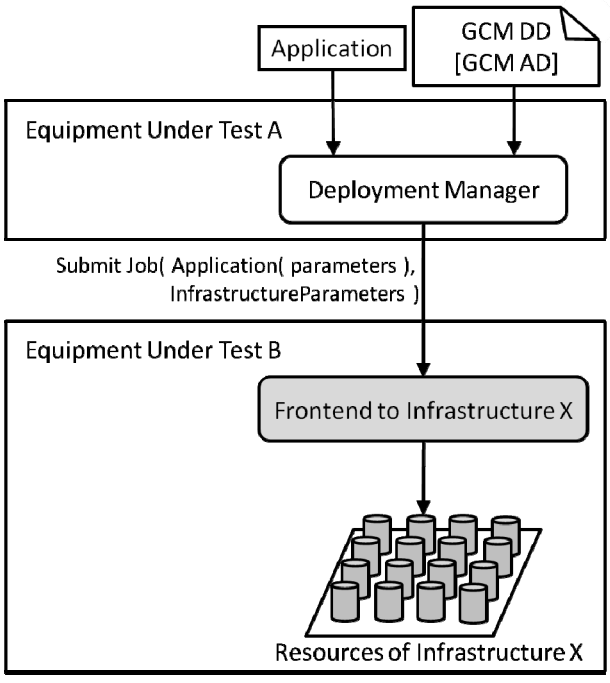

Figure 2: Single Infrastructure with a bridge

5.4 Two Infrastructures and bridges

The test configuration depicted in Figure 3 extends the test configuration described in clause 5.3 with a second infrastructure and bridge. This test configuration has three EUTs, whereas EUT A contains the deployment manager, EUT B contains the infrastructure X, and EUT C contains the infrastructure Y. Since the deployment manager controls both infrastructures at the same time, it has to be connected to each infrastructure via a bridge. The user submits jobs from a remote machine which is connected to the infrastructures via bridges. Depending on the type of the resource access provided by each infrastructure, a frontend may or may not be used to access resources.

NOTE: Any test specified in the present document for two infrastructures can also be extended to a configuration with more than two infrastructures.

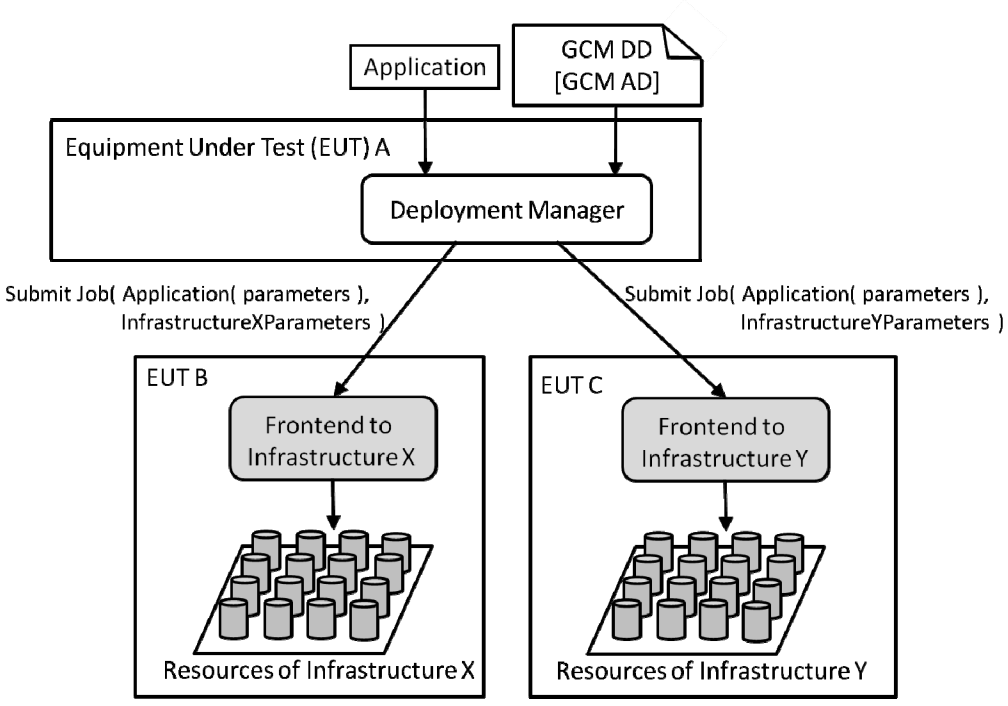

Figure 3: Two Infrastructures and bridges

5.5 Single Infrastructure with input and output data server(s)

The test configuration depicted in Figure 4 extends the test configuration described in clause 5.1 with input and output data servers. Here, the application can access the input/output data servers from the infrastructure. Depending on the type of the resource access provided by the infrastructure, a frontend may or may not be used to access resources. Since this configuration is used exclusively with GCM applications, the deployment manager must support both GCM DD as well as GCM AD.

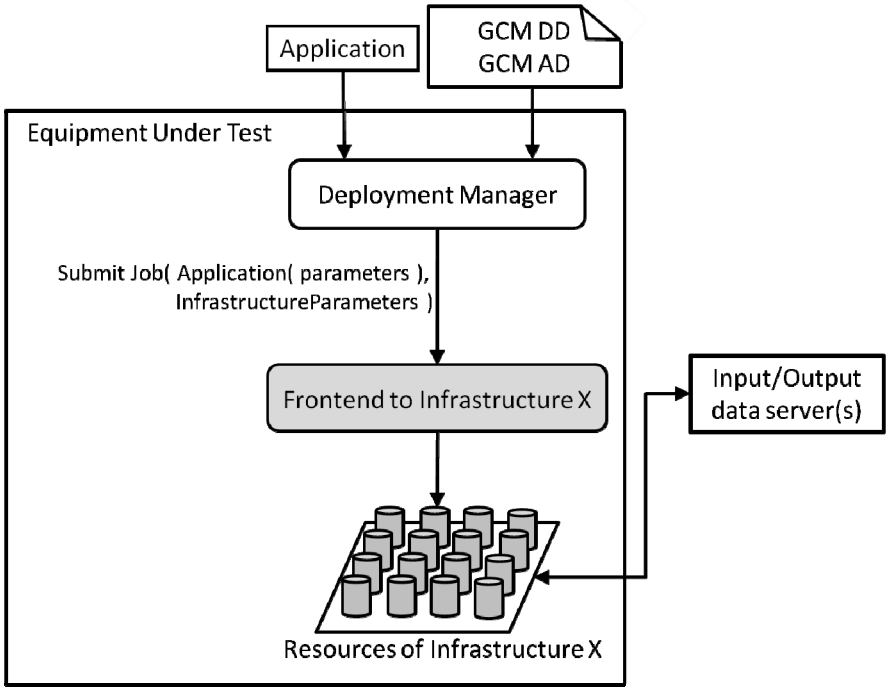

Figure 4: Single Infrastructure with input and output data servers

6 Test Applications

This clause describes test applications used in GCM interoperability tests to assess if requirements have been fulfilled as specified by the GCM standard(s). Example implementations of these test applications can be found in the electronic attachments GCM_Plugtests_DD_files_v010101.zip contained in archive ts_102811v010101p0.zip, which accompanies the present document.

6.1 Single process batch job

This test application starts a single process batch job on a single processor. This job is a simple application that consumes CPU and memory for a given amount of time. Its behavior can be controlled by the following parameters:

- `execTime`: execution time in seconds,
- `memoryConsumption`: the amount of memory that has to be allocated by a thread,
- `numberOfThreads`: the number of threads the process should create,
- `identifierString`: a unique string that identifies the application instance.

If none of the parameters are set, the application should be able to be executed with default values:

- `execTime` is 60 seconds,
- `memoryConsumption` is 10 MiB by thread,
- `numberOfThreads` is one,
- `identifierString` is a random identifier. It is the concatenation of the "random" word, and a 5 digits positive random integer.

The batch job must print all information required to determine if a test execution has succeeded or failed either displayed to the standard output or a file. The following information is mandatory:

- batch job start time,
- batch job end time,
- value of each parameter,
- the identifier of the batch job,
- start time of each thread,
- stop time of each thread.

6.2 Parallel job

This test application starts a job that uses multiple processes. Each process is mapped to a single processor. The multiple processor application consists of one master process and multiple worker processes. The worker processes communicate with the master process so that the master process receives notifications from all worker processes. A notification should include the host name where the worker process is running and a timestamp.

The number of worker processes to be created by the parallel application should be parameterizable. By default, the master process should start up as many worker processes as processors are available, i.e. one node less than specified in the GCM DD. That means that a parallel application requests all available resources.

The parallel job should print all the information required to determine if a test execution has succeeded or failed either to the standard output or a file. The following information is mandatory:

- the number of deployed workers,
- the number of received notifications,
- each notification with timestamp and hostname.

6.3 Virtual Node GCM Application

This test application starts a deployment as specified in the GCM AD and DD. Once the deployment has been performed, it prints the information provided by each virtual node either to the standard output or a file. For each virtual node, the following information is mandatory:

- virtual node name,
- current number of nodes,
- information about each node used (host name etc.).

6.4 Data Manipulation GCM Application

This test application starts a deployment as specified in the GCM AD and DD. It deploys a worker on every node it gets. Each worker reads the same input file from the remote or local input location as specified in the GCM AD. It creates a file with the same content as the input file into the remote or local output location as specified in the GCM AD. Workers should avoid file name conflicts and collisions in the output directory.

7 GCM Test Descriptions

The GCM test descriptions describe interoperability tests for GCM DD and AD. Each test requires a test configuration that is described in clause 5 and, in addition, a test application as explained in clause 6. Example implementations of these test applications can be found in the electronic attachments GCM_Plugtests_DD_files_v010101.zip contained in archive ts_102811v010101p0.zip, which accompanies the present document.

TD identifiers have been extended to include group and sub-group information to speed up the evaluation of TDs regarding their applicability. The group names are encoded as follows:

- Grid Component Model Deployment Descriptor (GCM_DD):
  - Direct Access (DA):
    - Processor Allocation (PA)
  - Indirect Access (IA):
    - Processor Allocation (PA)
    - Infrastructure Properties (IP)
  - Direct and Indirect Access (DA_IA)
- Grid Component Model Application Descriptor (GCM_AD):
  - Virtual Node (VN)
  - Data Location (DL)

NOTE: All GCM AD related tests are applicable for direct and indirect resource access.

7.1 GCM Deployment Descriptor

7.1.1 Direct access

7.1.1.1 Processor allocation

7.1.1.1.1 Single processor with direct resource access

Interoperability Test Description		
Identifier:	TD_GCM_DD_DA_PA_001	
Summary:	Ensure that an infrastructure with direct resource access provides a single processor as specified in the GCM DD	
Configuration:	Single Infrastructure or single Infrastructure with a bridge	
Specification References	GCM DD clause 7.1	
Test Application	Single process batch job	
Pre-test conditions:	• Infrastructure provides direct resource access • GCM DD contains a direct group description with `hostList` containing one host and host description with `hostCapacity=1` for the infrastructure • Infrastructure has a processor available for use	
Test Sequence:	**Step**	
	1	User loads the GCM DD and starts the test application on the infrastructure using the deployment manager
	2	Verify that the infrastructure has created and executed the process
	3	Verify that returned application output is correct

7.1.1.1.2 Single processor with multiple threads with direct resource access

Interoperability Test Description		
Identifier:	TD_GCM_DD_DA_PA_002	
Summary:	Ensure that an infrastructure with direct resource access provides a single processor with multiple threads as specified in the GCM DD	
Configuration:	Single Infrastructure or single Infrastructure with a bridge	
Specification References	GCM DD clause 7.1	
Test Application	Single process batch job	
Pre-test conditions:	• Infrastructure provides direct resource access • GCM DD contains a direct group description with `hostList` containing one host and host description with `hostCapacity=1` and `vmCapacity>1` for the infrastructure • Test application is parameterized to create the same number of threads as specified in the GCM DD (`vmCapacity`) • Infrastructure has a processor available for use	
Test Sequence:	**Step**	
	1	User loads the GCM DD and starts the test application on the infrastructure using the deployment manager
	2	Verify that the infrastructure has created and executed the process with the same number of threads as specified in the GCM DD (`vmCapacity`)
	3	Verify that returned application output is correct

7.1.1.1.3 Multiple processors on a single host with direct resource access

Interoperability Test Description		
Identifier:	TD_GCM_DD_DA_PA_003	
Summary:	Ensure that an infrastructure with direct resource access provides multiple processors for a parallel application on a single host as specified in the GCM DD	
Configuration:	Single Infrastructure or single Infrastructure with a bridge	
Specification References	GCM DD clause 7.1	
Test Application	Parallel job	
Pre-test conditions:	• Infrastructure provides direct resource access • GCM DD contains a direct group description with `hostList` containing one host with multiple processors and host description with `hostCapacity>1` for the infrastructure • `hostCapacity` does not exceed number of processors available for use in the infrastructure	
Test Sequence:	**Step**	
	1	User loads the GCM DD and starts the test application on the infrastructure using the deployment manager
	2	Verify that the infrastructure creates and executes all processes
	3	Verify that returned application output is correct

7.1.1.1.4 Multiple processors on multiple hosts with direct resource access

Interoperability Test Description		
Identifier:	TD_GCM_DD_DA_PA_004	
Summary:	Ensure that an infrastructure with direct resource access provides multiple processors for a parallel application on multiple hosts as specified in the GCM DD	
Configuration:	Single Infrastructure or single Infrastructure with a bridge	
Specification References	GCM DD clause 7.1	
Test Application	Parallel job	
Pre-test conditions:	• Infrastructure provides direct resource access with multiple processors • GCM DD contains a direct group description with `hostList` containing at least two hosts and at least one host descriptions with `hostCapacity>=1` • `hostCapacity` does not exceed number of processors available for use in the infrastructure	
Test Sequence:	**Step**	
	1	User loads the GCM DD and starts the test application on the infrastructure using the deployment manager
	2	Verify that the infrastructure creates and executes the processes at least on two hosts
	3	Verify that returned application output is correct

7.1.1.1.5 Multiple processors in two infrastructures with direct resource access

Interoperability Test Description		
Identifier:	TD_GCM_DD_DA_PA_005	
Summary:	Ensure that two infrastructures with direct resource access provide multiple processors for a parallel application as specified in the GCM DD	
Configuration:	Two Infrastructures and bridges	
Specification References	GCM DD clause 7.1	
Test Application	Parallel job	
Pre-test conditions:	• Both infrastructures provide direct resource access • Communication between the infrastructures is supported • GCM DD contains two direct group descriptions • Infrastructure has multiple processors available for use	
Test Sequence:	**Step**	
	1	User loads the GCM DD and starts the test application on both infrastructures using the deployment manager
	2	Verify that the processes have been created and executed in both infrastructures
	3	Verify that returned application output is correct

7.1.2 Indirect access

7.1.2.1 Processor allocation

7.1.2.1.1 Single processor with indirect resource access

Interoperability Test Description		
Identifier:	TD_GCM_DD_IA_PA_001	
Summary:	Ensure that an infrastructure with indirect resource access provides a single processor as specified in the GCM DD	
Configuration:	Single Infrastructure or single Infrastructure with a bridge	
Specification References	GCM DD clause 7.2	
Test Application	Single process batch job	
Pre-test conditions:	• Infrastructure provides indirect resource access • GCM DD contains an indirect group description which requests one processor • Infrastructure has a processor available for use	
Test Sequence:	**Step**	
	1	User loads the GCM DD and starts the test application on the infrastructure using the deployment manager
	2	Verify that the infrastructure has created and executed the process
	3	Verify that returned application output is correct

7.1.2.1.2 Multiple processors with indirect resource access

Interoperability Test Description		
Identifier:	TD_GCM_DD_IA_PA_002	
Summary:	Ensure that an infrastructure with indirect resource access provides multiple processors for a parallel application as specified in the GCM DD	
Configuration:	Single Infrastructure or single Infrastructure with a bridge	
Specification References	GCM DD clause 7.2	
Test Application	Parallel job	
Pre-test conditions:	• Infrastructure provides indirect resource access • GCM DD contains an indirect group description which requests more than one processor • Infrastructure has multiple processors available for use	
Test Sequence:	**Step**	
	1	User loads the GCM DD and starts the test application on the infrastructure using the deployment manager
	2	Verify that the processes have been created and executed in the infrastructure
	3	Verify that returned application output is correct

7.1.2.1.3 Multiple processors in two infrastructures with indirect resource access

Interoperability Test Description		
Identifier:	TD_GCM_DD_IA_PA_003	
Summary:	Ensure that two infrastructures with indirect resource access provide multiple processors for a parallel application as specified in the GCM DD	
Configuration:	Two Infrastructures and bridges	
Specification References	GCM DD clause 7.2	
Test Application	Parallel job	
Pre-test conditions:	• Both infrastructures provide indirect resource access • Communication between the infrastructures is supported • GCM DD contains two indirect group descriptions • Infrastructure has multiple processors available for use	
Test Sequence:	**Step**	
	1	User loads the GCM DD and starts the test application on both infrastructures using the deployment manager
	2	Verify that the processes have been created and executed in both infrastructures
	3	Verify that returned application output is correct

7.1.2.2 Infrastructure properties

7.1.2.2.1 Termination before the maximum execution time

Interoperability Test Description		
Identifier:	TD_GCM_DD_IA_IP_001	
Summary:	Ensure that in an infrastructure with indirect resource access, an application terminates as expected within the maximum execution time (MET) as specified in the GCM DD	
Configuration:	Single Infrastructure or single Infrastructure with a bridge	
Specification References	GCM DD clause 7.2	
Test Application	Single process batch job	
Pre-test conditions:	• Infrastructure provides indirect resource access and supports specification of MET (i.e. wall time) • GCM DD contains a group description which includes MET • Test application is parameterized with an execution time smaller than MET	
Test Sequence:	**Step**	
	1	User loads the GCM DD and starts the test application on the infrastructure using the deployment manager
	2	Verify that the infrastructure executes the test application and that the test application terminates as expected before MET (that it is not killed beforehand)
	3	Verify that returned application output is correct

7.1.2.2.2 Exceeding the maximum execution time

Interoperability Test Description		
Identifier:	TD_GCM_DD_IA_IP_002	
Summary:	Ensure that in an infrastructure with indirect resource access, any application that exceeds the maximum execution time (MET) as specified in the GCM DD is killed.	
Configuration:	Single Infrastructure or single Infrastructure with a bridge	
Specification References	GCM DD clause 7.2	
Test Application	Single process batch job	
Pre-test conditions:	• Infrastructure provides indirect resource access and supports specification of MET (i.e. wall time) • GCM DD contains a group description which includes MET • Test application is parameterized with an execution time greater than MET	
Test Sequence:	**Step**	
	1	User loads the GCM DD and starts the test application on the infrastructure using the deployment manager
	2	Verify that the infrastructure executes the test application and that the application is killed at MET

7.1.2.2.3 Job queues

Interoperability Test Description		
Identifier:	TD_GCM_DD_IA_IP_003	
Summary:	Ensure that an infrastructure with indirect resource access handles job queue parameters as specified in the GCM DD	
Configuration:	Single Infrastructure or single Infrastructure with a bridge	
Specification References	GCM DD clause 7.2	
Test Application	Single process batch job	
Pre-test conditions:	• Infrastructure provides indirect resource access and supports execution prioritization based on job queues • GCM DD 1 contains a group description where a high priority job queue is requested • GCM DD 2 contains a group description where a low priority job queue is requested • All processors in the infrastructure except one are in use and are not pre-empted throughout the test execution	
Test Sequence:	**Step**	
	1	User loads GCM DD 1 and starts an instance of the test application on the infrastructure using the deployment manager
	2	User loads GCM DD 1 and starts a second instance of the test application on the infrastructure using the deployment manager
	3	User loads GCM DD 2 and starts a third instance of the test application on the infrastructure using the deployment manager
	4	Verify that the test application started in step 3 is executed after the one of step 2

7.1.2.2.4 Redirection of standard output

Interoperability Test Description		
Identifier:	TD_GCM_DD_IA_IP_004	
Summary:	Ensure that an infrastructure with indirect resource access supports standard output redirection as specified in the GCM DD	
Configuration:	Single Infrastructure or single Infrastructure with a bridge	
Specification References	GCM DD clause 7.2	
Test Application	Single process batch job	
Pre-test conditions:	• Infrastructure provides indirect resource access and supports redirection of standard output • GCM DD contains a group description where the standard output is redirected	
Test Sequence:	**Step**	
	1	User loads the GCM DD and starts the test application on the infrastructure using the deployment manager
	2	Verify that the standard output of the test application has been redirected as specified in the GCM DD
NOTE: This test should be executed for all available redirections (e.g. stdout, file) supported by the infrastructure.		

7.1.2.2.5 Memory specification

Interoperability Test Description		
Identifier:	TD_GCM_DD_IA_IP_005	
Summary:	Ensure that an infrastructure with indirect resource access selects resources according to memory specification as specified in the GCM DD	
Configuration:	Single Infrastructure or single Infrastructure with a bridge	
Specification References	GCM DD clause 7.2	
Test Application	Single process batch job	
Pre-test conditions:	• Infrastructure provides indirect resource access and supports requests of a specific amount of memory • GCM DD specifies a group description where the requested memory is less than the maximum amount of physical main memory that is provided by a single processor in the infrastructure • Test application is parameterized to use the amount of memory as specified in GCM DD	
Test Sequence:	**Step**	
	1	User loads the GCM DD and starts the test application on the infrastructure using the deployment manager
	2	Verify that the test application has been executed and is able to request the specified amount of memory

7.1.2.2.6 Specified memory exceeds maximum amount of memory

Interoperability Test Description		
Identifier:	TD_GCM_DD_IA_IP_006	
Summary:	Ensure that an infrastructure with indirect resource access does not assign resources if the memory specification as specified in the GCM DD exceeds the maximum amount of physical main memory.	
Configuration:	Single Infrastructure or single Infrastructure with a bridge	
Specification References	GCM DD clause 7.2	
Test Application	Single process batch job	
Pre-test conditions:	• Infrastructure provides indirect resource access and supports requests of a specific amount of memory • GCM DD specifies a group description where the requested memory is greater than the maximum amount of physical main memory that is provided by a single processor in the infrastructure	
Test Sequence:	**Step**	
	1	User loads the GCM DD and requests to start the test application on the infrastructure using the deployment manager
	2	Verify that the request is rejected by the infrastructure

7.1.2.2.7 Memory limitation

Interoperability Test Description		
Identifier:	TD_GCM_DD_IA_IP_007	
Summary:	Ensure that an infrastructure with indirect resources access enforces memory limitation as specified in the GCM DD	
Configuration:	Single Infrastructure or single Infrastructure with a bridge	
Specification References	GCM DD clause 7.2	
Test Application	Single process batch job	
Pre-test conditions:	• Infrastructure provides indirect resource access and supports requests of a specific amount of memory • GCM DD specifies a group description where the requested memory is smaller than the maximum amount of physical main memory that is provided by a single processor in the infrastructure • Test application is parameterized (memory allocation) to use more memory than requested in the GCM DD	
Test Sequence:	**Step**	
	1	User loads the GCM DD and starts the test application on the infrastructure using the deployment manager
	2	Verify that memory limitation is enforced, e.g. the memory allocation is refused or the application is killed

7.1.3 Direct and indirect access

7.1.3.1 Processor allocation

7.1.3.1.1 Multiple processors in an infrastructures with indirect and direct resource access

Interoperability Test Description		
Identifier:	TD_GCM_DD_DA_IA_PA_001	
Summary:	Ensure that an infrastructure with indirect resource access and an infrastructure with direct resource access provide multiple processors for a parallel application as specified in the GCM DD	
Configuration:	Two Infrastructures and bridges	
Specification References	GCM DD clause 7.1, 7.2	
Test Application	Parallel job	
Pre-test conditions:	• One infrastructures provides indirect resource access • One infrastructures provides direct resource access • GCM DD contains one direct group description and one indirect group descriptions • Communication between the infrastructures is supported	
Test Sequence:	**Step**	
	1	User loads the GCM DD and starts the test application on both infrastructures using the deployment manager
	2	Verify that the processes have been created and executed in both infrastructures
	3	Verify that returned application output is correct

7.2 GCM Application Descriptor

7.2.1 Virtual node

7.2.1.1 Specific capacity of a single virtual node

Interoperability Test Description		
Identifier:	TD_GCM_AD_VN_001	
Summary:	Ensure that a specific capacity of a virtual node (VN) is enforced as specified in the GCM AD	
Configuration:	Single Infrastructure or single Infrastructure with a bridge	
Specification References	GCM AD clause 5.2.2	
Test Application	Virtual Node GCM Application	
Pre-test conditions:	• The infrastructure has multiple processors available • GCM DD requests more than one processor but less than the number of all available processors • GCM AD defines one VN with a `capacity` less than the number of processors specified in the GCM DD	
Test Sequence:	**Step**	
	1	User loads the GCM AD (and implicitly the GCM DD) and starts the test application on the infrastructure using the deployment manager
	2	Verify that the specified capacity of nodes have been assigned to the VN

7.2.1.2 Maximum capacity of a single virtual node

Interoperability Test Description		
Identifier:	TD_GCM_AD_VN_002	
Summary:	Ensure that a maximum capacity of a virtual node (VN) is enforced as specified in the GCM AD	
Configuration:	Single Infrastructure or single Infrastructure with a bridge	
Specification References	GCM AD clause 5.2.2	
Test Application	Virtual Node GCM Application	
Pre-test conditions:	• The infrastructure has multiple processors available • GCM DD requests more than one processor but less than the number of all available processors • GCM AD defines one VN that does not specify a `capacity`	
Test Sequence:	**Step**	
	1	User loads the GCM AD (and implicitly the GCM DD) and starts the test application on the infrastructure using the deployment manager
	2	Verify that the number of nodes assigned to the VN matches the number of processors requested by the GCM DD

7.2.1.3 Specific capacities of two virtual nodes

Interoperability Test Description		
Identifier:	TD_GCM_AD_VN_003	
Summary:	Ensure that specific capacities of two virtual nodes (VNs) are enforced as specified in the GCM AD	
Configuration:	Single Infrastructure or single Infrastructure with a bridge	
Specification References	GCM AD clause 5.2.2	
Test Application	Virtual Node GCM Application	
Pre-test conditions:	• The infrastructure has multiple processors available • GCM DD requests more than one processor but less than the number of all available processors • GCM AD defines two VNs whereas the sum of their capacities (`capacity`) does not exceed the number of processors requested by the GCM DD	
Test Sequence:	**Step**	
	1	User loads the GCM AD (and implicitly the GCM DD) and starts the test application on the infrastructure using the deployment manager
	2	Verify that the number of nodes assigned to the VNs matches the numbers of processors requested by the GCM DD

7.2.1.4 Maximum capacities of two virtual nodes

Interoperability Test Description		
Identifier:	TD_GCM_AD_VN_004	
Summary:	Ensure that when two virtual nodes (VNs) request maximum capacities, then nodes are assigned fairly	
Configuration:	Single Infrastructure or single Infrastructure with a bridge	
Specification References	GCM AD clause 5.2.2	
Test Application	Virtual Node GCM Application	
Pre-test conditions:	• The infrastructure has multiple processors available • GCM DD requests more than one processor but less than the number of all available processors • GCM AD defines two VNs that do not specify a `capacity`	
Test Sequence:	**Step**	
	1	User loads the GCM AD (and implicitly the GCM DD) and starts the test application on the infrastructure using the deployment manager
	2	Verify that the number of nodes have been fairly assigned to both VNs

7.2.1.5 Maximum and specific capacities of two virtual nodes

Interoperability Test Description		
Identifier:	TD_GCM_AD_VN_005	
Summary:	Ensure that when a specific capacity of a virtual node (VN) and a maximum capacity of another virtual node are requested, nodes are assigned firstly to the VN that requests a specific capacity and the remaining nodes to the VN that request a maximum capacity	
Configuration:	Single Infrastructure or single Infrastructure with a bridge	
Specification References	GCM AD clause 5.2.2	
Test Application	Virtual Node GCM Application	
Pre-test conditions:	• The infrastructure has multiple processors available • GCM DD requests more than one processor but less than the number of all available processors • GCM AD defines a first VN with a `capacity` of `1` node and a second VN that does not specify a `capacity`	
Test Sequence:	**Step**	
	1	User loads the GCM AD (and implicitly the GCM DD) and starts the test application on the infrastructure using the deployment manager
	2	Verify that one node is assigned to the first VN and all remaining nodes have been assigned to the second VN.

7.2.2 Data location

7.2.2.1 Default input and output data

Interoperability Test Description		
Identifier:	TD_GCM_AD_DL_001	
Summary:	Ensure that default input data can be read and default output data can be written for a specific file access protocol as specified in the GCM AD	
Configuration:	Single Infrastructure with input and output data servers	
Specification References	GCM AD clause 5.2.4	
Test Application	Data Manipulation GCM Application	
Pre-test conditions:	• The infrastructure has multiple processors available • GCM DD requests more than one processor but less than the number of all available processors • GCM AD contains `inputDefault` element with a `remoteAccess` element specifying the input URI of a file • GCM AD contains `outputDefault` element with a `remoteAccess` element specifying the output URI of a directory • I/O server and test application both support the selected file access protocol • An input file is located at the default input location	
Test Sequence:	**Step**	
	1	User loads the GCM AD (and implicitly the GCM DD) and starts the test application on the infrastructure using the deployment manager
	2	Verify that the content of all files located in the default output directory match the input data
	3	Verify that the number of created files in default output location is the same as the number of requested nodes
NOTE: This test should be executed for all available file access protocols (e.g. http, ftp, file, sftp) supported by the implementation.		

Annex A (informative): Electronic attachments

This clause describes test applications used in GCM interoperability tests to assess if requirements have been fulfilled as specified by the GCM standard(s). Example implementations of these test applications can be found in the electronic attachments GCM_Plugtests_DD_files_v010101.zip contained in archive ts_102811v010101p0.zip, which accompanies the present document.

This archive file contains the following hierarchy. The names of the XML descriptor files included follow the naming scheme of the test descriptions defined in clause 7.

`Plugtest/lib:` utility java files

`Plugtest/src/com/activeon/plugtest/common`: all required files for running the test suite

`./applications`: java sources for the two applications used for the tests

`Batch.java` `Parallel.Java`

`./tests/ad`: `AD.xml`: a generic application descriptor file

`Pa_da_001/`: a java class implementing test TD_GCM_DD_DA_PA_001, as defined in clause 7.1.1.1.1, and its deployment descriptor file

`./test/dd/da/pa`: deployment descriptor files for tests TD_GCM_DD_DA_PA_001 to _005

`./test/dd/ia/ip`: deployment descriptor files for tests TD_GCM_DD_IA_IP_001 to 07, for various protocols (lsf, sge, pbs)

`./test/dd/ia/pa`: deployment descriptor files for tests TD_GCM_DD_IA_PA_001 to 03, for various protocols (lsf, sge, pbs)

History

Document history		
V1.1.1	March 2010	Publication