

# Grid System Guidelines

## Introduction

This standard describes requirements to be considered in integration and operation of grid systems that effectively provide services by virtualizing and flexibly assigning, collaborating and using various resources including computers, storages and networks in accordance with different purposes. In order for the systems to effectively function, clarification and operational management of many related activities are required. In grid systems suppliers provide services to consumers, and in many cases consumers themselves may become suppliers and provide services to other consumers.

Coordinated construction and operation of grid systems generate opportunities for ongoing management, greater efficiency and continual improvement.

This standard is assumed to target people who use and operate grid systems.

## 1. Scope

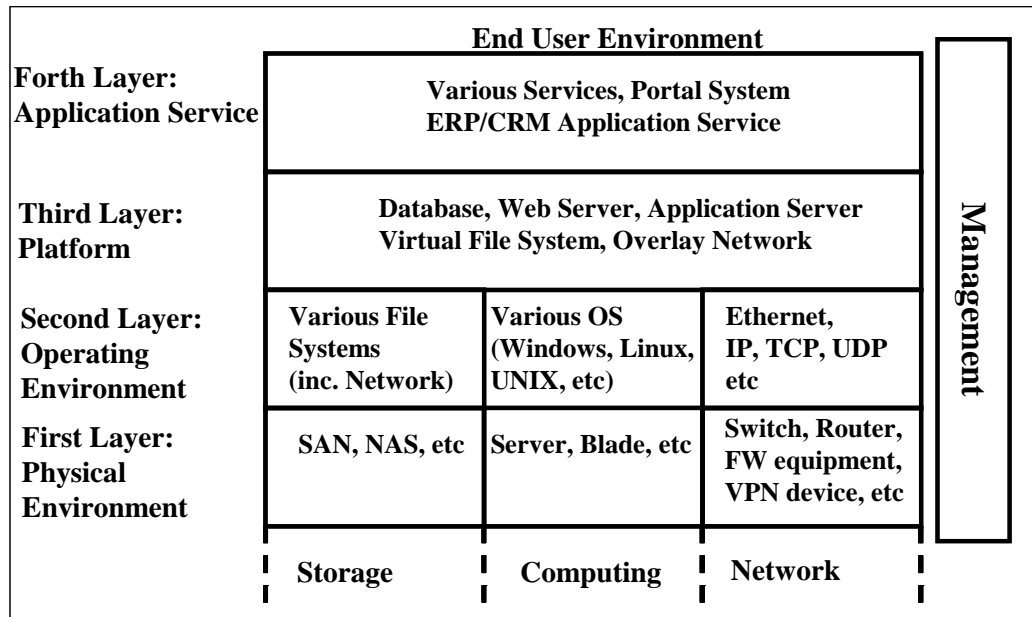
This standard specifies requirements for construction and operation of grid systems of an acceptable quality for customers.

This standard may be used by the following business enterprises, organizations and applications

- a) Organizations who design, construct and operate grid systems
- b) Commercial Data Centers that provide hosting and housing services as their business.
- c) Service providers who provide applications and IT resources
- d) Organizations that mediate various information services

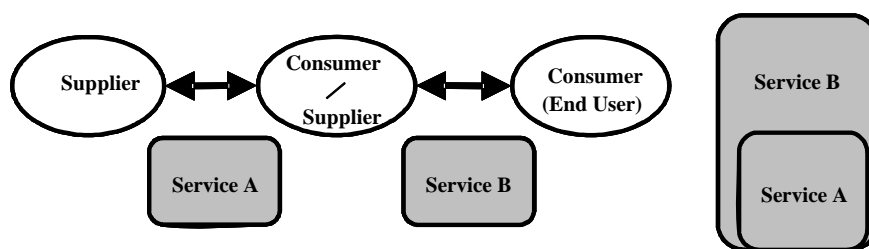
This standard, as Figure 1 shows, defines a grid system as a hierarchical structure that consists of four layers. The first layer is the physical environment layer that consists of hardware components associated with servers, storages and networks. The second layer is the operating environment layer that consists of a number of software such as an operating system and a file system that makes the first layer operable. The third layer is the platform layer that consists of a number of software to achieve operations over multiple components such as database and grid middleware. The forth layer is the application service layer that consists of applications and portals. Consumers who use the forth layer is called end-users.

## Grid System



**Figure 1. Hierarchy Diagram of the Grid System**

Suppliers operate the entire or a part of grid system and provide them as services to consumers. Consumers may add components of hardware or software where needed. In this case consumers become suppliers who provide services with added components to other consumers. As Figure 2 shows, such pairs of suppliers and consumers are concatenated to form a chain and the consumers at the end are called end-users. Although end-users access to services through the forth layer, there may be services without the forth layer. This standard applies to a pair of a supplier and consumer and the service provided between them.



**Figure 2. Chain of Supplier and Consumer**

Requirements included in this standard are limited to minimal and therefore, addition of any requirement that is needed to satisfy the needs of a specific business may be considered. The way requirements in this standard are implemented to achieve the entire objective depends on the characteristics of the relations between suppliers and consumers.

## 2. Terms and Definitions

### 2.1 Service

A system provided by a supplier is called a service.

Note: A service may corresponds to both the entire grid system and a part of grid system. In other words, multiple services provided by multiple suppliers may be integrated to form one grid system.

### 2.2 Supplier

A supplier is a person who provides either the entire or a part of a grid system as a service.

Note: Suppliers include system operators and they use this standard from the standpoint of designer and operator of systems. Multiple suppliers are present in a grid system that consists of multiple services.

### 2.3 Consumer

A consumer is a person who makes use of a service provided by a supplier.

Note: The consumer may refer not only to a person but a part of a system. This means that services provided in the layers below the forth layer may be accessed directly by the components in the upper layer that a consumer has added. Furthermore, consumers may not necessarily be the members of a single organization and members of a virtual organization that consists of multiple organizations are also treated as consumers.

### 2.4 Access

Access is an operation for consumers to directly use the services under their privileges.

Note: Submissions of jobs to computing resources and writing records to database resources correspond to this operation, for example.

### 2.5 Agreement

Agreement is an operation of consumers that enable indirect use of services by making requests to suppliers to implement processes that consumers have no privilege to implement.

Note: Change of priorities of job submissions to computing resources and retrieval of log data of submitted jobs and database access correspond to this operation, for example.

## 2.6 Control

Control is an operation by suppliers to manage/operate services.

Note: Allocation of resource for each consumer, setting of priority and configuration of consumer access privilege to resources correspond to this operation, for example.

## 2.7 Usability

This term indicates the characteristics related to ease of use from the viewpoint of consumers.

Note: This does not only mean "availability".

## 2.8 Controllability

The term indicates the characteristics related to ease of use and control from the viewpoint of supplier.

Note: This does not only mean "ability to control".

## 2.9 Confidentiality

The term means to ensure that only authorized consumers are allowed to access information.

## 2.10 Integrity

The term means to preserve information and processing method correct and complete.

## 2.11 Policy

The term refers to the content specified for the way of allocating services in advance.

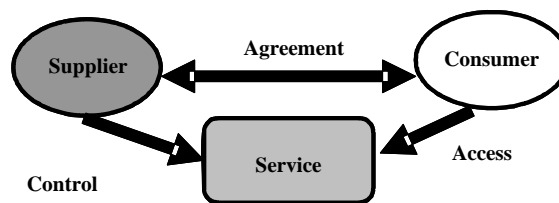
Note: This is used for the purpose of data sharing that do not have effect on the load distribution, prioritized processing for each consumer and access and other consumers of the service. Policies include operation policies for suppliers to manage and operate services and usage policies for consumers to use services.

### 3. Grid System Model

Types of operations performed between suppliers, consumers and services are shown in Figure 3. Actions that suppliers implement against services are operations to manage services and therefore called "control". Actions that consumers implement against services are classified into two. One is the direct operation performed using consumers' own privileges and this is called "access". The other is the indirect operations performed by making requests to suppliers to implement some process and this is called "agreement". This "agreement" includes disclosure of service information and prioritization of executions.

Requirements for "access", "agreement" and "control" are described in 4.1, 4.2 and 4.3 respectively.

There is a case where a grid system is used in cooperation with other external grid systems. Requirements for grid systems in such case are described in 4.4.



**Figure 3 Operations between Supplier, Consumer and Service**

## 4. Requirements for Construction and Operation of Grid Systems

### 4.1 Access

#### 4.1.1 Usability

The following items shall be considered as requirements from a usability point of view when consumers access services.

- Consumers can access services without being aware of the lower level layers (including location, OS and middleware).
- Services are accessible using a uniform interface.
- Access protocols to services are selectable where there are more than one access protocols present.
- Existing applications are operable without any change.

- When more than one authentication mechanisms are present, only a single authentication procedure is required and the rest procedures can be omitted.

#### 4.1.2 Security

The following items shall be considered as requirements from a security point of view when consumers access services.

- Integrity and confidentiality of access contents are mutually assured between multiple consumers making use of the same service.
- Confidentiality of access information of consumers against suppliers is assured.

### 4.2 Agreement

#### 4.2.1 Usability

The following items shall be considered as requirements from a usability point of view when consumers perform agreement-related operations against services.

- Static information including configuration information and performance of services is disclosed to consumers.
- Dynamic information including load status and processing capacity of services is disclosed to consumers.
- Consumers can configure usage policies for each service individually at the time of usage .

#### 4.2.2 Accounting

The following item shall be considered as a requirement from the accounting point of view when consumers perform agreement-related operations against services.

- Accounting information such as log data of services used by consumers are disclosed to consumers.

#### 4.2.3 Security

The following items shall be considered as requirements from the security point of view when consumers perform agreement-related operations against services.

- Integrity and confidentiality of accounting-related information such as log data of services that consumers used are assured.
- Integrity and confidentiality of usage policy configured by consumers are assured.

## 4.3 Control

### 4.3.1 Controllability

The following items shall be considered as requirements from the controllability point of view when suppliers perform control-related operations against services.

- Priorities configured by and for each consumer are configurable.
- Suppliers make services accessible to consumers without being aware of lower level layers (including location, OS and middleware)
- Resource allocation is dynamically altered according to suppliers' operation policy
- Management items required to construct and operate upper level layers are configurable.
- Status of services are viewable by suppliers
- Policies for service allocation at the time of consumer access are configurable.
- Services include a mechanism to easily perform maintenance.
- Suppliers can easily perform maintenance
- Configuration change, expansion and destroy of services are performed without halting the whole system.

### 4.3.2 Accounting

The following item shall be considered as a requirement from the accounting point of view when suppliers perform control-related operations against services.

- Usage history of consumers is viewable by suppliers.

### 4.3.3 Security

The following items shall be considered as requirements from the security point of view when suppliers perform control-related operations against services.

- Provisions of services to consumers are not interrupted by failures.
- Consumers and services can be authenticated.

#### 4.4 Cooperation between Grid Systems

The following items shall be considered as requirements when a service cooperates with an external grid system.

- Ways to establish mutual trust relations are specified.
- Each other's services are cooperable.