Chapter 6

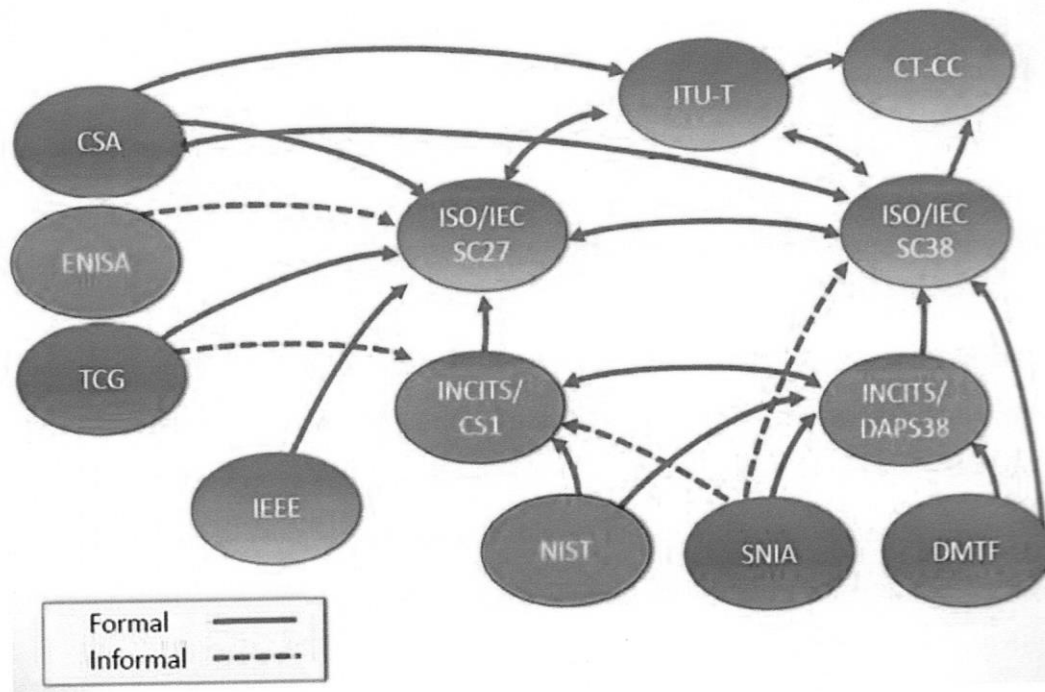# Frameworks for Service level Agreements

6.1   Introduction

There are a number of Standards Development Organizations such as ITU-T, ISO etc. and industry groups working on Cloud Computing and therefore, a number of definitions of cloud computing and several sets of Cloud Actors have been defined by different research organizations keeping in perspective of their target audience. For example: NIST defines Cloud Actors from the perspective of Government Agencies procuring cloud services defining actors as consumer, provider, broker, carrier and auditor. ITU-T defines the terms from the perspective of telecommunications service providers defining cloud actors as user, provider and partners. Distributed Management Task Force (DMTF) defines the terms with a focus from Cloud technology implementer's perspectives defining actors as provider, consumer and developer.

Hibbard, CISSP, ISSAP, ISSEP, ISSMP, CISA (2013) lists some of the Standards Development Organizations and depicts their relationships.

CSA:	Cloud Security Alliance
DMTF:	Distributed Management Task Force
ENISA:	European Network and Information Security Agency
ETSI:	European Telecommunications Standards Institute
IEC:	International Electrotechnical Commission
IEEE:	Institute of Electrical and Electronics Engineers
INCITS:	International Committee for Information Technology Standards
ISO:	International Organization for Standardization
ITU-T:	International Telecommunication Union – Telecom
NIST:	National Institute for Standards and Technology
OASIS:	Organization for the Advancement of Structured Information Standards
SNIA:	Storage Networking Industry Association

TCG: Trusted Computing Group

Formal ——————
Informal ------

**Figure 6.1: Sample Cloud SDO Relationships**

A significant number of the cloud computing standards and specifications are still in draft form and there are many organizations operating in this space, but it does appear there are conscious efforts to avoid duplication and contradiction. It is also unlikely that a single, all-encompassing standard (or source for standards) will emerge for cloud. The efforts from different organizations though appear to bring out varying outcomes, but eventually shall facilitate bringing synergy in understanding and adoption of universally acceptable practices for cloud adoption.

6.2   Framework of SLA

NIST (2011) was one of the early standards development organization to analyse and come out with a list of 10 high priority roadmap requirements for cloud computing in its first draft report in July, 2011 and to 'Develop Technical specifications to enable development of consistent, high-quality Service Level Agreements' appeared therein. It was further elaborated to include development

of a controlled and standardized vocabulary of cloud SLA terms and definitions and to ensure consistency in guidance and policy regarding SLA relevant terms and definition.

NIST suggests that SLA is part of a Master Service Agreement (MSA) which reflects commercial practice of a contract between two or more parties being made of a series of documents following standard templates. MSA is, therefore, a top level legal agreement between provider and customer covering general aspects. Typically, MSA will reference documents containing definitions of the services being offered, and separately the SLA for each of those services and possibly the operational aspects. MSA contains consideration of: stakeholders involved in the ecosystem, regulatory compliance and legal aspects, remedies and compensations, SLAs and other elements. One of the advantages of MSA is that contractual terms and conditions related to the general business relationship can be separated from service specific details and conditions, and avoids having unintended differences in the way services are contracted. A diagrammatic representation of MSA and SLA is given below:
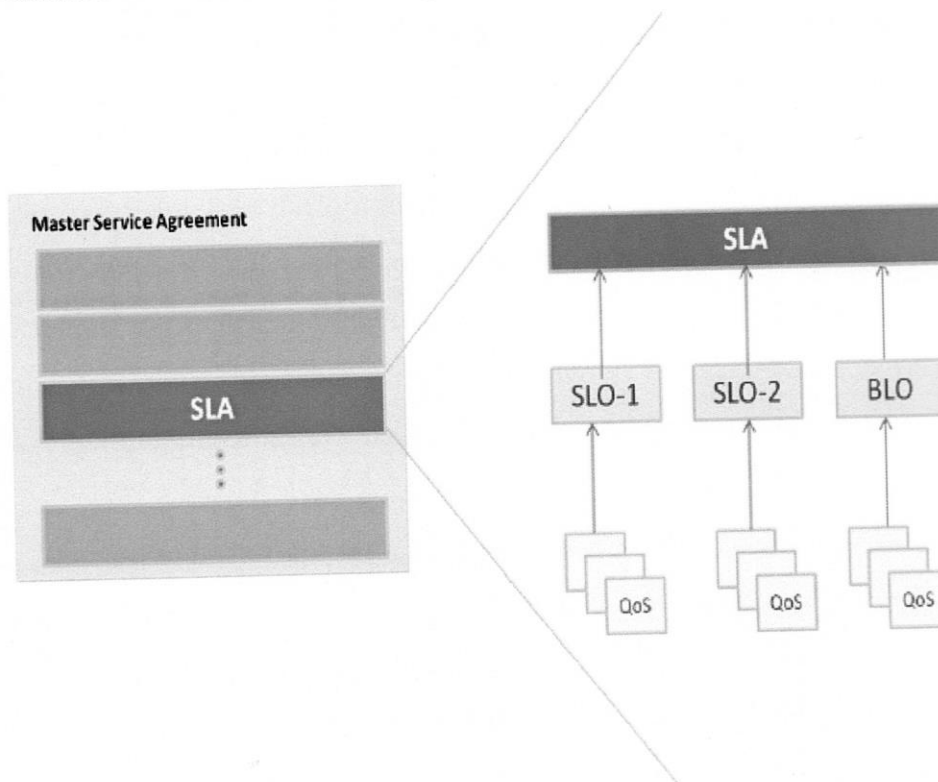
(Source: TR 178, version 0.4, tm forum, September, 2012)

Figure 6.2: Master Service Agreement and Service Level Agreement

ITU-T elaborates service level agreement (SLA) as an abbreviated service agreement stating the technical performance promises made by a provider, including remedies for performance failures. An SLA is composed of three parts: (1) a collection of promises made to subscribers, (2) a collection of promises explicitly not made to subscribers, i.e., limitations, and (3) a set of obligations that subscribers must accept. SLA serves as a means of formally documenting the services, performance expectations, responsibilities and limits between cloud service provider and their users.

Service Level Objectives (SLOs) are specific measurable characteristics of the service being monitored such as availability, throughput, frequency, response time, or quality. They are composed of one or more quality of service (QoS) objects or Service Matrices that are combined to produce the SLO achievement value. Matrices define how service parameters can be measured and are typically functions. As an example, an availability SLO may depend on multiple components, each of which may have a QOS availability measurement. The combination of Quality of Service (QOS) measures into an SLO achievement value will depend on the nature and architecture of the service. There are at least two major types of metrics. 1) Resource metrics are retrieved directly from the provider resources and are used as is without further processing. For example, transaction count; and 2) Composite matrices represents a combination of several resource matrices, calculated according to a specific algorithm. For example transactions per hour combine the raw resource matrices of transaction count and uptime. Composite matrices are required when the consumers need insightful and contextual information where raw numbers do not suffice.

For adoption of cloud, a customer needs to first understand its business requirements and cloud service technical benefits along with issues associated with different types of services. The offerings from different cloud service providers can then be evaluated against requirements and a decision can be taken based on the agreement between the customer and the provider which is represented in the SLA. The definition and usage of appropriate metrics and their

underlying measures is an essential aspect to verifying the SLA and without proper metrics it is difficult to enforce an SLA. By monitoring the cloud system it can be verified that the requirements laid out in the SLA are being met.

Cloud Standards Customer Council (CSCC) (2012) argues that before evaluating any cloud SLA, consumers must first develop a strong business case and strategy for their cloud computing environment. This includes identifying specific services that will be deployed in the cloud along with a clear understanding of the criticalness of these services to the business. It also provided a set of perspective steps that should be taken by cloud consumers to evaluate cloud SLAs from different providers, these steps include:

- Understand roles and responsibilities
- Evaluate business level policies
- Understand service and deployment model differences
- Identity critical performance objectives
- Evaluate security and privacy requirements
- Identify service management requirements
- Prepare for service failure management
- Understand the disaster recovery plan
- Define an effective management process
- Understand the exit process

SLA accountability between Customer and Provider is often based on business factors rather than technical factors.

6.3 Standardization works under ISO/IEC JTC 1/SC 38

ISO/IEC JTC1 (Joint Technical Committee -1)/SC38 (Sub Committee on Information Technology - Distributed Application Platforms and Services) is working on cloud computing service level agreement (SLA) framework and terminology and is expected to bring out SLA guidelines through ISO/IEC 19086 which is expected in 2015. It is expected to:

- Provide an overview of SLAs for cloud services

- Identify the relationship between the master service agreement and the SLA
- Address SLA concepts and requirements that can be used to build SLAs
- Specify terms and conditions as well as metrics commonly used in SLAs for cloud services
- Seek to establish a set of common SLA building blocks (concepts, terms, definitions, contexts) that can then be used to create SLAs that will help avoid confusion and facilitate common understanding between the Cloud Service Providers and the Cloud Service Customers

6.4 Initiatives of Cloud Services Measurement Initiative Consortium

There is growing popularity for adopting cloud computing and a trend toward sending IT-enabled services outside of industry and government organizations. The decision-makers have to select and manage service providers who will meet their requirements and deliver high performance. The current situation is that each cloud service provider (CSP) has defined the measures and service level agreements (SLAs) their potential clients may consider. These measures often exclude critical attributes that the clients need to measure, e.g., initial cost of acquisition/transition, control of access and employee privileges, or scalability and flexibility of the provider to increase/decrease service provisions.

The Cloud Services Measurement Initiative Consortium (CSMIC) has developed the Service Measurement Index (SMI) to address this situation and to ensure that measures are developed to be globally appropriate and to meet the needs of both public and private sector clients. Past Consortium members of CSMIC include Accenture, BeyondCore, CA Technologies (the founding member), Carnegie Mellon University, Cask, LLC, City University London, Data Security Council of India (DSCI), International Association of Outsourcing Professionals (IAOP), ISG (TPI), KPMG, Mycroft, RampRate, Stony Brook University, New York, TM Forum, and the University of Melbourne, Australia.

The Service Measurement Index is based on a framework of critical characteristics (both business and technical), associated attributes, and measures that provide a standardized method for measuring and comparing a business service regardless of whether that service is internally provided or sourced from an outside company for any cloud service. It is designed to become a standard method to help organizations measure cloud-based services based on their specific business and technology requirements.

CSMIC has described the steps in formation of SMI. First, a comprehensive Framework of the Cloud-related attributes for clients to use when determining the performance and quality provisions they require was developed. Then, well-defined measures including a standard way of describing and documenting service measures was developed, so that users can make valid apples-to-apples comparisons among multiple cloud service providers. Development of a method/process for calculating the relative importance and adequacy of Provider capabilities is under process, and it shall be followed by creation of a prototype decision support tool to apply the measures and the method in selecting Cloud Service Providers.

accountability
agility
assurance
financial
performance
security and privacy
usability
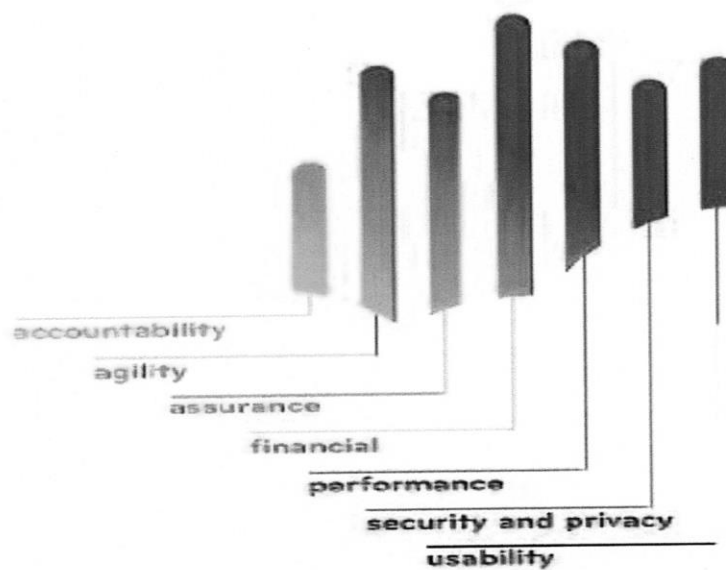
(Source: CSMIC Service measurement Index Framework version 2.1)
Figure 6.3: SMI Framework

The SMI is a hierarchical framework. The top level divides the measurement space into 7 Categories. Each Category is further refined by 4 or more Attributes. Then within each Attribute a set of Key Performance Indicators (KPI's) are defined that describe the data to be collected for each measure/metric.