

August 3, 2014

---

# Definition of the Metrics, Elements and Actions of the SLAC Language

**Rafael Brundo Uriarte**  
rafael.uriarte@imtlucca.it  
IMT Lucca

**Francesco Tiezzi**  
francesco.tiezzi@imtlucca.it  
IMT Lucca

**Rocco De Nicola**  
rocco.denicola@imtlucca.it  
IMT Lucca



# Contents

<b>1</b>	<b>Brief Introduction</b>	<b>2</b>
<b>2</b>	<b>Metrics</b>	<b>3</b>
2.1	Core Language . . . . .	3
2.2	Business Metrics . . . . .	4
<b>3</b>	<b>List Elements</b>	<b>5</b>
3.1	Core Language . . . . .	5
3.2	Business Aspects . . . . .	6
<b>4</b>	<b>Actions</b>	<b>6</b>
4.1	Core Language . . . . .	6
4.2	Business Actions . . . . .	6

# 1 Brief Introduction

The SLAC language specifies the syntax and semantics for the definition of Service-Level-Agreements (SLAs) devised for the cloud computing domain. In this technical report we describe the metrics, list elements and actions of this language.

These definitions are the result of a research on the literature, current commercial offers and metrics/elements available in tools used to implement and support this paradigm. However, the resulting lists are not conclusive and can be extended according to the needs of parties involved in the SLA. Notably, when extended, the language loses the compatibility to the standard version, which might become a problem when the parties use different specification.

All types, metrics, elements and actions, are divided into two categories: metrics for the core-language and for the business aspects extension. We opt for a textual description since the implementation can be different according to the tools and resources of the environment. This means that their actual implementation, i.e. translation of a SLA into a low level metric, is defined by the party in charge of the metric, following the textual definition here presented.

## 2 Metrics

### 2.1 Core Language

Name	Type	St Unit	Example	Definition
<i>ccpu</i>	Numeric	1.0 Ghz of a Xeon Processor	[1, ∞]	Cloud CPU Unit - No widely adopted standard measure for different CPU exist. Most of the IaaS providers define their own CPU unit, and claim its equivalence to a fraction of a well-known physical processor (usually Xeon and Opteron). For example: Amazon states that their EPU unit is equivalent to a 1.0-1.2 Ghz Xeon, Microsoft defines the Microsoft CPU as 1.6 GHz Xeon and Luna Cloud affirms that its vCPU is equivalent to 1.5 Ghz Xeon <sup>1</sup>
<i>cpu_cores</i>	Numeric	#	[4,8]	Number of (virtual) cores employed in the service.
<i>ram</i>	Numeric	GB	[4,4]	RAM Memory (independently of the technology and speed).
<i>storage</i>	Numeric	GB	[500, ∞]	Disk space available in for the storage of data.
<i>storage_type</i>	Numeric	Pre-Defined	[Local_SSD]	Type of storage for the service.
<i>storage_IOP</i>	Numeric	#	[1000,3000]	The number of input/output operations on the storage specified for the service. Can also be used with the IOP per second defining the UNIT as second.
<i>storage_bandwidth</i>	Numeric	Mbps	[10,100]	Measure of the capacity to transfer data between the service and the storage.
<i>hypervisor</i>	List	Pre-Defined	[Xen]	Hypervisor employed in the provision of the service.
<i>operating_system</i>	List	Pre-Defined	[Linux_Debian, Android]	Specification of the supported operating systems in the cloud provider.
<i>data_ingress</i>	Numeric	GB	[0,200]	Quota of allowed data transfer to the cloud by consumers or applications out of the cloud.
<i>data_egress</i>	Numeric	GB	[6,10]	Quota of allowed data transfer from the cloud to consumers or applications.
<i>data_internal</i>	Numeric	GB	[100, ∞]	Quota of allowed data transfer between nodes in the cloud.
<i>access_protocol</i>	List	Pre-Defined	[SSH]	Supported protocols for accessing the resources of the cloud (e.g, VM or sending a job using a secure transmission protocol).
<i>interfaces</i>	List	Pre-Defined	[OCCI, EC2]	Types of cloud interfaces supported in the service.
<i>response_time</i>	Numeric	Milliseconds	[0,10]	Time that the system reacts to a given input.
<i>RT_delay</i>	Numeric	Milliseconds	[0,10]	Time that the system reacts to a given input.

*Continued on next page*

<sup>1</sup>This equivalence is only a rough guide for comparison. Furthermore, even in the description, the providers usually cite the year or other details about the processor (e.g: vCPU uses Xeon 2010 while EPU Xeon 2007)

Continued from previous page

Name	Type	St Unit	Example	Definition
<i>availability</i>	Numeric	Percentage	[99.5,100]	It is the ratio of the time that the service is functioning and ready for use, divided by the total running time of the service or defined period ( $\frac{Uptime}{(Uptime+Downtime)}$ ). We define the standard metric as monthly based but the consumer can specify a period of time (e.g. <i>availability</i> [95.00, 100] hour).
<i>region</i>	List	Pre-Defined	[It, Fr]	Geographical area in which the resources are located.
<i>jurisdiction</i>	List	Pre-Defined	[It, Fr]	Political location (country or state) where the contract is valid.
<i>network_bandwidth</i>	List	Pre-Defined	[100BASE-T]	Network speed between the internal nodes involved in the service provision.
<i>monitoring</i>	List	Pre-Defined	[CPU_usage, memory_usage]	The list of monitoring metrics made available for the specified service.
<i>monitoring_frequency</i>	Numeric	Seconds	[200,300]	The interval between the sending of monitoring information to consumers.
<i>boot_time</i>	Numeric	Seconds	[10,60]	It is the time to boot a new instance of a VM.
<i>replication</i>	Boolean	Bool	true	Whether the service is replicated.
<i>back_up</i>	Boolean	Bool	true	Whether the provider creates a backup of the current service.
<i>data_encryption</i>	Boolean	Bool	true	Whether the data in the cloud is stored encrypted.

Table 1: Core Metrics for the SLAC Language.

## 2.2 Business Metrics

Name	Type	St Unit	Example	Definition
<i>cost</i>	Numeric	Euro	[10,100]	Financial cost of the service or part of the service. The unit can be any available currency supported by the party that receives the payment. Notably, this metric is using for billing purposes.
<i>offer</i>	Numeric	Euro	[2,5]	Financial offer for a service (or group of terms). It is not used for billing, however is useful in some of the pricing models.
<i>currency</i>	List	Pre-Defined	[euro, dollar]	List the needed support for currencies. Mostly, this metric is used in the search for provider that support a specific currency.
<i>upfront_cost</i>	Numeric	Currency	[1000,1000]	Initial cost paid before the service is deployed.
<i>MTTR</i>	Numeric	Minutes	[1,3]	Mean Time to Repair, average time taken by the party to fix a problem and make the service available in case of failures.

Continued on next page

Continued from previous page

Name	Type	St Unit	Example	Definition
<i>max_time_to_repair</i>	Numeric	Minutes	[1,3]	Maximum time taken by the party to fix a problem and make the service available in case of failures.
<i>MTBF</i>	Numeric	Hours	[2,5]	Mean Time Between Failures, Average time that the system runs correctly before a failure. This metric is a defined in hours.
<i>min_time_between_failures</i>	Numeric	Hours	[2,5]	Minimum time that the system runs correctly before a failure. This metric is a defined in hours.
<i>telephone_support</i>	Numeric	Minutes	[2,5]	Maximum response time of the support telephone.
<i>chat_support</i>	Numeric	Minutes	[2,5]	Maximum response time of the support via internet chat.
<i>email_support</i>	Numeric	Minutes	[2,5]	Maximum response time of the support via e-mail.
<i>support_RT</i>	Numeric	Minutes	[2,5]	Maximum response time of the support. The upper bound should be in the interval of the types of support available by the provider (e.g: telephone, chat, email).

Table 2: Business metrics Defined in the SLAC language.

### 3 List Elements

#### 3.1 Core Language

Name	Values
<i>storage_type</i>	Local_SSD, Local_HDD, Local_SCSI, SAN_HDD, SAN_SDD and SAN_SCSI. SAN refer to Storage area network while Local refer to the local machine.
<i>hypervisor</i>	Xen, KVM, Vmware
<i>operating_system</i>	Linux, Windows, MAC OS, Unix, Android, Symbian, Linux_Debian, Linux_Ubuntu, Linux_Fedora, Linux_CentOS, Linux_Red_Hat, Linux_OpenSuse, Linux_Slackware, Linux_Ubuntu, Windows_8.1, Windows_8, Windows_7, Windows_Vista, Windows_XP, Windows_ME, Windows_2000, Windows_2012_Server, Windows_2012_Server_R2, Windows_2008_Server, Windows_2008_Server_R2, Windows_2000_R2, Windows_2000. The keywords Linux, Windows and MACOS should verify all available versions of this operating systems and if any of the type is in the list it should return true. For instance, if a consumer requires a VM with <b>Linux</b> and the provider has <b>Linux_Debian</b> , it should return true.
<i>access_protocol</i>	SSH, IpSEC, TLS/SSL
<i>interfaces</i>	OCCI, EC2, EH, FS, GG, SC, SH, CS, GN, EV, VM <sup>2</sup>

Continued on next page

<sup>2</sup>See <http://forge.ogf.org/sf/wiki/do/viewPage/projects.occi-wg/wiki/FeatureMatrix> for a comparison between the interfaces

Continued from previous page

Name	Values
<i>region</i>	The elements consist of: all regions (2 digit) defined in the ISO 3166 <sup>3</sup> as prefix, "-", and an ID. For instance <i>it-Lucca01</i> . The comparison between offer and request should verify only the region not the id.
<i>jurisdiction</i>	All region countries defined in the ISO 3166 <sup>3</sup> .
<i>network_bandwidth</i>	10BASE-T, 100BASE-T, 100BASE-SX, 1000BASE-T, 10GBASE-LX4, 10GBASE-ER and 10GBASE-SR
<i>Monitoring</i>	cpu_utilization, disk_utilization, load, ram, swap_memory, number_users, up_time, job_execution_time, number_processes.

Table 3: List Elements for the core of the SLAC language.

### 3.2 Business Aspects

Name	Values
currency	All currency codes defined in the ISO 4217 <sup>4</sup> .

Table 4: List Elements for the Business extension of the SLAC language.

## 4 Actions

### 4.1 Core Language

Name	Req Involved Parties	Description
<i>notify</i>	Yes	The origin party notifies the destination parties of an event or condition.
<i>renegotiate</i>	No	A new negotiation process is started and the agreement the current agreement is terminated.

Table 5: Actions Definitions for the core language of SLAC.

### 4.2 Business Actions

Name	Req Involved Parties	Description
<i>pay</i>	Yes	The origin party has to pay the specified amount to the destination party. If more than one party is specified, the values has to be paid to each of them.

Continued on next page

<sup>3</sup><https://www.iso.org/obp/ui/#search>

<sup>4</sup>[http://www.iso.org/iso/home/standards/currency\\_codes.htm](http://www.iso.org/iso/home/standards/currency_codes.htm)

*Continued from previous page*

<b>Name</b>	<b>Involved Parties</b>	<b>Description</b>
<i>reserve</i>	No	Reserve resources (or QoS) in form of a term (that, in turn, specifies the involved parties).
<i>bonus</i>	Yes	The origin party assigns a resource as a bonus to the destination parties in case of an event or condition.
<i>credit</i>	Yes	The origin party gives a certain amount of credit the destination parties of an event or condition. This credit can be spend only with the origin party.

Table 6: Actions Definitions for the business extensions of the SLAC language.