



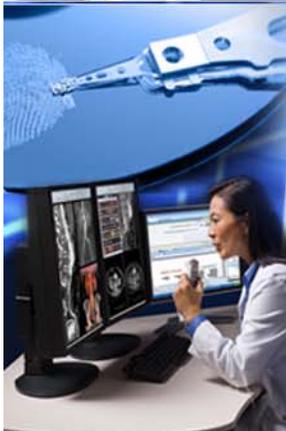
CLOUD SERVICE LEVEL AGREEMENTS

Meeting Customer and Provider needs

Eric Simmon

January 28th, 2014

NIST Software and System Division
National Institute of Standards and Technology/U.S. Department of Commerce



BACKGROUND

NIST Software and System Division
National Institute of Standards and Technology/U.S. Department of Commerce



Federal Cloud Computing Strategy

- Efficiency improvements will shift resources towards higher-value activities
- Assets will be better utilized
- Demand aggregation will reduce duplication
- Data center consolidation can be accelerated
- IT will be simpler and more productive
- Agility improvements will make services more responsive
- Services will be more scalable
- Innovation improvements will rapidly enhance service effectiveness
- Encourage entrepreneurial culture by reducing risk



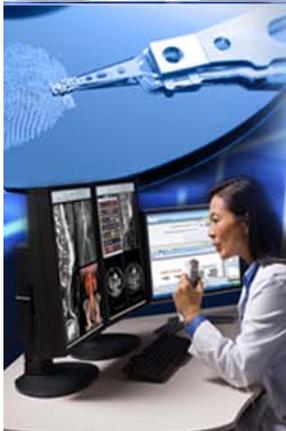


NIST Cloud Computing Program Goal

To accelerate the federal government's adoption of cloud computing

Build a USG Cloud Computing Technology Roadmap which focuses on the highest priority USG cloud computing security, interoperability and portability requirements

Lead efforts to develop standards and guidelines in close consultation and collaboration with standards bodies, the private sector and other stakeholders



NIST Mission

To promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.



NIST Cloud Computing Technology Roadmap

Vol I

High-Priority Requirements to Further
USG Agency Cloud Computing Adoption

Vol II

Useful Information for Cloud Adopters

Reference architecture

Use cases

Standards

Security



Roadmap Requirements HIGH PRIORITIES

REQUIREMENTS

1. International voluntary consensus standards
2. Solutions for Security Requirements
3. High quality Service Level Agreements
4. Consistently categorized cloud services
5. Federated community cloud environments
6. Decoupling security solutions from policy decisions
7. Unique government regulatory requirements
8. Collaborative strategic “future cloud” initiatives
9. Defined reliability design goals
10. Defined cloud service metrics



Roadmap Requirements Related to SLAs

Requirement 3: Develop Technical specifications to enable development of consistent, high-quality Service-Level Agreements

Develop a controlled and standardized vocabulary of cloud SLA terms and definitions

Ensure consistency in guidance and policy regarding SLA relevant terms and definition

Requirement 10: Define and implement cloud service metrics

Standardize Units of Measurement for cloud services, seeking public comment and collaboration.

Incorporate Cloud Service Units of Measurement consistently in Service-Level Agreements.

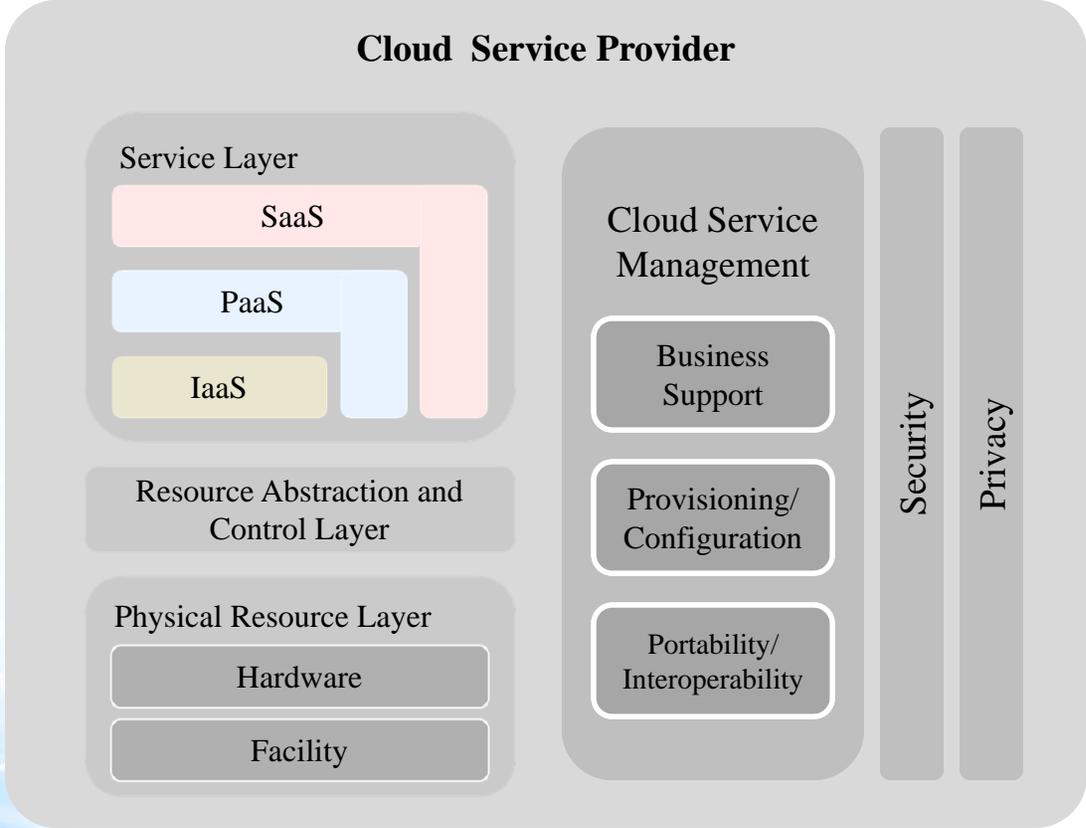


Cloud Reference Architecture



Cloud Service Consumer

- Cloud Auditor**
- Security Audit
 - Privacy Impact Audit
 - Performance Audit



Cloud Broker

- Service Intermediation
- Service Aggregation
- Service Arbitrage

Cloud Carrier



Cloud Actors

Cloud Consumer

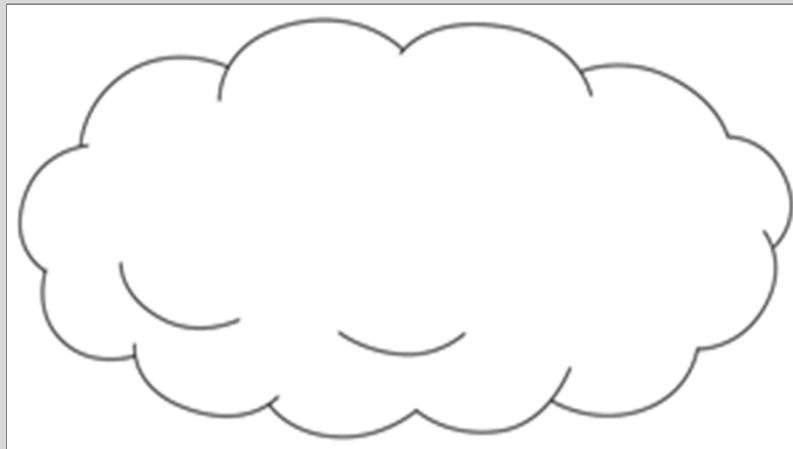
Person or organization that maintains a business relationship with, and uses services.

Cloud Auditor

A party that can conduct independent assessment of cloud services

Cloud Provider

Person, organization or entity responsible for making a service available to *Cloud Consumers*.



Cloud Broker

An entity that manages the use, and negotiates relationships between *Cloud Providers* and *Cloud Consumers*.

Cloud Carrier

The intermediary that provides connectivity and transport of cloud services

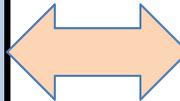


Cloud SLA Actors



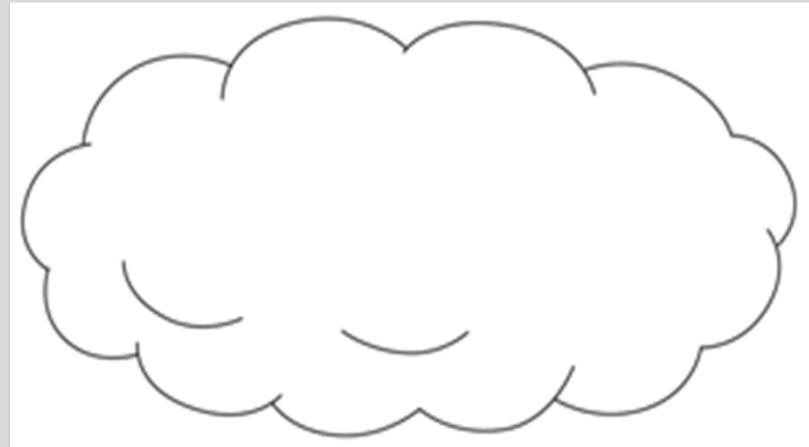
Cloud Consumer

Person or organization that maintains a business relationship with, and uses services.



Cloud Provider

Person, organization or entity responsible for making a service available to *Cloud Consumers*.





SLA Definitions

Service Level Agreement

Documented agreement between the service provider and customer that identifies services and serviceTargets ((ISO 20000-1 (2011))

Cloud Service-level Agreement

A document stating the technical performance promises made by the cloud provider, how disputes are to be discovered and handled, and any remedies for performance failures. (NIST SP 800-146)





MSA – SA – SLA

Master Service Agreement

Top level legal agreement between provider and customer covering general aspects

Service Agreement

Lower level agreement covering one specific service

Service Level Agreement

Lower level agreement covering the performance aspects of a service



Why is there a problem with existing SLAs?

Each provider uses different language, making it difficult to compare SLAs

Current SLAs do not provide assurances the customer's needs will be met

Remedies are not sufficient





Why is there a problem with existing SLAs?

Each provider uses different language, making it difficult to compare SLAs

Current SLAs do not provide assurances the customer's needs will be met

Remedies are not sufficient





Three parts to the process



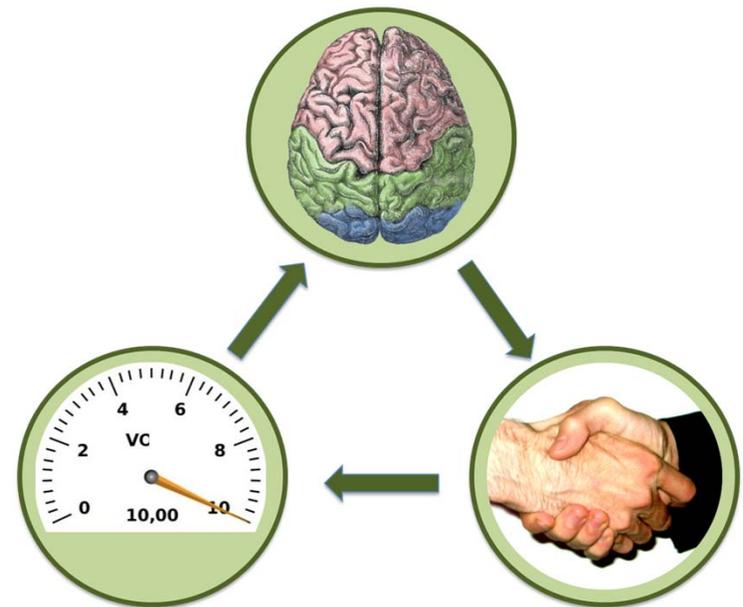
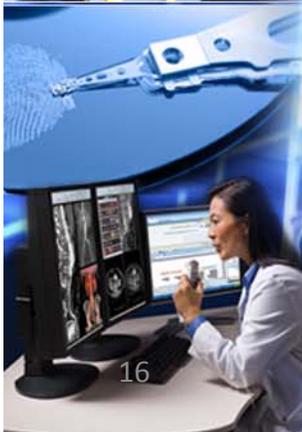
The decision making framework helps the customer lay out the requirements for the cloud service

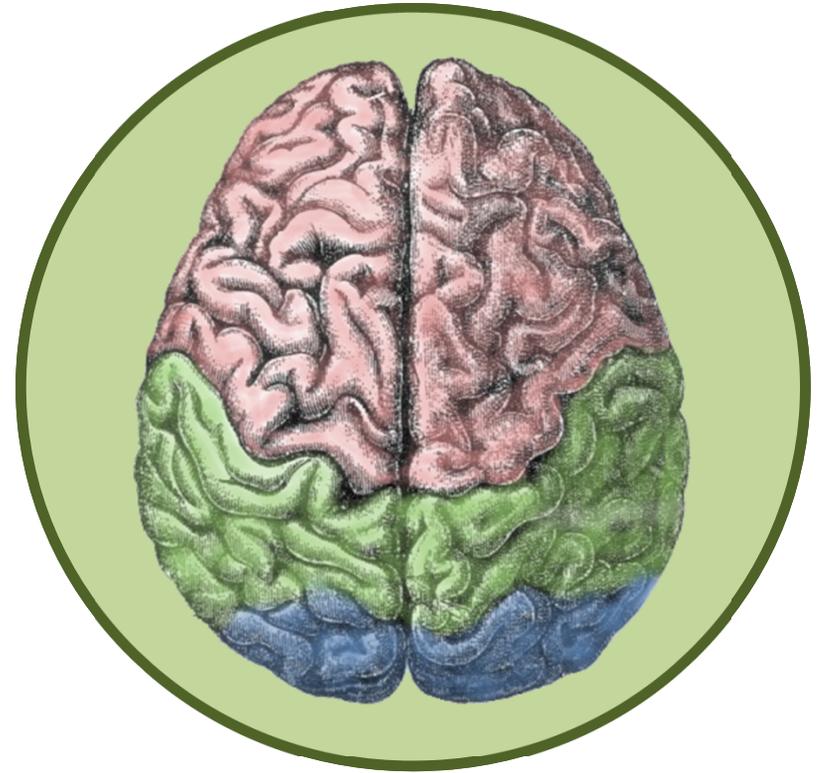


The SA/SLA then represents the agreement between the customer and the provider



Metrics and measurements show what is provided (whether the SLA thresholds are met).





DECISION MAKING

NIST Software and System Division
National Institute of Standards and Technology/U.S. Department of Commerce



Decision Making

NIST Roadmap Volume III

Technical Considerations for USG
Cloud Computing Deployment

Cloud Service Index Measurement
Consortium



Decision Making

Customers need a way to evaluate cloud offerings

- Understand cloud service technical benefits and issues for different types of services
- Understand business requirements
- Evaluate cloud service against requirements





Cloud Service Measurement Index

- Quantifiable method of assessing cloud service properties
- Weighted properties
- Each level is rolled up
- Provides single quantifiable assessment of cloud service





CSMIC

The SMI's hierarchical framework.

- The top level divides the measurement space into 7 Categories.
- Each Category is further refined by 3 or more Attributes.
- Then within each Attribute a set of Key Performance Indicators

KPI's are being defined that describe the data to be collected for each measure/metric.

Public version is available at www.CSMIC.org

CSMIC is providing a version for government use – testing will be underway soon.



CSMIC Top Level Categories

	Category	Questions
1.	Accountability	Can we count on the provider organization?
2.	Agility	Can it be changed and how quickly can it be changed?
3.	Assurance	How likely is it that the service will work as expected?
4.	Financial	How much is it?
5.	Performance	Does it do what we need?
6.	Security and Privacy	Is the service safe and privacy protected?
7.	Usability	Is it easy to learn and to use?



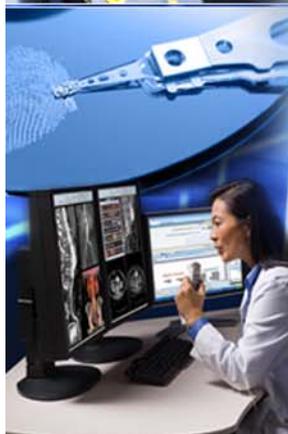


CSMIC Category Attributes



Category	Selected Attributes
Accountability	Compliance, Ease of Doing Business, Provider Certifications, Provider contract/SLA verification
Agility	Elasticity, Portability (legal and technical), Scalability (up and down)
Assurance	Availability, Reliability, Resiliency/fault tolerance
Financial	Acquisition, On-going cost, Transition costs
Performance	Functionality, Interoperability, Service response time, Suitability
Security and Privacy	Access control & privilege management, Data integrity, Data privacy and data loss
Usability	Accessibility, Learnability

CSMIC Concept



Worksheet:	SMI1
Service:	Test
Service Provider:	Acme Cloud Services

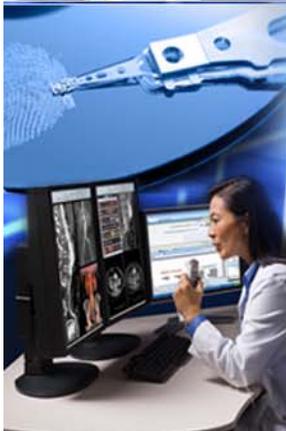
SMI SCORE: **48**

Category	Weight	Score
Accountability	1	3.00
Agility	3	6.00
Assurance	5	5.00
Financial	10	5.00
Performance	6	7.00
Security & Privacy	7	1.00
Usability	10	10.00

All Minimum Acceptable Ratings Satisfied: **YES**

SMI Category Scores





SERVICE LEVEL AGREEMENTS

NIST Software and System Division
National Institute of Standards and Technology/U.S. Department of Commerce



SLAs International Standardization Effort

ISO/IEC 19086





ISO/IEC 19086 Cloud computing Service level agreement (SLA) framework and terminology

BEING DONE WITHIN IEC/ISO JTC1 (JOINT TECHNICAL COMMITTEE) SC38 (DISTRIBUTED APPLICATION PLATFORMS AND SERVICES)

ISO/IEC 19086 DRAFT INCLUDES

- OVERVIEW OF SERVICE LEVEL AGREEMENTS (SLAS) FOR CLOUD SERVICES
- RELATIONSHIP BETWEEN THE MASTER AGREEMENT AND SLAS
- DISCUSSION OF SLA MANAGEMENT
- SLA ELEMENTS THAT CAN BE USED WITHIN A FRAMEWORK TO BUILD SLAS
- A SEPARATE DOCUMENT DESCRIBING THE NECESSARY METRICS



SLA Element Examples

Availability

Response Performance

Privacy

Security

Reliability

Support

Data Management

Certifications and Audits





ISO/IEC 19086 Timeline

New Work Item began September 2013

Second face to face January 2014

Next meeting April 2014

Committee Draft (CD) October 2014

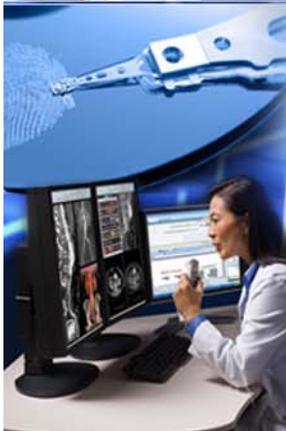
Final Publication 2015





IEC/ISO 19086

PLEASE PROVIDE INPUT
ERIC.SIMMON@NIST.GOV



NIST Software and System Division
National Institute of Standards and Technology/U.S. Department of Commerce



METRICS

NIST Software and System Division
National Institute of Standards and Technology/U.S. Department of Commerce



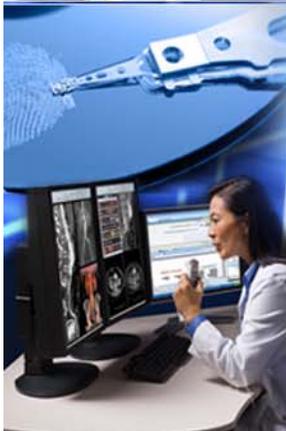
Role of Metrics to Support SLAs

The definition and usage of appropriate metrics and their underlying measures is an essential aspect to verifying the SLA.

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.





NIST CC Metrics PUBLIC Working Group

NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

DRAFT

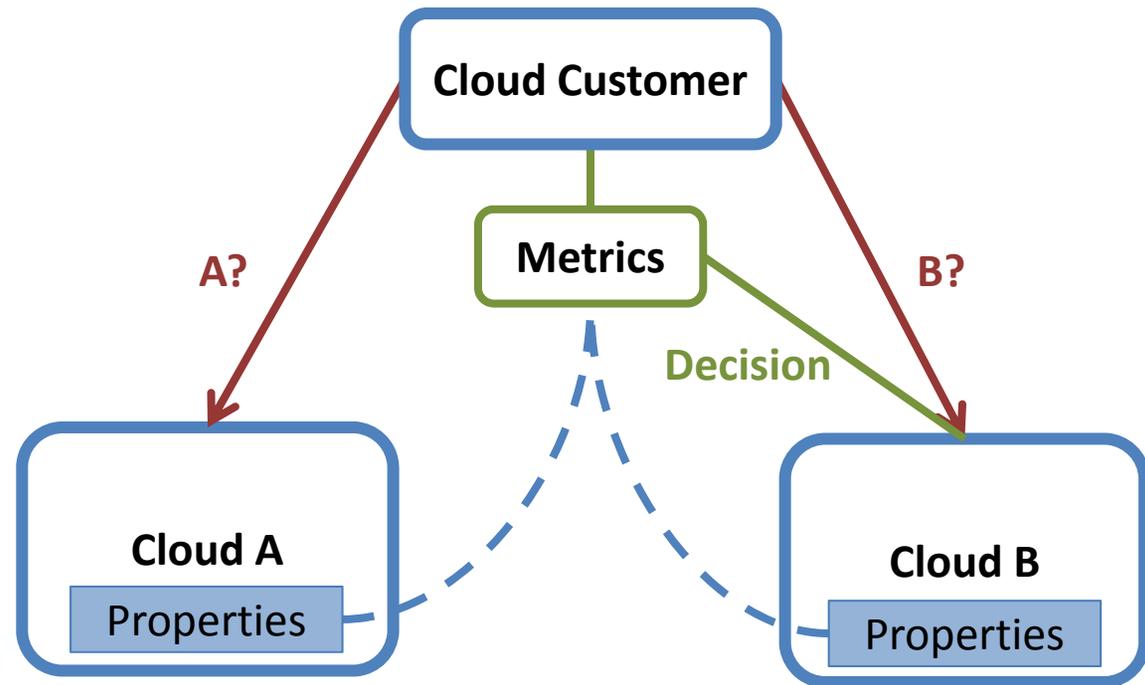
NIST Cloud Computing Reference Architecture Cloud Service Metrics Description

National Institute of Standards and
Technology (NIST)

NIST Software and System Division
National Institute of Standards and Technology/U.S. Department of Commerce



Metrics for Deciders





Metrics for Verifiers

Cloud Customer

Requirements

Metrics

SLA Agreement

Capabilities

Cloud Offering B



Metrics Challenge

Standardized measurement definitions and formats

The metrics for specific measurements themselves





Metrics Challenge

Standardized measurement definitions and formats

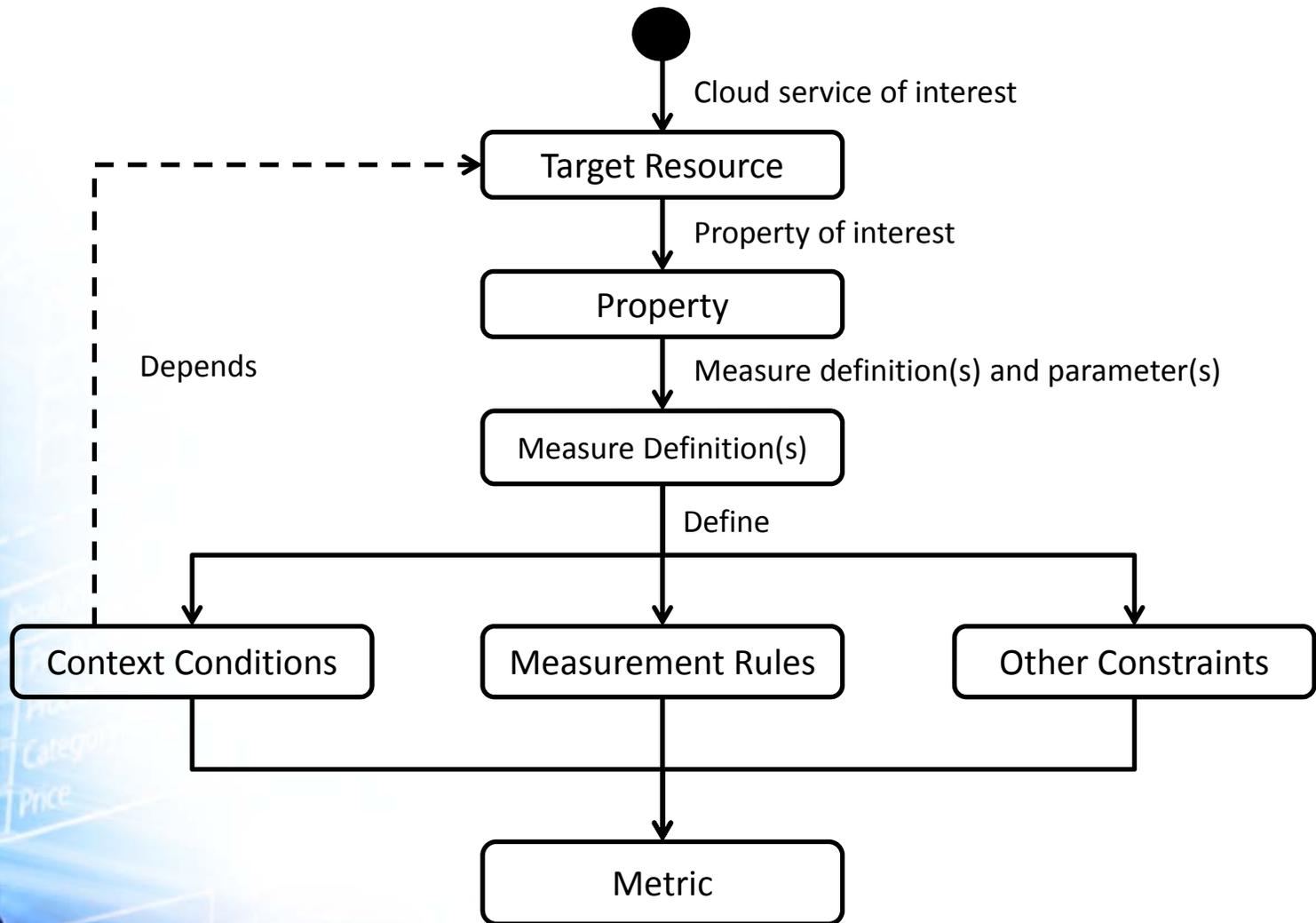
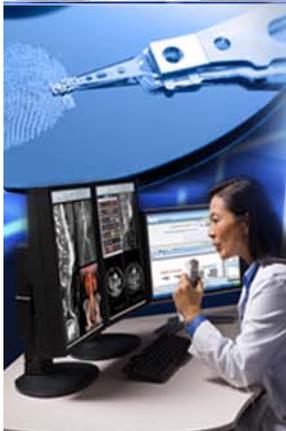
The measurements/metrics themselves

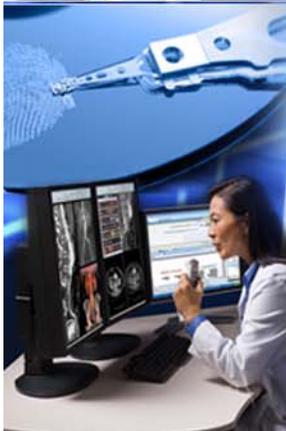




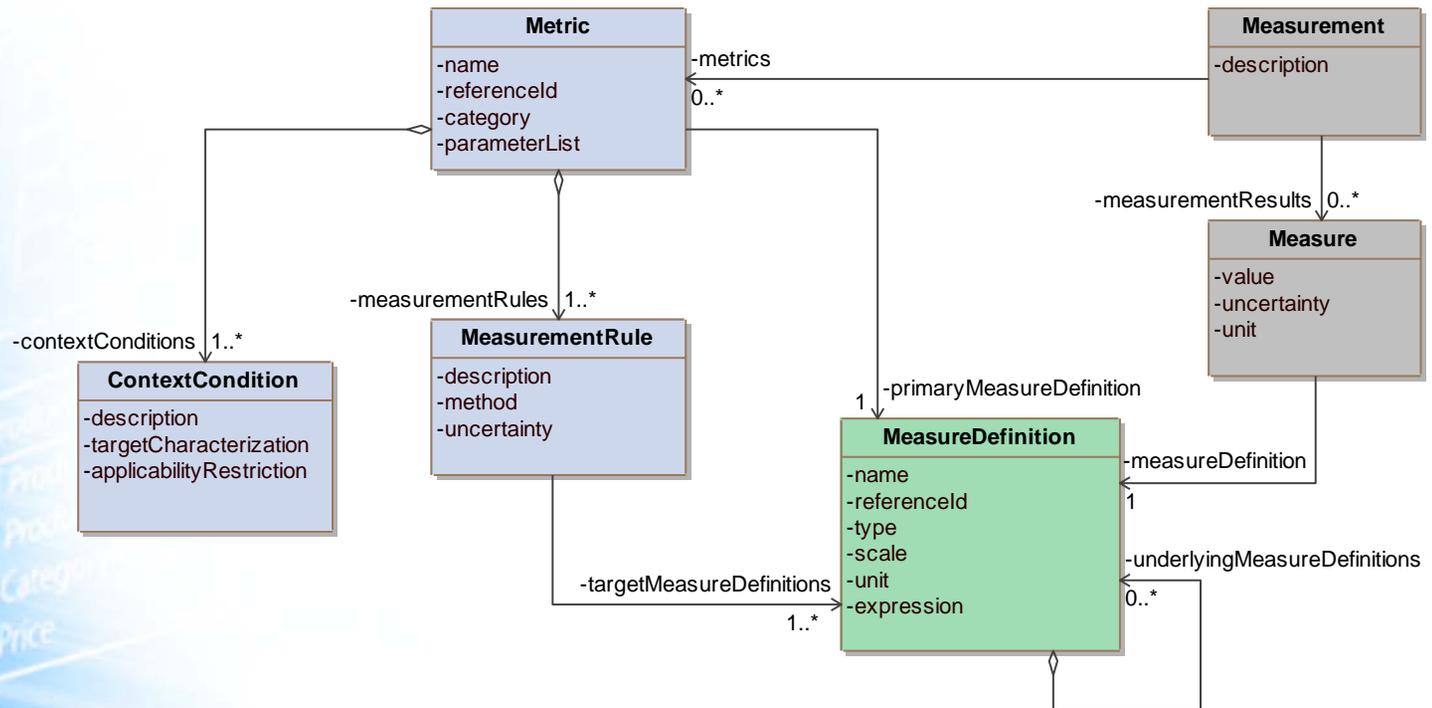
Definition Uncertainty

Term	Source	Description
base measure	ISO/IEC 15939	measure defined in terms of an attribute and the method for quantifying it
measure	ISO/IEC 15939	variable to which a value is assigned as the result of measurement
measure	ISO/IEC 15939	make a measurement
measure	NIST SP 500-209	The numerical value obtained by either direct or indirect measurement; may also be the input, output, or value of a metric.
measure	IEEE 1061	(A) a way to ascertain or appraise value by comparing it to norm. (B) to apply a metric
measure	SAMATE	we use measure for more concrete or objective attributes
measure	SMM	a method assigning comparable numerical or symbolic values to entities in order to characterize an attribute of the entities



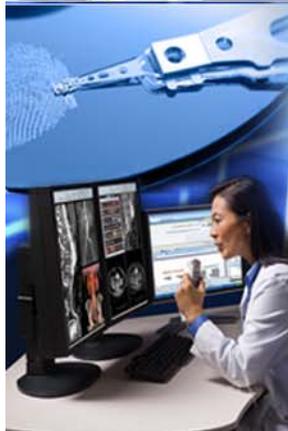


Metrics Model





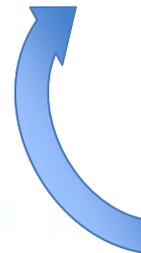
Future of Cloud Computing



Customer



Provider



Customer





Future of Cloud Computing

- Heterogeneous mix of cloud services
- Combination of services exhibit cloud characteristics
- Service level agreements
 - Self service
 - Multiple levels
 - Automated
 - Machine process-able





Federal Cloud Computing Standards and Technology Working Group



Discussions of technical challenges
and solutions for federal agencies

The image shows a hospital room with medical equipment, including a bed, monitors, and IV stands. The room is brightly lit and appears to be a modern medical facility.

Conference call 3rd Thursday each
month

The image shows a woman in a white lab coat sitting at a desk with multiple computer monitors. She is looking at one of the monitors and has her hand near her face. The background is a blue-tinted image of a computer workstation with various technical terms like 'Category', 'Price', and 'Database' visible.

NIST Software and System Division
National Institute of Standards and Technology/U.S. Department of Commerce



Thank you



ERIC SIMMON

301-975-3956

ERIC.SIMMON@NIST.GOV

NIST Software and System Division
National Institute of Standards and Technology/U.S. Department of Commerce