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High Quality Metric-Based SLAs for Cloud Computing

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

A Vision of the Path Forward

Given: Every cloud contract is created to address a unique business need.

Goal: Reduce the time and effort needed to create high quality, reliable SLAs.

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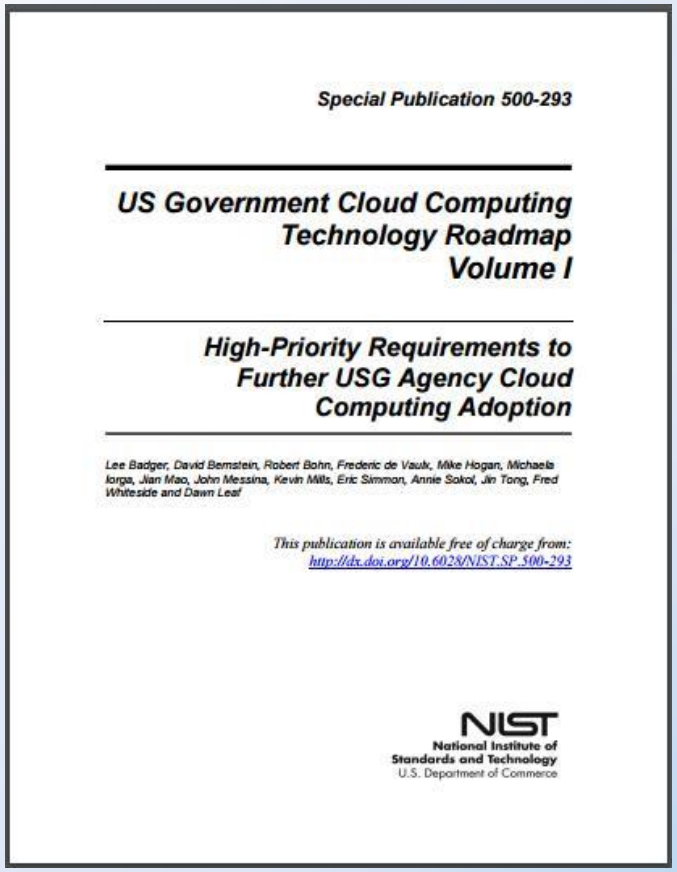
A USG Technology Roadmap

Public Working Groups

- Reference Architecture
- Standards
- Security
- Technical Use Cases
- Business Use Cases



Special Publication 500-293

US Government Cloud Computing Technology Roadmap Volume I

High-Priority Requirements to Further USG Agency Cloud Computing Adoption

Lee Badger, David Bernstein, Robert Bohn, Frederic de Vaulx, Mike Hogan, Michaela Iorga, Jian Mao, John Messina, Kevin Mills, Eric Simmon, Annie Sokol, Jin Tong, Fred Whiteside and Dawn Leaf

This publication is available free of charge from: http://dx.doi.org/10.6028/NIST.SP.500-293

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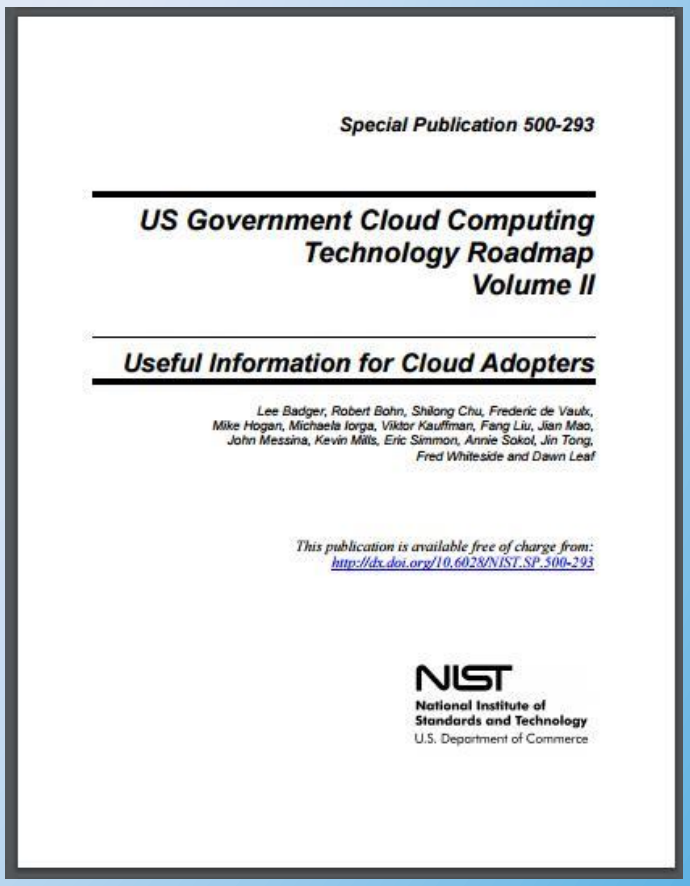

Special Publication 500-293

US Government Cloud Computing Technology Roadmap Volume II

Useful Information for Cloud Adopters

Lee Badger, Robert Bohn, Shilong Chu, Frederic de Vaulx, Mike Hogan, Michaela Iorga, Viktor Kauffman, Fang Liu, Jian Mao, John Messina, Kevin Mills, Eric Simmon, Annie Sokol, Jin Tong, Fred Whiteside and Dawn Leaf

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USG Cloud Computing Technology Roadmap Requirements (NIST SP 500-293)

1. International voluntary consensus-based standards
2. Solutions for High-priority Security Requirements, technically de-coupled from organizational policy decisions
3. Technical specifications to enable development of consistent, high-quality Service-Level Agreements
4. Clearly and consistently categorized cloud services
5. Frameworks to support seamless implementation of federated community cloud environments
6. Updated Organization Policy that reflects the Cloud Computing Business and Technology model
7. Defined unique government regulatory requirements and solutions
8. Collaborative parallel strategic “future cloud” development initiatives
9. Defined and implemented reliability design goals
10. Defined and implemented cloud service metrics

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What are Service Level Agreements (SLAs)?

An SLA is *part* of a Cloud Computing agreement that:

- Defines the service and service levels being provided
- Sets performance characteristics
- Identifies metrics and how they will be measured
- Identifies guarantees and methods of redress
- There is no standard naming convention or structure for an SLA

SLAs help manage expectations of customers and CSPs

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Challenges with SLAs

There are no current SLA standards resulting in:

- No Uniformity
- Providers use different terminologies and definitions
- Everyone is using differing metrics

This wide diversity in SLAs makes:

- Understanding and composing them a time consuming activity
- Contributes to misconceptions on the part of both consumer and provider
- Comparing cloud services with different underlying SLAs is very difficult

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19086 Series -- Service Level Agreements Standards

ISO/IEC JTC 1/SC 38 – Cloud Computing

- 19086-1 -- Cloud computing -- Service level agreement (SLA) framework and technology -- Part 1: Overview and concepts -- Stage: Published September 2016
- 19086-2 -- Cloud computing -- Service level agreement (SLA) framework and technology -- Part 2: Metrics -- Stage: Draft International Standard (DIS)
- 19086-3 -- Cloud computing -- Service level agreement (SLA) framework -- Part 3: Core conformance requirements -- Stage: Draft International Standard (DIS)

ISO/IEC JTC 1/SC 27 -- IT Security Techniques

- 19086-4 -- Cloud computing -- Service level agreement (SLA) framework and technology -- Part 4: Security and privacy -- Stage: Committee Draft (CD)

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Fundamental Concepts and Vocabulary

- **Cloud Service Agreement (CSA)**
  - documented agreement between the cloud service provider and cloud service customer that governs the covered service(s)
- **Cloud Service Level Agreement (SLA)**
  - part of the *cloud service agreement* that includes *cloud service level objectives* and *cloud service qualitative objectives* for the covered cloud service(s)
- **Cloud Service Level Objectives (SLO)**
  - commitment a *cloud service provider* makes for a specific, quantitative characteristic of a *cloud service,* where the value follows the *interval scale* or *ratio scale*
- **Cloud Service Qualitative Objectives (SQO)**
  - commitment a *cloud service provider* makes for a specific, qualitative characteristic of a *cloud service* where the value follows the *nominal scale* or *ordinal scale*

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Details of cloud SLAs, SLOs and SQOs can vary for different cloud service offerings.

The Role of Metrics

The definition and usage of appropriate metrics and their underlying measures and measurements are essential aspects of the cloud SLA.

- The metrics are used to set the boundaries and margins of error and limitations.
- Examples of how metrics can be used:
  - Determine if SLOs are met
  - Define a purpose for measures and measurements
  - Deliver a consistent representation of measure and measurement information
  - Link properties, measurements and metrics
  - Enable comparison of monitoring between services
  - Determine cloud service effectiveness for business objectives

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Back to the Vision…

Given: Every cloud contract (and SLA) is created to address a unique business need

Goal: Reduce the time and effort needed to create high quality, reliable SLAs

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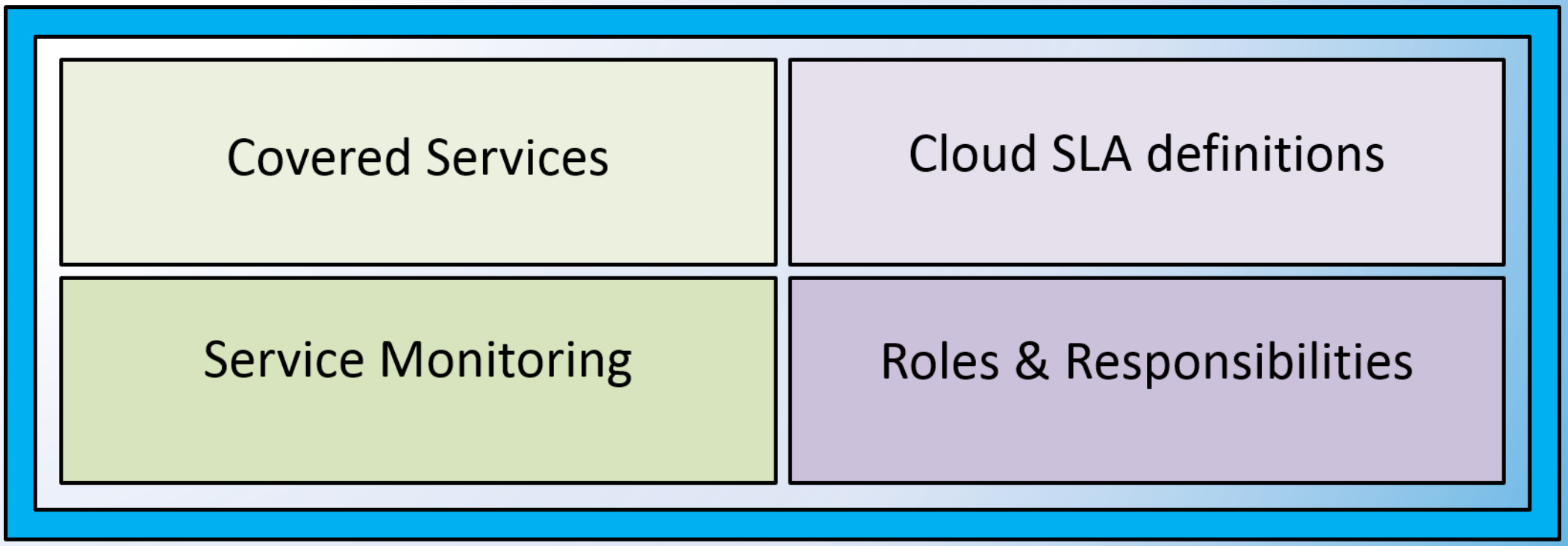
Construction of an SLA via ISO/IEC19086

Final product: High quality, technically informed SLA.



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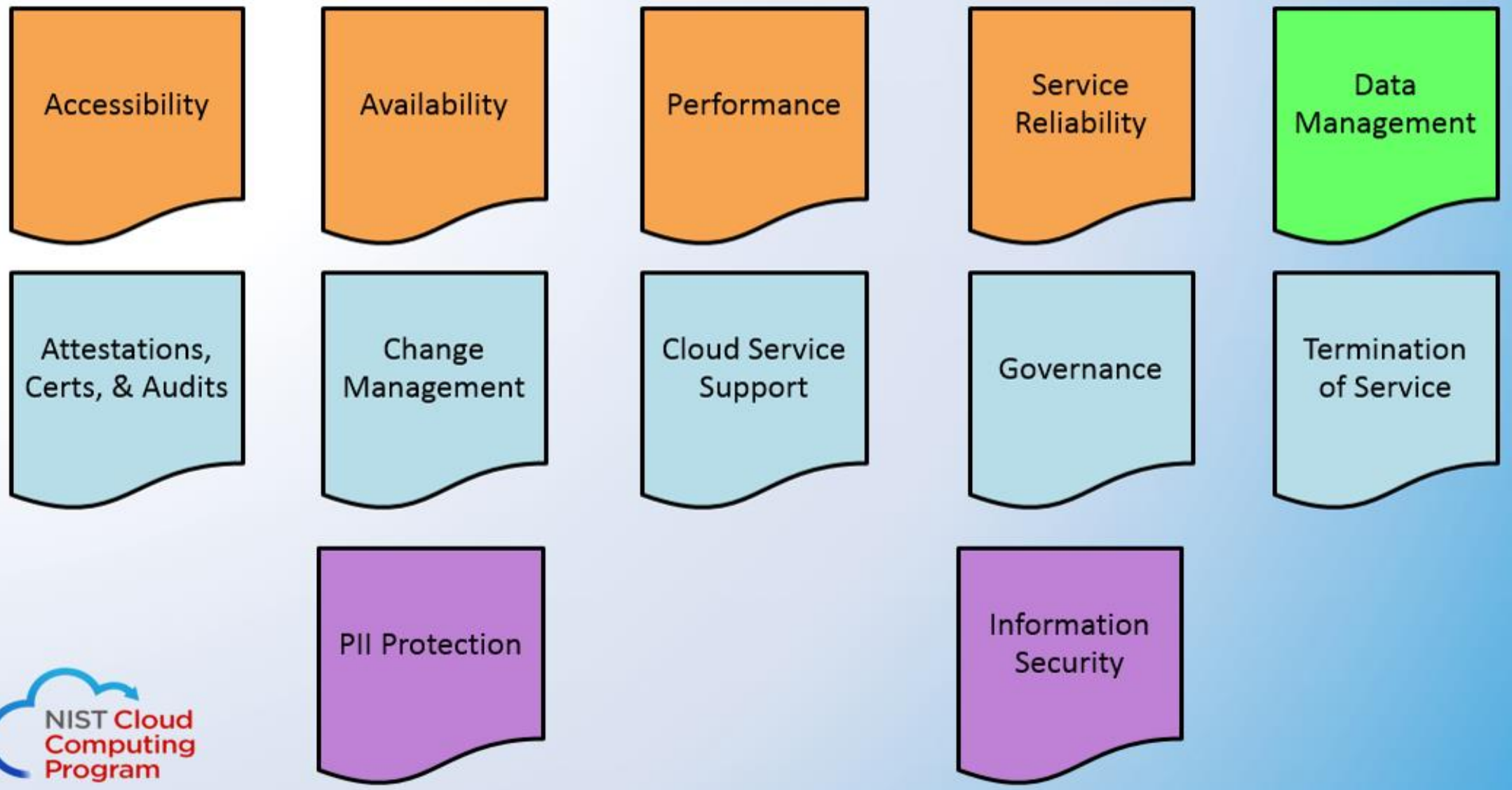
12 possible SLA Content Areas



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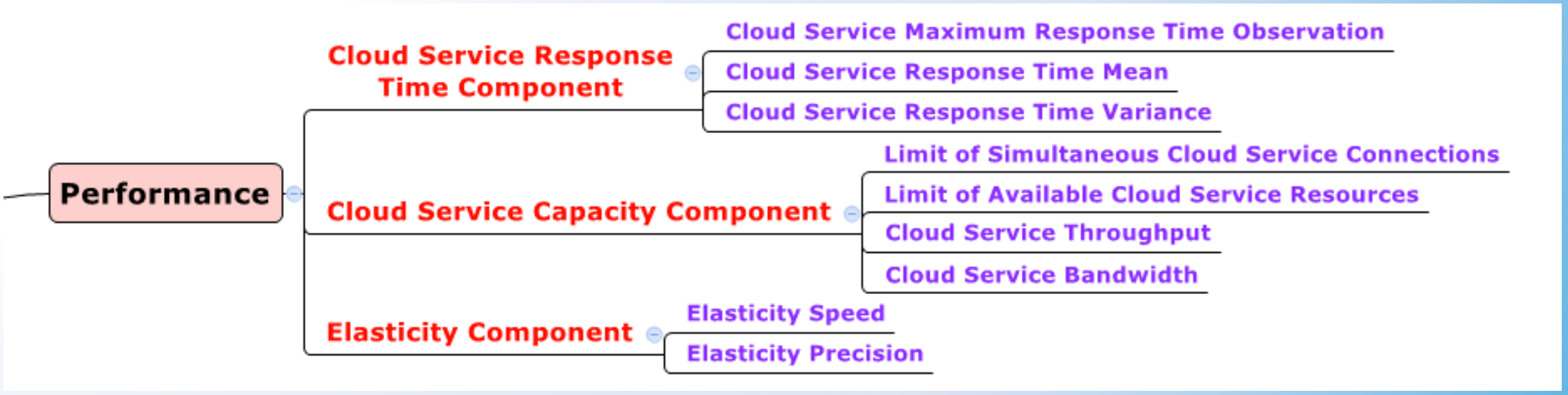
Examination of Performance Content Area



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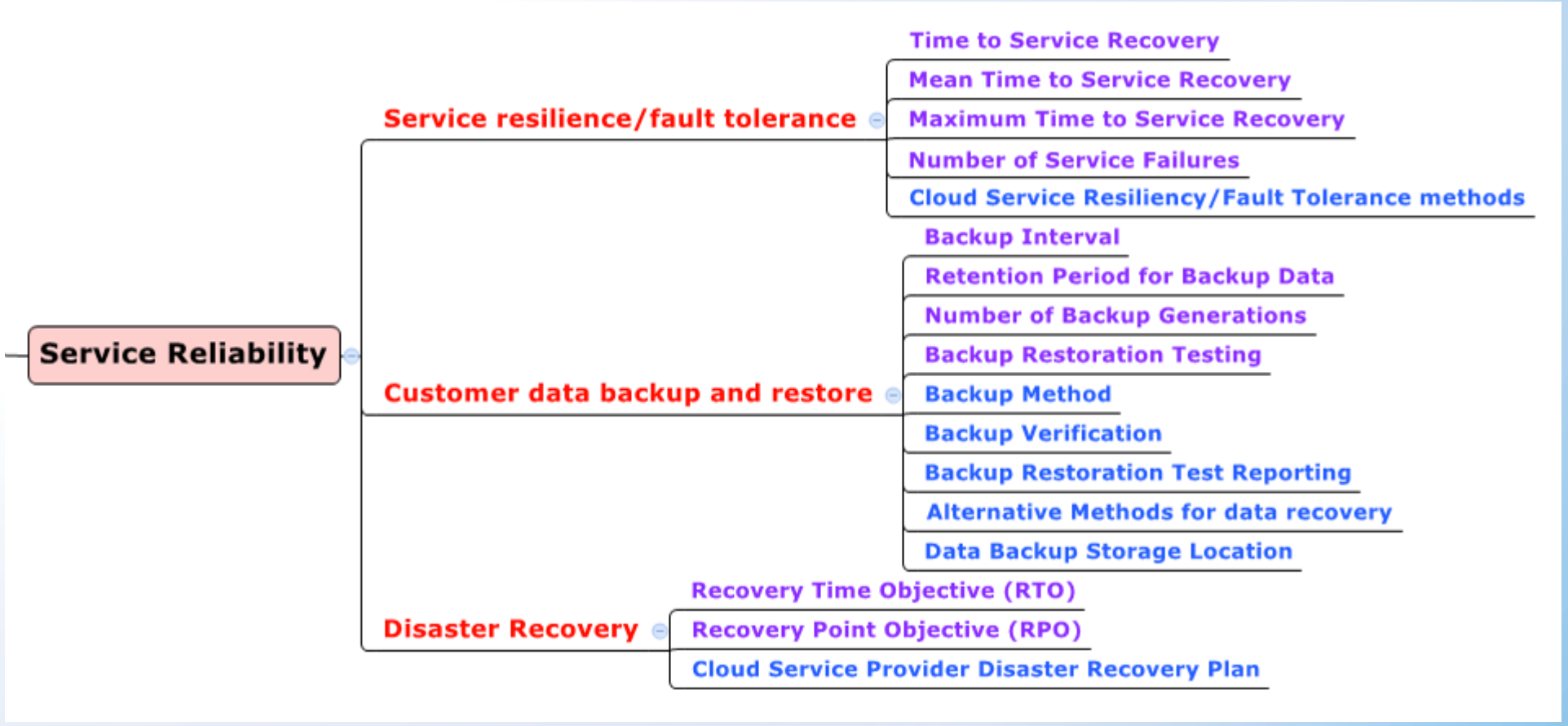
Examination of Service Reliability Content Area



4 SLOs 1 SQO

4 SLOs 5 SQOs

2 SLOs 1 SQO

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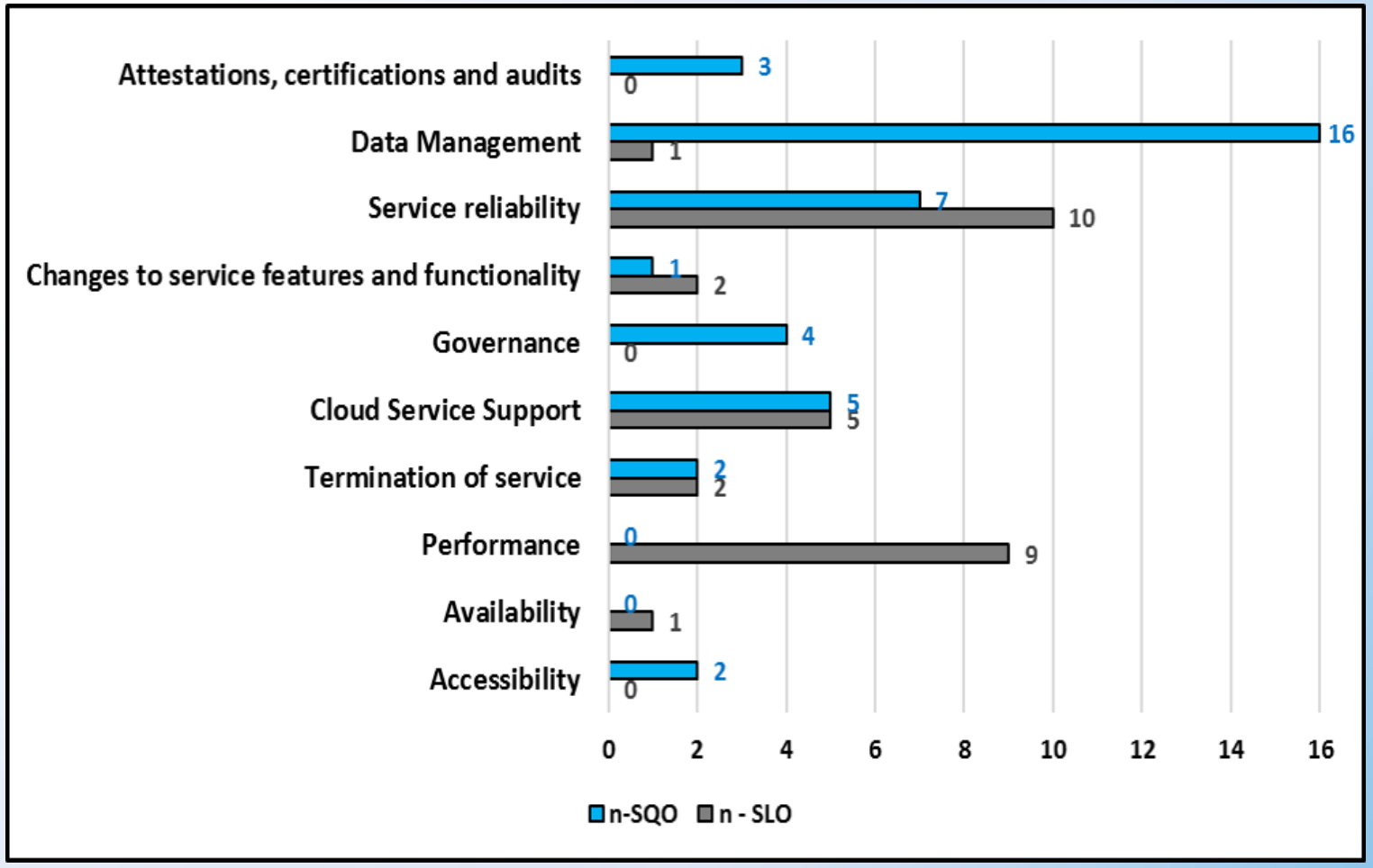
Number of SLOs/SQOs per Content Area



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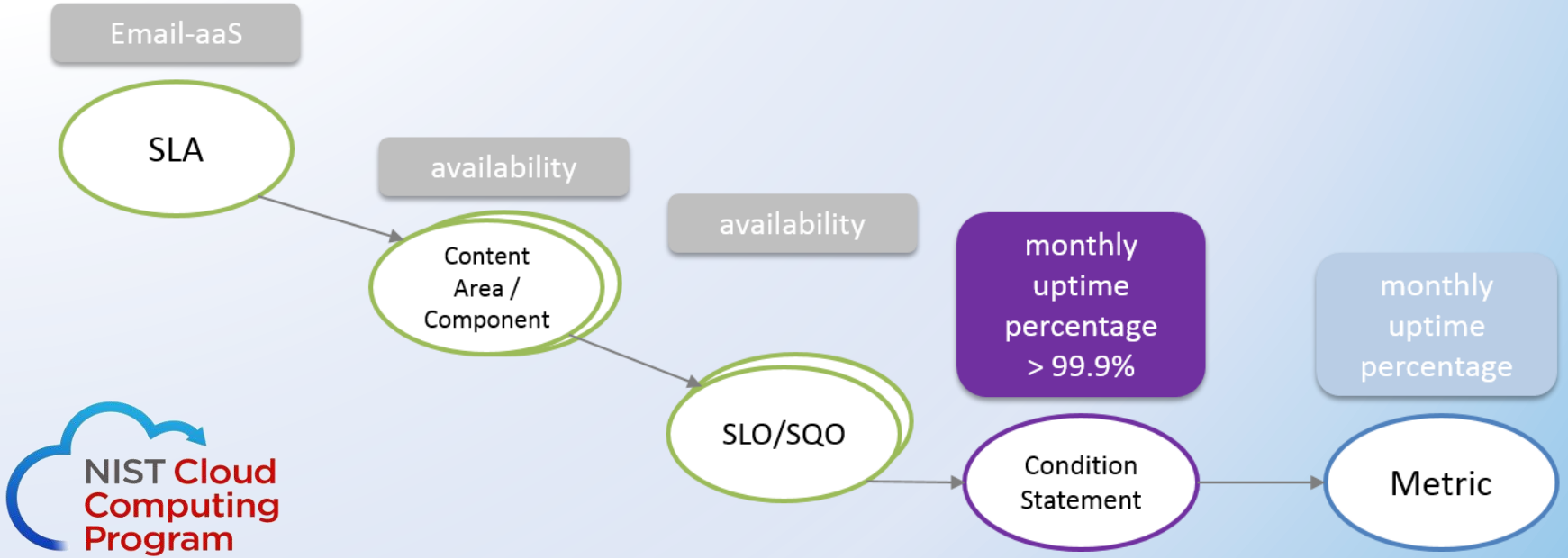
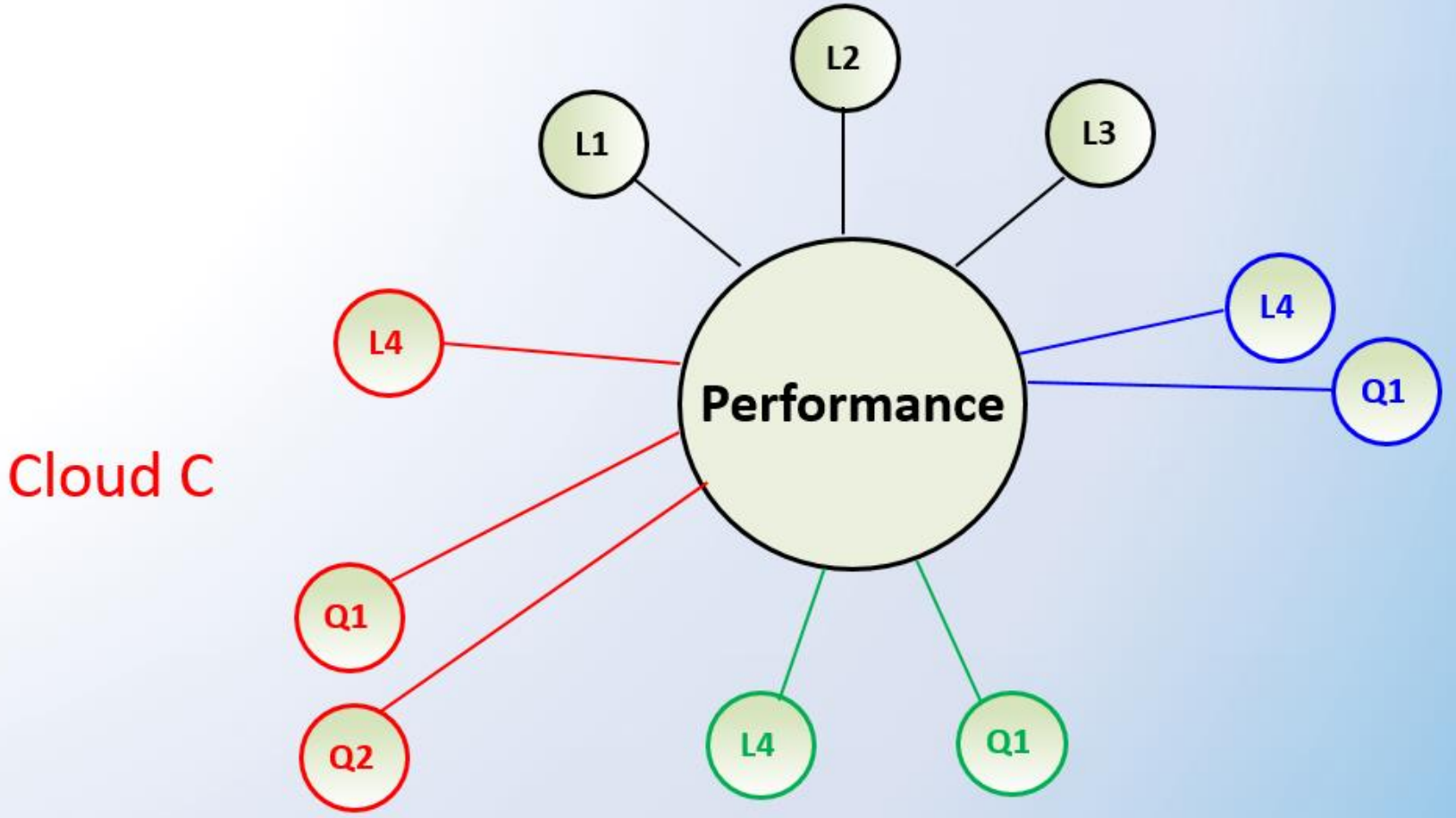
Construction of SLAs with 19086

- Built upon selected SLA content areas.
- SLA content area is formed from a set of SLOs and SQOs.
- Each SLO & SQO has associated metrics.
- Metrics described using the NIST Cloud Metric Model.
- New cloud metrics can be constructed using this model



USG SLA Base model



Extensible by Cloud Providers

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Current State

- Review and Develop additional Content Area
- Develop additional SLO/SQO for Content Areas.
- Develop additional metrics for SLO/SQOs.

Needs

- Common vocabulary
- Modular set of components
- Catalog of ready to use metrics
- Guidance documents
- Real World Examples

You -

- Validation for content areas
- Additional metrics
- Boilerplate language

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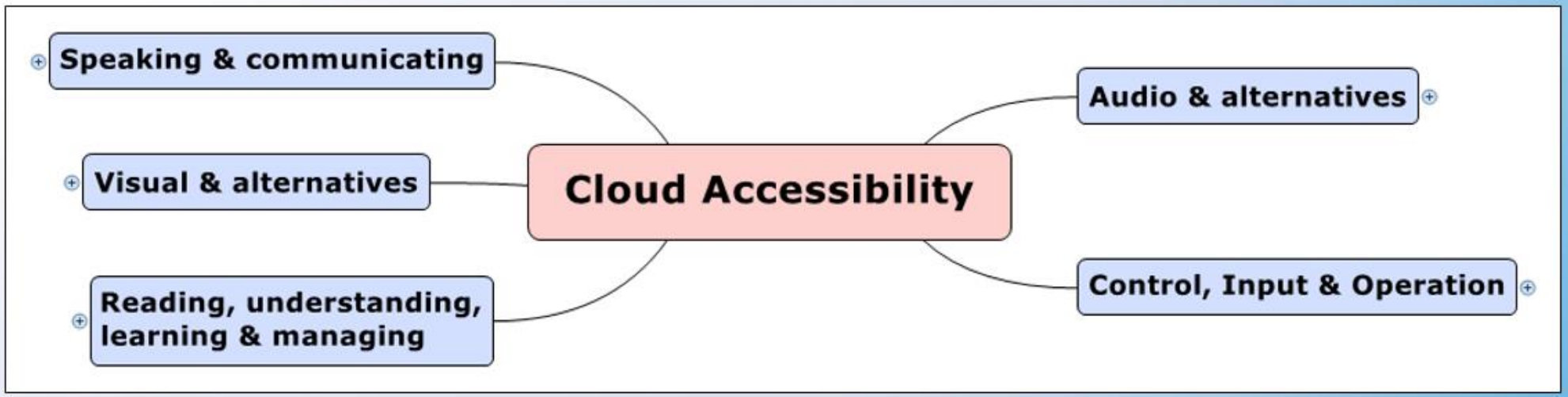
Examination of Accessibility Content Area



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Series of Workshops to Educate & Socialize

30 min	Discussion	• Status of Cloud SLAs for USG?
60 min	Education	• SLA • Metrics • Standards – 19086 & NIST
120 min	Exercise	• Scenario/story • SLA Content Areas • Determine applicable SLO/SQO • Determine metrics • Compile list of SLO/SQO/metrics
30 min	Discussion	• What does this all mean?

Investigate additional SLA Content Areas & Service Models
Produce boiler-plate language for contracts
Development of reusable components

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NIST ITL Cloud Computing Home Page **http://www.nist.gov/itl/cloud**

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