1. **Title of the Project**: Use-case testing for Cloud interoperability and portability.

2. **Background:**
   a) Cloud computing is a technology that allows users to access and use computing resources (such as computing power, storage, and applications) over the internet, often referred to as "the cloud." Instead of owning and maintaining physical servers or infrastructure, users can leverage cloud services provided by third-party vendors.
   b) With increased prevalence of cloud infrastructure, it has become common that a customer might use cloud services from multiple cloud service providers for different applications. Thus comes in picture the cloud interoperability and portability paradigm.
   c) Cloud interoperability is the ability of different cloud systems, applications, and services to work together seamlessly. It ensures that diverse cloud platforms can communicate, share data, and function cohesively. Interoperability is crucial for avoiding vendor lock-in, allowing users to integrate services from different cloud providers, and facilitating the smooth operation of applications and data across various cloud environments.
   d) Cloud portability refers to the ease with which applications and data can be moved between different cloud environments or providers. It involves the flexibility to transfer workloads without significant modifications, ensuring that applications remain functional and data remains accessible regardless of the specific cloud platform. Portability enables organizations to avoid dependence on a single cloud provider and supports the creation of hybrid or multi-cloud strategies.
   e) The world today is facing challenges in the interoperability and portability paradigm due to issues related to coordination and communication between multiple service providers. This project intends to carry out use case testing for various multi-cloud scenarios, analyse the results and identify the facets which require standardization on priority.

3. **Objective:** To collect technical data, analyze the interoperability and portability challenges, and identify aspects of cloud interoperability and portability for standardization.

4. **Scope**:
   a) Study and comparative analysis of existing literature which includes existing standards, reports, documents and whitepapers and any other report available on on cloud interoperability and portability and its implementation challenges.
   b) Collection of following data regarding multi-cloud implementation during interaction/deliberations with cloud vendors:
      a. Overview of multi-cloud environment.
      b. Description of the cloud providers involved.
      c. Types of services utilized across multiple clouds.
      d. Identification of key use cases for interoperability.

  e. Identification of key use cases for portability.

  f. Assessment of how well different cloud services communicate and work together.

  g. Challenges faced in multi-cloud environment.

  h. Best practices followed for optimizing multi-cloud deployment.

 c) Testing of use-cases for interoperability and portability in multi-cloud, clearly stating the following:

  a. Detailed explanation of the use-case being tested.

  b. Details of the test environment created/utilised.

  c. Detailed explanation of the testing approach.

  d. Testing methodologies and tools used.

  e. Presentation of specific test results for each use case.

  f. Additional details on testing methodologies, tools, and configurations used.

  g. Identification of strengths and weaknesses in terms of interoperability and portability.

  h. Any issues or challenges encountered during testing.

  i. Strategies for mitigating identified challenges.

  j. Suggestions for improving multi-cloud interoperability and portability.

  k. Summary of key findings and outcomes from the testing.

  l. Recommendations for future testing and improvements.

  m. Any supplementary data, charts, or graphs.

  n. Citations and references to relevant standards, documentation, and research.

 d) Feedback from users of multi-cloud environment in India.

5. Research Methodology:

a) Review and analyze the literature as per the details mentioned scope.

b) Collect feedback/information through circulation of structured questionnaire.

c) During the visit to vendors of multi-cloud/cloud services:

  a. Observe the facilities for collection of data.

  b. Conduct focused group discussion in a structured format.

d) Conduct use-case testing.

6. Sampling Plan:

a) Testing of at-least 20 use cases to assess interoperability and portability each.

b) Two cloud vendors from large, medium and small scale each shall be visited.

c) Feedback from at-least 10 users shall be sought.

7. Deliverables: The following should be submitted in hard copy and digital format to BIS:

a) Study report covering all the aspects mentioned in the scope.

b) Questionnaire and response received to them.

8. Requirement for the CVs: CVs of the following members to be shared by the organization conducting the research:

a) Project leader for the R&D project.
b) Team members to be engaged for the project.

9. **Timeline and Method of Progress Review:**
   a) The timeframe for completing the study and submission of the final report is 4 months from the date of award of the project.
   a) Interim review: Interim report covering the review of the literature and survey conducted, use-cases identified to be tested, test environment details and testing methodology to be submitted within 45 days from the date of award of the project.
   b) Draft report: To be submitted with 90 days from the date of award of the project.
   c) In case of delay in submission of final draft report, the justification shall be given by the project proposer for consideration by the Sectional Committee.
   d) d) The proposer shall comply to the provisions given in the BIS guidelines for Research & Development Projects for Formulation and Review of Standards, i.e., **doc no. SCMD/R&D Guidelines/20230909.**
   e) e) The proposer taking up the project shall clear all doubts on provisions of research including ToR and BIS guidelines before acceptance of the project and signing agreement.

10. **Support BIS will Provide:** Following will be provided by BIS on request
    a) Any national/international standard relevant to the project.
    b) Assistance by introducing researchers to third parties wherever suitable.

----------x----------