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Is CDMI and Non-CDMI operations interoperable in conformance testing: Addressing challenges, approach & best practice?

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Abstract

With the rapid growth of the cloud market, today there are a slew of vendors offering multiple cloud solutions for cloud migration, data management and cloud security. Multiple cloud solutions put end-users in qualm about the best solution. The Cloud Data management Interface (CDMI) specification is stirring on the top towards CDMI, Non-CDMI as well as Profile based categories to resolve end user muddle.

TCS has been concentrating on implementing the Conformance Test Suite as well as contributing to SNIA CDMI Conformance Test Specification, which is focusing towards incorporating CDMI, Non-CDMI and profile.

In this proposal we will share the approach and challenges for testing of interoperability of CDMI and Non-CDMI specification as well as profile based scenarios of the cloud products. Also, we will share additional challenges / learning's gathered from testing of CDMI Products for conformance. These learning's will help as a ready reference for organizations developing CDMI, Non-CDMI and profile based product suit.

Agenda

- CDMI Test Specification Overview
  - Key challenges in CDMI-based testing
- Non-CDMI Test Specification Overview
  - Key challenges in Non-CDMI-based testing
- Profiles-Based Testing Overview
  - Key challenges in Profiles-based testing
- Best Practices
- Conclusion

CDMI Test Specification Overview

- CDMI Test Specification

  The goal of CDMI Test Specification is to:

  - Perform conformance testing
  - Ensure that the target product is implemented according to the CDMI Cloud Storage standards
  - Ensure compliance of the target product with the mandatory standards

Reference: http://snia.org/sites/default/files/CDM_Test_Spec_v1.0a.pdf

CDMI Test Specification Overview

- Objects Apprehended:
  - Capability Object –URD Operations: Capability object covered 5 test case scenarios.
  - Container Object –CURD Operations: Container object covered 35 test case scenarios excluding the data file.
  - Data Object –CURD Operations: Data Object covered 44 test case scenarios excluding the data file.

CDMI Test Specification Overview

- Test Specification Data File

  Data file contains multiple parameters that should be checked in the test case for their validity.

  Example:

  - To read a container using percent escaping reserved character.

  According to the specification, four percent escaping character and their values are shown in the following example:

  %40 the value is @, %3A the value is : , %3F the value is ? and %23 the value is #.

  - To read a container with various combinations of valid fields.

  Consider the following examples,

  field_set=objectId, objectType or objectId;objectType and so on

```
GET <root URI>/TestContainer1/?field_set  HTTP/1.1
Host: cloud.example.com
Accept: application/cdmi-container
X-CDMI-Specification-Version: 1.0.2
```

Key challenges in CDMI-Based Testing

- CDMI and Non-CDMI Interoperability

  Few functionalities are missing in Non-CDMI Interoperability.

  For example, On container objects such as Container Read or Update, interoperable test cannot be performed.

Key challenges in CDMI-Based Testing

- Requirement of CDMI Server or Simulators with Digest authentication implemented:
  - Requirement of CDMI test server with Digest authentication scheme is implemented on simulators, to test the successful implementation of digest-based test scripts.
  - Requirement of at least two CDMI servers, to test successful implementation of test scripts for interoperability testing.

Key challenges in CDMI-Based Testing

- Capability is not defined according to the functionality implementation:

  Incorrect or missing capability definition of the implemented functionality leads to improper testing.

  Example:

  - 'cdmi_dataobjects' capability is not listed in the reading capability object. However, data objects are supported by CDMI servers.
  - 'cdmi_create_container' capability is listed and defined as System Wide capability in CDMI Server while in CDMI specification it is mentioned as Container capability.

Key challenges in CDMI-Based Testing

- CDMI Specifications Challenges:

  The Scenario Implementation Find is difficult to implement due to the absence of appropriate examples in CDMI Specification.

  Example:

  - To move objects or data from one CDMI cloud to another CDMI cloud, no Authentication or Authorization example is available.

```
PUT <root URI>/TestContainer1/TestContainer3/ HTTP/1.1
Host: server1
Accept: application/cdmi-container
Content-Type: application/cdmi-container
X-CDMI-Specification-Version: 1.0.2
{
    "move" : "server2/<root URI>/TestContainer1/TestContainer2/"
}
```

    In this request, authorization information will be set for CDMI server1 to move the data from CDMI server1 to CDMI server2. However, the authorization information for server2 in this request is missing in the CDMI Specification.

Non-CDMI Test Specification Overview

- Non-CDMI Test Specification

  The goal of the Non-CDMI Test Specification is to perform conformance testing and ensure that the target product is implemented according to CDMI and Non-CDMI standards. The target product must comply with the mandatory standards.

Non-CDMI Test Specification Overview

- Objects Apprehended
  - Capability Object –URD Operation: Capability object covered 5 test case scenarios.
  - Container Object –CD Operation: Container object covered 12 test case scenarios excluding the data file.
  - Data Object –CURD Operation: Data Object covered 21 test case scenarios excluding the data file.

Non-CDMI Test Specification Overview

- Objects Apprehended
  - Capability Object –URD Operation: Capability object covered 5 test case scenarios.
  - Container Object –CD Operation: Container object covered 12 test case scenarios excluding the data file.
  - Data Object –CURD Operation: Data Object covered 21 test case scenarios excluding the data file.

Key challenges in Non-CDMI-Based Testing

- Non-CDMI client cannot read capability object

  No provision to read capability object using Non-CDMI client. This causes the test case to be executed on assumption.

Example :

- Data Object Create test case: No method to query the capability object and check if Data Objects and its Create operation are supported as a prerequisite of this test case, instead the test case runs on hit-and-try method.

Non-CDMI-Based Testing key challenges

- Non-CDMI client unable to determine object ID

  Specific format has not been defined in CDMI specification to determine the objectId of objects using Non-CDMI client. Non-CDMI restricts implementation of test case scenarios-based on objectId.

Example :

- For every CDMI Specification, no Non-CDMI Create or Read operation returns objectId of the questioned object, therefore test cases based on ‘flat object ID’ access (<rootURI>/cdmi_objectid/<objectId>/) cannot be implemented. For example, a scenario can be ‘Read a Data Object using its object ID’.

Profiles-Based Testing Overview

- Profile-Based CDMI Test Specification

  Profile-Based CDMI Compliance testing comprises a subset of CDMI and Non-CDMI test specification and test suite. It helps the vendors to test their servers in a rapid manner because of the limited features and limited capability of the following profiles:

  - Basic Storage Service
  - Self-Storage Management

Profiles-Based Testing Overview

- Profile: Basic Storage Management

- Objects Apprehended
  - Capability Object
  - CDMI Container Object–Read Operation: Container object covered one test case scenarios
  - Non-CDMI Container Object–Create or Delete Operations: Container object covers only one test case scenario.
  - Non-CDMI Data Object–CRUD Operation: Data Object covers four test case scenarios.

Profiles-Based Testing Overview

- Profile: Self Storage Management

- Objects Apprehended
  - Capability Object.
  - CDMI Container Object – CRUD Operation: Container object covered 8 test case scenarios excluding the data file.

Best Exercise

- Cloud Storage Vendor should adopt CDMI specification to implement CDMI Server .
- Must use Simulator.
- Follow CTP specification to test their cloud storage servers.

Subsequent Phase

- Use CDMI Test Specification for conformance CDMI Server.
- Use of Vendor conformance test tool for testing Cloud Storage Products for conformance to CDMI, will enable implementation of the CDMI standard in the right manner.

Questions?

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