Calendar, Tasks, and Notes Profile (CTN)

Bluetooth® Test Suite

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- Group Prepared By: Audio, Telephony and Automotive WG
- Feedback Email: ata-main@bluetooth.org

Abstract:
This document defines test structures and procedures for the interoperability tests of Bluetooth products implementing the Calendar, Tasks, and Notes Profile (CTN).
### Revision History

<table>
<thead>
<tr>
<th>Revision History</th>
<th>Date</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
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### Contributors

<table>
<thead>
<tr>
<th>Name</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veit Kötting</td>
<td>Berner &amp; Mattner</td>
</tr>
<tr>
<td>Joachim Mertz</td>
<td>Berner &amp; Mattner</td>
</tr>
<tr>
<td>Dominik Sollfrank</td>
<td>Berner &amp; Mattner</td>
</tr>
<tr>
<td>Alicia Courtney</td>
<td>Broadcom</td>
</tr>
<tr>
<td>Burch Seymour</td>
<td>Continental</td>
</tr>
<tr>
<td>Magnus Sommanson</td>
<td>CSR</td>
</tr>
<tr>
<td>Kyle Penri-Williams</td>
<td>Parrot</td>
</tr>
</tbody>
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Contents

1 Scope ........................................................................................................................................... 6

2 References, Definitions, and Abbreviations ................................................................................. 7
   2.1 References ............................................................................................................................... 7
   2.2 Definitions and Abbreviations ............................................................................................... 7

3 Test Suite Structure (TSS) ............................................................................................................. 8
   3.1 Overview ............................................................................................................................... 8
   3.1.1 Pass/Fail Verdict Conventions ......................................................................................... 9
   3.2 Test Groups ........................................................................................................................... 9
   3.3 References to Generic PIM Profile Test suite test cases ..................................................... 10

4 Test Cases (TC) ............................................................................................................................. 11
   4.1 Introduction ........................................................................................................................... 11
   4.1.1 Test Case Identification Conventions ............................................................................. 11
   4.1.2 Conformance ..................................................................................................................... 11
   4.2 Account Handling ................................................................................................................ 13
   4.2.1 IUT – CTN Client Equipment (CCE) ............................................................................. 13
   4.2.2 IUT – CTN Server Equipment (CSE) ............................................................................. 14
   4.2.2.1 CTN/CSE/CAH/BV-01-I [Retrieve Information about a CAS Account] ..................... 14
   4.2.2.2 CTN/CSE/CAH/BV-11-I [Return Information about a CAS Account] ..................... 14
   4.3 CTN Browsing Feature .......................................................................................................... 15
   4.3.1 IUT – CTN Client Equipment (CCE) ............................................................................. 15
   4.3.1.1 CTN/CCE/CBR/BV-01-I [Retrieve an Object Listing] ................................................. 15
   4.3.2 IUT – CTN Server Equipment (CSE) ............................................................................. 15
   4.3.2.1 CTN/CSE/CBR/BV-11-I [Return an Object Listing] ................................................. 15
   4.3.2.2 CTN/CSE/CBR/BV-01-I [Reject an Object Listing Request for an Invalid Folder] ..... 15
   4.3.2.3 CTN/CSE/CBR/BV-06-I [Receive Listing Filtered by datetime] ............................... 15
   4.4 CTN Object Handling Feature .............................................................................................. 16
   4.4.1 IUT – CTN Client Equipment (CCE) ............................................................................. 16
   4.4.1.1 CTN/CCE/CH/01-I [Retrieve a bCalendar Object from the CSE] .............................. 16
   4.4.1.2 CTN/CCE/CH/02-I [Upload a bCalendar Object to the CSE] .................................... 16
   4.4.1.3 CTN/CCE/CH/03-I [Delete a bCalendar Object on the CSE] ..................................... 16
   4.4.1.4 CTN/CCE/CH/04-I [Forward a bCalendar Object on the CSE] ................................. 16
   4.4.1.5 CTN/CCE/CH/05-I [Update Status of a bCalendar Object on the CSE] ................. 16
   4.4.1.6 CTN/CCE/CH/06-I [Receive Listing Filtered by datetime] ....................................... 16
   4.4.2 IUT – CTN Server Equipment (CSE) ............................................................................. 16
   4.4.2.1 CTN/CCE/CH/01-I [Return a bCalendar Object] ....................................................... 16
   4.4.2.2 CTN/CCE/CH/01-I [Reject an Invalid Request for a bCalendar Object] .................... 16
   4.4.2.3 CTN/CCE/CH/02-I [Receive a bCalendar Object from the CCE] ............................. 16
   4.4.2.4 CTN/CCE/CH/03-I [Delete a bCalendar Object] ....................................................... 16
   4.4.2.5 CTN/CCE/CH/04-I [Forward a bCalendar Object] .................................................... 16
   4.4.2.6 CTN/CCE/CH/05-I [Update Status of a bCalendar Object] ....................................... 16
   4.4.2.7 CTN/CCE/CH/06-I [Filtering by datetime] ............................................................... 16
   4.5 CTN Notification Feature ...................................................................................................... 17
   4.5.1 IUT – CTN Client Equipment (CCE) ............................................................................. 17
   4.5.1.1 CTN/CCE/CNO/01-I [Receive a Notification Event] ................................................... 17
   4.5.2 IUT – CTN Server Equipment (CSE) ............................................................................. 17
   4.5.2.1 CTN/CCE/CNO/11-I [Send a Notification Event] ....................................................... 17

Calendar, Tasks, and Notes Profile (CTN) / Test Suite
5  Test Case Mapping

..................................................................................................................28
1 Scope

This Bluetooth document contains the Test Suite Structure (TSS) and Test Cases (TC) for the Calendar, Tasks, and Notes Profile.

The objective of this test suite is to provide a basis for interoperability tests for Bluetooth devices giving a high probability of air interface interoperability between different manufacturers’ Bluetooth devices.

Basic test cases are defined in the Generic PIM Profile (GPP) test suite and are mandatory for CTN.
2 References, Definitions, and Abbreviations

2.1 References
This Bluetooth document incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter.

[1] Bluetooth Core Specification 2.1 or later
[3] Bluetooth Calendar, Tasks and Notes Profile Specification
[4] Bluetooth Calendar, Tasks and Notes Profile ICS
[6] Bluetooth Generic PIM Profile Test Suite

2.2 Definitions and Abbreviations
All definitions and additional abbreviations are found in [1], [2], and [3].

In particular the following abbreviations apply.

<table>
<thead>
<tr>
<th>Abbreviation or Acronym</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS</td>
<td>CTN Access Service</td>
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<tr>
<td>CNS</td>
<td>CTN Notification Service</td>
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<td>GPP</td>
<td>Generic PIM Profile</td>
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<td>PAS</td>
<td>PIM Access Service</td>
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<td>PIM</td>
<td>Personal Information Management</td>
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<tr>
<td>PNS</td>
<td>PIM Notification Service</td>
</tr>
</tbody>
</table>

*Table 2.1: Abbreviations used in this document*
3 Test Suite Structure (TSS)

3.1 Overview

The test objectives are to verify functionality of the CTN Profile and enable interoperability between different devices. The testing approach is to cover mandatory and optional requirements in the Profile specification and to match these to the support of the IUT as described in the ICS Proforma. This is being done by through a combination of tests defined in this document together with a set of referenced tests defined either in the [6] GPP.TS or the [9] GOEP.TS.

This defines the tree structure of the conformance and interoperability tests to be passed in order to qualify as a CTN device. The test suite structure (TSS) is presented in Figure 3.1 and Figure 3.2. The TSS is composed of nested test groups organized in a top down approach.

Whenever a test case defined by this document requires functionality from external networks, such as receiving or sending CTN objects, this can be performed by a real network or a suitable network simulator.

CTN Profile interoperability test suite structure (1)

Account handling functional components
  CCE
    Retrieve information about a CAS account CTN/CCE/CAH/BV-01-I
  CSE
    Return information about a CAS account CTN/CSE/CAH/BV-11-I

Figure 3.1: CTN Interoperability Test Structure Representation (1)
CTN Profile interopability test suite structure (2)

Browsing functional components

CCE
- Retrieve an object listing (*)
  CTN/CCE/CRB/BV-01-I

CSE
- Return an object listing (*)
  CTN/CSE/CRB/BV-11-I
- Reject a request for an invalid folder
  CTN/CSE/CRB/BV-12-I

Object handling functional components

CCE
- Retrieve a bCalendar object from the CSE (*)
  CTN/CCE/COH/BV-01-I
- Upload a bCalendar object to the CSE (*)
  CTN/CCE/COH/BV-02-I
- Delete a bCalendar object on the CSE (*)
  CTN/CCE/COH/BV-03-I
- Forward a bCalendar object on the CSE
  CTN/CCE/COH/BV-04-I
- Update Status of a bCalendar object on the CSE
  CTN/CCE/COH/BV-05-I
- Receive a listing filtered by datetime
  CTN/CCE/COH/BV-06-I

CSE
- Return a bCalendar object (*)
  CTN/CSE/COH/BV-11-I
- Reject an invalid request for a bCalendar object
  CTN/CSE/COH/BV-12-I
- Receive a bCalendar object from the CCE (*)
  CTN/CSE/COH/BV-13-I
- Delete a bCalendar object (*)
  CTN/CSE/COH/BV-14-I
- Forward a bCalendar object
  CTN/CSE/COH/BV-15-I
- Update Status of a bCalendar object
  CTN/CSE/COH/BV-16-I
- Filtering by datetime
  CTN/CSE/COH/BV-17-I

Notification functional components

CCE
- Receive a notification event
  CTN/CCE/CNO/BV-01-I

CSE
- Send a notification event
  CTN/CSE/CNO/BV-11-I

(*) To be performed for all supported object types (calendar, tasks, notes)

Figure 3.2: CTN Interoperability Test Structure Representation (2)

3.1.1 Pass/Fail Verdict Conventions

Each test case has an Expected Outcome section, which outlines all the detailed pass criteria conditions that shall be met by the IUT to merit a Pass Verdict.

The convention in this test suite is that, unless there is a specific set of fail conditions outlined in the test case, the IUT fails the test case as soon as one of the pass criteria conditions cannot be met. If this occurs the outcome of the test shall be the Fail Verdict.

3.2 Test Groups

This defines test groups to structure the CTN test cases.

Figure 3.1 and Figure 3.2 summarize the TSS for the interoperability tests based on CTN.

- CTN account handling:
  Tests verifying the account-related functions of CTN, i.e. getting account information and updating accounts. These functions are part of CTN Access Service.

- Notification:
  Tests verifying the notification i.e. functionality for sending events from the CSE to the CCE. This function is part of the CTN Notification Service.
• **Browsing:**
  Tests verifying that the CCE can browse through the CSE's object message repository. This function is part of the CTN Access Service.

• **Object handling:**
  Tests verifying the handling of literal objects, i.e. download, upload and deletion of objects in the CSE’s object repository by the CCE. These functions are part of the CTN Access Service.

### 3.3 References to Generic PIM Profile Test suite test cases

The Generic PIM Profile specifies generic function definitions that are further defined at the higher profile layer. Please refer to the CTN specification for the definitions of the functions and how they are used in CTN to meet the Qualification testing requirements for the CTN profile. The CTN function definitions are found in 5 of the CTN specification [3].

This test suite reuses test case definitions from the Generic PIM Profile Test Suite (GPP TS) [6]. If the test procedure references to a GPP TS test case, then the ‘Initial condition’, ‘Test procedure’ and ‘Expected outcome’ including Pass verdicts of the referenced GPP TS test case shall apply.

Additional steps and requirements are listed in each applicable test case and shall be applied when performing the CTN test case. If additional pass verdicts are listed, the test case is passed **only** if the additional Pass verdicts are met.
4 Test Cases (TC)

4.1 Introduction

4.1.1 Test Case Identification Conventions

Test cases shall be assigned unique identifiers per the conventions in Error! Reference source not found.. The convention used here is `<spec abbreviation>/<IUT role>/<class>/<feat>/<func>/<subfunc>/<cap>/<xx>-<nn>-<y>`. Bolded ID parts shall appear in the order prescribed. Non-bolded ID parts (if applicable) shall appear between the bolded parts. The order of the non-bolded parts may vary from test suite to test suite, but shall be consistent within each individual test suite.

Testing of CTN functionality includes a set of tests from the GOEP test suite and the GPP test suite. The required GOEP tests are referred to in this TCMT per the following convention `<spec abbreviation>/<IUT role>/GOEP/<GOEP TC Identification>`. The required GPP tests are referred to in this TCMT per the following convention `<spec abbreviation>/<IUT role>/GPP/<GPP TC Identification>`.

<table>
<thead>
<tr>
<th>Identifier Abbreviation</th>
<th>Spec Identifier &lt;spec abbreviation&gt;</th>
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<tr>
<td>CTN</td>
<td>Calendar, Tasks, and Notes Profile</td>
</tr>
<tr>
<td>Identifier Abbreviation</td>
<td>Role Identifier &lt;IUT role&gt;</td>
</tr>
<tr>
<td>CCE</td>
<td>CTN Client Equipment Role</td>
</tr>
<tr>
<td>CSE</td>
<td>CTN Server Equipment Role</td>
</tr>
<tr>
<td>Identifier Abbreviation</td>
<td>Feature Identifier &lt;feat&gt;</td>
</tr>
<tr>
<td>CAH</td>
<td>CTN Account Handling functions</td>
</tr>
<tr>
<td>CBR</td>
<td>CTN Browsing functions</td>
</tr>
<tr>
<td>CNO</td>
<td>CTN Notification functions</td>
</tr>
<tr>
<td>COH</td>
<td>CTN Object Handling functions</td>
</tr>
</tbody>
</table>

Table 4.1: CTN TC Feature Naming Convention

4.1.2 Conformance

When conformance is claimed, all capabilities indicated as mandatory for this Specification shall be supported in the specified manner (process-mandatory). This also applies for all optional and conditional capabilities for which support is indicated. All mandatory capabilities, and optional and conditional capabilities for which support is indicated, are subject to verification as part of the Bluetooth Qualification Program.

The Bluetooth Qualification Program may employ tests to verify implementation robustness. The level of implementation robustness that is verified varies from one Specification to another and may be revised for cause based on interoperability issues found in the market.
Such tests may verify:

- That claimed capabilities may be used in any order and any number of repetitions that is not excluded by the Specification, OR
- That capabilities enabled by the implementations are sustained over durations expected by the use case, OR
- That the implementation gracefully handles any quantity of data expected by the use case, OR
- That in cases where more than one valid interpretation of the Specification exists, the implementation complies with at least one interpretation and gracefully handles other interpretations OR
- That the implementation is immune to attempted security exploits.

A single execution of each of the required tests is required in order to constitute a Pass Verdict. However, it is noted that in order to provide a foundation for interoperability, it is necessary that a qualified implementation consistently and repeatedly pass any of the applicable tests.

In any case, where a member finds an issue with the Test Plan Generator, the Test Case as described in the Test Suite, or with the Test System utilized, the Member is required to notify the responsible party via an errata request such that the issue may be addressed.
4.2 Account Handling

The purpose of the tests described in this is to check that the CTN accounts can be handled properly.

4.2.1 IUT – CTN Client Equipment (CCE)

The purpose of the tests described in this is to check that the CTN Client Equipment (CCE) can properly handle CTN CAS accounts.

4.2.1.1 CTN/CCE/CAH/BV-01-I [Retrieve Information about a CAS Account]

• Test Purpose
  Verify that the CCE can retrieve descriptive information of a CAS-account from the CSE.

• Reference
  [3] 4.2
  [6] 4.3.1.1

• Initial Conditions
  - The Initial Conditions of GPP/GIH/BV-01-I apply ([6] 4.3.1.1).

• Test Procedure
  Perform the Test Procedure of GPP/GIH/BV-01-I ([6] 4.3.1.1).

• Expected Outcome
  Pass verdict
  The Pass verdicts of GPP/GIH/BV-01-I ([6] 4.3.1.1) apply.
  Additionally these pass criteria apply to this test case:
  The IUT receives the application parameters ‘EmailURI’ and ‘LastUpdate’ in the response from the Lower Tester.

4.2.2 IUT – CTN Server Equipment (CSE)

The purpose of the tests described in this is to check that the CTN Server Equipment (CSE) can properly provide CTN accounts.

4.2.2.1 CTN/CSE/CAH/BV-11-I [Return Information about a CAS Account]

• Test Purpose
  Verify that the CSE can deliver descriptive information of a CAS-account to the CCE.

• Reference
  [3] 4.2
  [6] 4.3.2.1

• Initial Condition
  - The Initial Conditions of GPP/GIH/BV-11-I apply ([6] 4.3.2.1).

• Test Procedure
  Perform the Test Procedure of GPP/GIH/BV-11-I ([6] 4.3.2.1)
• Expected Outcome

Pass verdict

The Pass verdicts of GPP/GIH/BV-11-I ([6] 4.3.2.1) apply.

Additionally these pass criteria apply to this test case:

The IUT sends the application parameters ‘EmailURI’ and ‘LastUpdate’ in the response.

4.3 CTN Browsing Feature

The purpose of the tests described in this is to verify that the Browsing in the CSE’s repository is properly implemented.

4.3.1 IUT – CTN Client Equipment (CCE)

The purpose of the tests described in this is to verify that the functions specific to the Browsing in the object repository are properly implemented by the CCE.

4.3.1.1 CTN/CCE/CBR/BV-01-I [Retrieve an Object Listing]

• Test Purpose

Verify that the CCE can retrieve object listings from the CSE for each object type supported by the CCE.

• Reference

[3] 4.4
[6] 4.5.1.2

• Initial Condition

- The Initial Conditions of GPP/GBR/BV-02-I apply ([6] 4.5.1.2)
- The IUT (CCE) and the Lower Tester (CSE) have established an active CAS connection.
- The ‘GetCTNListing’ function is used.

• Test Procedure

- Perform the Test Procedure of GPP/GBR/BV-02-I ([6] 4.5.1.2)

Depending on the object types supported by the CCE, the following folders shall be selected for the listings:

- 1. ‘..\telecom\CTN\calendar’ for event objects
- 2. ‘..\telecom\CTN\tasks’ for task or to-do objects
- 3. ‘..\telecom\CTN\notes’ for note objects

The test shall be performed for all object types supported by the IUT (CCE).

• Expected Outcome

Pass verdict

The Pass verdicts of GPP/GBR/BV-02-I ([6] 4.5.1.2) apply.
4.3.2 IUT – CTN Server Equipment (CSE)

The purpose of the tests described in this is to verify that the functions specific to the Browsing in the object repository are properly implemented by the CSE.

4.3.2.1 CTN/CSE/CBR/BV-11-I [Return an Object Listing]

- Test Purpose
  Verify that the CSE can deliver object listings to the CCE for each object type supported by the CSE.

- Reference
  [3] 4.4  
  [6] 4.5.2.3

- Initial Condition
  - The Initial Conditions of GPP/GBR/BV-12-I apply ([6] 4.5.2.3).
  - The IUT (CSE) and the Lower Tester (CCE) have established an active CAS connection.
  - The ‘GetCTNListing’ function is used.

- Test Procedure
  - Perform the Test Procedure of GPP/GBR/BV-12-I ([6] 4.5.2.3)

Depending on the object types supported by the CSE, the following folders shall be selected for the listings:
- 1. ‘..\telecom\CTN\calendar’ for event objects
- 2. ‘..\telecom\CTN\tasks’ for task or to-do objects
- 3. ‘..\telecom\CTN\notes’ for note objects

The test shall be performed for all object types supported by the IUT (CSE).

- Expected Outcome
  Pass verdict

The Pass verdicts of GPP/GBR/BV-12-I ([6] 4.5.2.3) apply.

4.3.2.2 CTN/CSE/CBR/BI-12-I [Reject an Object Listing Request for an Invalid Folder]

- Test Purpose
  Verify that the CSE can reject a CCE request for an object listing of a non-existing folder.

- Reference
  [3] 4.4

- Initial Condition
  - The IUT and the Lower Tester have established a CTN session. In that session, the CTN Access Service is active.
• **Test Procedure**

The Lower Tester requests an object-listing by a ‘GetCTNListing’ function request with an invalid folder included in the ‘Name’ header of the request, i.e. something different from

- 
- \telecom\CTN\calendar
- \telecom\CTN\tasks
- \telecom\CTN\notes

The IUT responds with an error code.

• **Expected Outcome**

**Pass verdict:**

- The IUT response of ‘GetCTNListing’ function is well formatted according to [3] AND
- The IUT responds with a suitable error code (For details see 7.2.7 OBEX Error Codes in [6])

## 4.4 CTN Object Handling Feature

The purpose of the tests described in this is to verify that handling of the CTN bCalendar objects is properly implemented.

### 4.4.1 IUT – CTN Client Equipment (CCE)

The purpose of the tests described in this is to verify that the functions specific to the handling of the CTN bCalendar objects in the CSE’s repository are properly implemented by the CCE.

#### 4.4.1.1 CTN/CCE/COH/BV-01-I [Retrieve a bCalendar Object from the CSE]

• **Test Purpose**

Verify that the CCE can retrieve bCalendar objects from the CSE for each object type supported by the CSE.

• **Reference**

[3] 4.5

[6] 4.6.1.1

• **Initial Condition**

- The Initial Conditions of GPP/GOH/BV-01-I apply ([6] 4.6.1.1).
- The IUT (CCE) and the Lower Tester (CSE) have established an active CAS connection.
- The ‘GetCTNObject’ function is used.

• **Test Procedure**

- Perform the Test Procedure of GPP/GOH/BV-01-I ([6] 4.6.1.1)
- Depending on the object types supported by the CCE and CSE, the following folders shall be selected for the object download:
  - 1. ‘\telecom\CTN\calendar’ for event objects
  - 2. ‘\telecom\CTN\tasks’ for task or to-do objects
3. '\telecom\CTN\calendar' for event objects
- The test shall be performed for all object types supported by the IUT (CCE).

- Expected Outcome
  Pass verdict

  The Pass verdicts of GPP/GOH/BV-01-I ([6] 4.6.1.1) apply.

4.4.1.2 CTN/CCE/COH/BV-02-I [Upload a bCalendar Object to the CSE]

- Test Purpose
  Verify that the CCE can upload bCalendar objects on the CSE repository for each object type supported by CCE.

- Reference
  [3] 4.6
  [6] 4.6.1.2

- Initial Condition
  - The Initial Conditions of GPP/GOH/BV-02-I apply ([6] 4.6.1.2).
  - The IUT (CCE) and the Lower Tester (CSE) have established an active CAS connection.

- Test Procedure
  - Perform the Test Procedure of GPP/GOH/BV-02-I ([6] 4.6.1.2)
  - Depending on the object types supported by the CCE, the following folders shall be selected for the object upload:
    1. '\telecom\CTN\calendar' for event objects
    2. '\telecom\CTN\tasks' for task or to-do objects
    3. '\telecom\CTN\notes' for note objects
  - The test shall be performed for all object types supported by the IUT (CCE).

- Expected Outcome
  Pass verdict

  The Pass verdicts of GPP/GOH/BV-02-I ([6] 4.6.1.2) apply.

4.4.1.3 CTN/CCE/COH/BV-03-I [Delete a bCalendar Object on the CSE]

- Test Purpose
  Verify that the CCE can delete bCalendar objects on the CSE repository for each object type supported by CCE.

- Reference
  [3] 4.8
• Initial Condition
  - The IUT (CCE) and the Lower Tester (CSE) have established an active CAS connection.
  - The ‘SetCTNStatus’ function is used.

Depending on the object types supported by the CCE, the following folders shall be selected for the object deletion:

- ..\telecom\CTN\calendar for event objects
- ..\telecom\CTN\tasks for task or to-do objects
- ..\telecom\CTN\notes for note objects

The test shall be performed for all object types supported by the IUT (CCE) and CSE.

• Test Procedure

  The IUT requests the Lower Tester to delete one literal object X from its folder by using the function ‘SetCTNStatus’ with the StatusIndicator ‘deletedStatus’ set to the StatusValue ‘yes’ which means delete.

  Pass verdict

  - The request of the ‘SetCTNStatus’ function is well formatted according to [3].
  - The literal CTN object X has been deleted from the Lower Tester’s folder.

4.4.1.4 CTN/CCE/COH/BV-04-I [Forward a bCalendar Object on the CSE]

• Test Purpose

  Verify that the CCE can initiate action to forward of bCalendar objects on the CSE repository for each object type supported by CCE.

• Reference

  [3] 4.7

• Initial Condition

  - The IUT and the Lower Tester have established a CTN session. In that session, the CTN Access Service is active.
  - The repository of the Lower Tester (CSE) contains at least one bCalendar object for each object type supported by the IUT (CCE). The Lower Tester has retrieved the handles of these objects.

• Test Procedure

  - The IUT requests a forward of a bCalendar object by using the ‘ForwardCTNObject’ function with a valid email URI included in the ‘Description’ header of the request.
  - The Lower Tester forwards the bCalendar object to the related address
  - The test shall be performed for all object types supported by the IUT (CCE)
• Expected Outcome

Pass verdict:

- The IUT request of the ‘CTNForward’ function is well formatted according to [3] AND
- The bCalendar object has been sent to the recipient related to the email URI.

4.4.1.5 CTN/CCE/COH/BV-05-I [Update Status of a bCalendar Object on the CSE]

• Test Purpose
Verify that the CCE can change the status of bCalendar objects on the CSE repository.

• Reference
[3] 4.5

• Initial Condition
- The IUT and the Lower Tester have established a CTN session. In that session, the CTN Access Service is active.
- The repository of the Lower Tester (CSE) contains at least one bCalendar object in the ..\telecom\CTN\calendar folder (event type) with a confirm-status of the participant related to the CSE that is other than ‘accepted’ and with non-activated alarm.
- The IUT has retrieved the handle of this object.

• Test Procedure
- The IUT requests for the of the bCalendar object on the CSE a confirm-status change of the participant related to the CSE to ‘accepted’ by using the ‘SetCTNStatus’ function.
- The Lower Tester changes the confirm-status and sends a ‘success’ response.
- The IUT requests for the of the bCalendar object an alarm-status change with value ‘yes’ (=activate-alarm) by using the ‘SetCTNStatus’ function.
- The Lower Tester changes the confirm-status and sends a ‘success’ response.

• Expected Outcome

Pass verdict:

- The IUT requests of the ‘SetCTNStatus’ function are well formatted according to [3] AND
- The confirm-status of the bCalendar object has changed to ‘accepted’ AND
- The alarm-status of the bCalendar object has changed to ‘yes’ (=activated)

4.4.1.6 CTN/CCE/COH/BV-06-I [Receive Listing Filtered by datetime]

• Test Purpose
Verify that the CCE can receive a listing filtered by datetime.

• Reference
[3] 5.3
• Initial Condition
  - The IUT and the Lower Tester have established a CTN session. In that session, the CTN Access Service is active.
  - The current folder of the Lower Tester contains at least one object that has a datetime before X.
  - The current folder of the Lower Tester contains at least one object that has a datetime later than Y.
  - The current folder of the Lower Tester contains at least one object that has a date between X and Y.

• Test Procedure
  1. The IUT (CCE) requests a listing using the function ‘GetCTNListing’ with the ApplicationParameter FilterPeriodBegin set to datetime X and FilterPeriodEnd set to datetime Y.
  2. The IUT (CCE) requests a listing using the function ‘GetCTNListing’ with the ApplicationParameter FilterPeriodBegin set to a datetime before X and FilterPeriodEnd set to datetime X.
  3. The IUT (CCE) requests a listing using the function ‘GetCTNListing’ with the ApplicationParameter FilterPeriodBegin set to datetime Y and FilterPeriodEnd set to after datetime Y.
  4. The IUT (CCE) requests a listing using the function ‘GetCTNListing’ with the ApplicationParameter FilterPeriodBegin set to a datetime before X and FilterPeriodEnd set to after datetime Y.

• Expected Outcome
  Pass verdict:
  - The IUT’s request of the ‘GetCTNListing’ function is well formatted according to [3].
  - The listing in the response of test procedure step 1 only contains entries with a datetime between X and Y.
  - The listing in the response of test procedure step 2 only contains entries with a datetime between “before X” and X.
  - The listing in the response of test procedure step 3 only contains entries with a datetime between Y and “after datetime Y”.
  - The listing in the response of test procedure step 4 only contains entries with a datetime between “before X” and “after datetime Y”.

4.4.2 IUT – CTN Server Equipment (CSE)

The purpose of the tests described in this is to verify that the functions specific to the handling of the bCalendar objects in the CSE’s repository are properly implemented by the CSE.

4.4.2.1 CTN/CSE/COH/BV-11-I [Return a bCalendar Object]

• Test Purpose
  Verify that the CSE can deliver bCalendar objects to the CCE for each object type supported by the CSE.
• Reference
  [3] 4.5
  [6] 4.6.2.1

• Initial Condition
  - The Initial Conditions of GPP/GOH/BV-11-I apply ([6] 4.6.2.1).
  - The IUT (CSE) and the Lower Tester (CCE) have established an active CAS connection.
  - The ‘GetCTNObject’ function is used.

• Test Procedure
  - Perform the Test Procedure of GPP/GOH/BV-11-I ([6] 4.6.2.1)
  - Depending on the object types supported by the CSE, the following folders shall be selected for the object download:
    - 1. ‘..\telecom\CTN\calendar’ for event objects
    - 2. ‘..\telecom\CTN\tasks’ for task or to-do objects
    - 3. ‘..\telecom\CTN\notes’ for note objects
  - The test shall be performed for all object types supported by the IUT (CSE).

• Expected Outcome
  Pass verdict

  The Pass verdicts of GPP/GOH/BV-11-I ([6] 4.6.2.1) apply.

4.4.2.2 CTN/CSE/COH/BI-16-I [Reject an Invalid Request for a bCalendar Object]

• Test Purpose
  Verify that the CSE can reject a request for a non-existing bCalendar object.

• Reference
  [3] 4.5
  [6] 4.6.2.2

• Initial Condition
  - The Initial Conditions of GPP/GOH/BI-11-I apply ([6] 4.6.2.2).
  - The IUT (CSE) and the Lower Tester (CCE) have established an active CAS connection.
  - The ‘GetCTNObject’ function is used for the request.

• Test Procedure
  - Perform the Test Procedure of GPP/GOH/BI-11-I ([6] 4.6.2.2) when applied to the retrieval of bCalendar objects.
• Expected Outcome

Pass verdict

The Pass verdicts of GPP/GOH/BV-11-I ([6] 4.6.2.2) apply.

4.4.2.3 CTN/CSE/COH/BV-12-I [Receive a bCalendar Object from the CCE]

• Test Purpose
Verify that the CSE can receive bCalendar objects from the CCE for each object type supported by CSE and CCE.

• Reference
[3] 4.6
[6] 4.6.2.3

• Initial Condition
- The Initial Conditions of GPP/GOH/BV-12-I apply ([6] 4.6.2.3).
- The IUT (CCE) and the Lower Tester (CSE) have established an active CAS connection.
- The ‘PushCTNObject’ function is used.

• Test Procedure
Perform the Test Procedure of GPP/GOH/BV-12-I ([6] 4.6.2.3)
- Depending on the object types supported by the CSE, the following folders shall be selected for the object download:
  - 1. ‘..\telecom\CTN\calendar’ for event objects
  - 2. ‘..\telecom\CTN\tasks’ for task or to-do objects
  - 3. ‘..\telecom\CTN\notes’ for note objects
- The test shall be performed for all bCalendar object types supported by the IUT (CSE) and CCE.

• Expected Outcome

Pass verdict

The Pass verdicts of GPP/GOH/BV-12-I ([6] 4.6.2.3) apply.

4.4.2.4 CTN/CSE/COH/BV-13-I [Delete a bCalendar Object]

• Test Purpose
Verify that the CSE can delete bCalendar objects on request of the CCE for each object type supported by the CSE.

• Reference
[3] 4.8

• Initial Condition
- The IUT (CSE) and the Lower Tester (CCE) have established an active CAS connection.
The ‘SetCTNStatus’ function is used.

**Test Procedure**

The Lower Tester requests the IUT to delete one literal object from its folder by using the function ‘SetCTNStatus’ with the StatusIndicator ‘deletedStatus’ set to the StatusValue ‘yes’ which means delete.

Dependent on the object types supported by the CSE the following folders shall be selected for the object deletion:

- ..\telecom\CTN\calendar for event objects
- ..\telecom\CTN\tasks for task or to-do objects
- ..\telecom\CTN\notes for note objects

The test shall be performed for all object types supported by the IUT (CSE).

**Expected Outcome**

**Pass** verdict

- The response of the ‘SetCTNStatus’ function is well formatted according to [3].
- The literal CTN object has been deleted from the IUT’s folder.

### 4.4.2.5 CTN/CSE/COH/BV-14-I [Forward a bCalendar Object]

**Test Purpose**

Verify that the CSE can forward a bCalendar object on request of the CCE for each object type supported by CSE.

**Reference**

[3] 4.7

**Initial Condition**

- The IUT and the Lower Tester have established a CTN session. In that session, the CTN Access Service is active.
- The repository of the IUT (CSE) contains at least one bCalendar object for each object type supported by the IUT. The Lower Tester has retrieved the handles of these objects.

**Test Procedure**

- The Lower Tester requests a forward of a bCalendar object by using the ForwardCTNObject function with a valid email URI included in the ‘Description’ header of the request.
- The IUT forwards the bCalendar object to the related address

The test shall be performed for all object types supported by the IUT (CSE).

**Expected Outcome**

**Pass** verdict:

- The IUT response of the ‘CTNForward’ function is well formatted according to [3] AND
The bCalendar object has been sent by the IUT device to the recipient related to the email URI.

4.4.2.6 CTN/CSE/COH/BV-15-I [Update Status of a bCalendar Object]

- Test Purpose
  Verify that the CSE can change the status of bCalendar objects on request of the CCE.

- Reference
  [3] 4.5

- Initial Condition
  - The IUT and the Lower Tester have established a CTN session. In that session, the CTN Access Service is active.
  - The repository of the IUT (CSE) contains at least one bCalendar object in the "\telecom\CTN\calendar folder (event type) with a confirm-status of the participant related to the CSE that is other than ‘accepted’ and with non-activated alarm.
  - The Lower Tester has retrieved the handle of this object.

- Test Procedure
  - The Lower Tester (CCE) requests for the of the bCalendar object on the IUT (CSE) a confirm-status change of the participant related to the CSE to ‘accepted’ by using the SetCTNStatus function.
  - The IUT changes the confirm-status and sends a ‘success’ response.
  - The Lower Tester requests for the of the bCalendar object an alarm-status change with value ‘yes’ (=activate-alarm) by using the ‘SetCTNStatus’ function.
  - The IUT changes the confirm-status and sends a ‘success’ response.

- Expected Outcome
  Pass verdict:
  - The IUT responses of the ‘SetCTNStatus’ function are well formatted according to [3] AND
  - The confirm-status of the bCalendar object has changed to ‘accepted’ AND
  - The alarm-status of the bCalendar object has changed to ‘yes’ (=activated)

4.4.2.7 CTN/CSE/COH/BV-16-I [Filtering by datetime]

- Test Purpose
  Verify that the CSE can properly respond to a listing request with filtering by datetime.

- Reference
  [3] 5.3

- Initial Condition
  - The IUT and the Lower Tester have established a CTN session. In that session, the CTN Access Service is active.
  - The current folder contains at least one object that has a datetime before X.
- The current folder contains at least one object that has a datetime later than Y.
- The current folder contains at least one object that has a datetime between X and Y.

• **Test Procedure**

  1. The Lower Tester (CCE) requests a listing using the function ‘GetCTNListing’ with the ApplicationParameter FilterPeriodBegin set to datetime X and FilterPeriodEnd set to datetime Y.

  2. The Lower Tester (CCE) requests a listing using the function ‘GetCTNListing’ with the ApplicationParameter FilterPeriodBegin set to a datetime before X and FilterPeriodEnd set to datetime X.

  3. The Lower Tester (CCE) requests a listing using the function ‘GetCTNListing’ with the ApplicationParameter FilterPeriodBegin set to datetime Y and FilterPeriodEnd set to after datetime Y.

  4. The Lower Tester (CCE) requests a listing using the function ‘GetCTNListing’ with the ApplicationParameter FilterPeriodBegin set to a datetime before X and FilterPeriodEnd set to after datetime Y.

• **Expected Outcome**

  **Pass verdict**

  - The IUT response of the “GetCTNListing” function is well formatted according to [3].

  - The listing in the response of test procedure step 1 only contains entries with a datetime between X and Y.

  - The listing in the response of test procedure step 2 only contains entries with a datetime between “before X” and X.

  - The listing in the response of test procedure step 3 only contains entries with a datetime between Y and “after datetime Y”.

  - The listing in the response of test procedure step 4 only contains entries with a datetime between “before X” and “after datetime Y”.

4.5 **CTN Notification Feature**

The purpose of the tests described in this is to verify the normal behavior of the components necessary to realize the CTN Notification.

4.5.1 **IUT – CTN Client Equipment (CCE)**

The purpose of the tests described in this is to verify that the CTN Client Equipment device can properly take advantage of the CTN Notification.

4.5.1.1 **CTN/CCE/CNO/BV-01-I [Receive a Notification Event]**

• **Test Purpose**

  Verify that the CCE can receive notification events from the CSE.

• **Reference**

  [3] 4.3
  [6] 4.7.1.1
• Initial Condition
  - The Initial Conditions of GPP/GNO/BV-01-I apply (6 4.7.1.1).
  - The IUT (CCE) and the Lower Tester (CSE) have established an active CNS connection and an active CAS connection.
  - The ‘SendCTNEvent’ function is used.

• Test Procedure
  - Perform the Test Procedure of GPP/GNO/BV-01-I (6 4.7.1.1)
  - The test shall be performed for several types of events, i.e. the following operations shall be performed by the Lower Tester with reporting of the related events:
    1. Create a new bCalendar object on the Lower Tester
      - → Lower Tester sends a ‘NewObject’ event
    2. Change the content of a bCalendar object on the Lower Tester
      - → Lower Tester sends an ‘ObjectUpdate’ event
    3. Delete a bCalendar object on the Lower Tester
      - → Lower Tester sends an ‘ObjectDeleted’ event
    4. An alarm has been triggered for an event on the Lower Tester
      - → Lower Tester sends an ‘Alarm’ event.

• Expected Outcome
  Pass verdict
  The Pass verdicts of GPP/GNO/BV-01-I (6 4.7.1.1) apply.

4.5.2  IUT – CTN Server Equipment (CSE)
The purpose of the tests described in this is to verify that the CTN Server Equipment device has properly implemented the CTN Notification.

4.5.2.1 CTN/CSE/CNO/BV-11-I [Send a Notification Event]
• Test Purpose
  Verify that the CSE can send notification events to the CCE.

• Reference
  [3] 4.3
  [6] 4.7.2.1

• Initial Condition
  - The Initial Conditions of GPP/GNO/BV-11-I apply (6 4.7.2.1).
  - The IUT (CSE) and the Lower Tester (CCE) have established an active CNS connection and an active CAS connection.
  - The ‘SendCTNEvent’ function is used.
• Test Procedure
  - Perform the Test Procedure of GPP/GNO/BV-11-I ([6] 4.7.2.1)
  - The test shall be performed for several types of events, i.e. the following operations shall be performed by the IUT with reporting of the related events:
    1. Create a new bCalendar object on the IUT
      - → IUT sends a ‘NewObject’ event
    2. Change the content of a bCalendar object on the IUT
      - → IUT sends an ‘ObjectUpdate’ event
    3. Delete a bCalendar object on the IUT
      - → IUT sends an ‘ObjectDeleted’ event
    4. An alarm has been triggered for an event on the IUT
      - →IUT sends an ‘Alarm’ event

• Expected Outcome
  Pass verdict

  The Pass verdicts of GPP/GNO/BV-11-I ([6] 4.7.2.1) apply.
### 5 Test Case Mapping

The Test Case Mapping Table (TCMT) maps test cases to specific capabilities in the ICS. Profiles, protocols and services may define multiple roles, and it is possible that a product may implement more than one role. The product shall be tested in all roles for which support is declared in the ICS document.

The columns for the TCMT are defined as follows:

- **Item**: contains an y/x reference, where y corresponds to the table number and x corresponds to the feature number as defined in the ICS Proforma for the CTN profile [4]. If the item is defined with Protocol, Profile or Service abbreviation before y/x, the table and feature number referenced are defined in the abbreviated ICS proforma document.

- **Feature/Function**: recommended to be the primary feature defined in the ICS being tested or may be the test case name.

- **Test Case(s)**: the applicable test case identifiers required for Bluetooth Qualification if the corresponding y/x references defined in the Item column are supported.

For purpose and structure of the ICS/IXIT proforma and instructions for completing the ICS/IXIT proforma refer to the Bluetooth ICS and IXIT proforma document.

<table>
<thead>
<tr>
<th>Item</th>
<th>Feature/Function</th>
<th>Test Case(s)</th>
</tr>
</thead>
</table>
| CTN 2/1a | Session Management: CAS, single account (CCE) | CTN/CCE/GPP/GSM/BV-01-I  
CTN/CCE/GPP/GSM/BV-03-I |
| CTN 2/1a AND CTN 2/2 | Session Management: single CAS and CNS (CCE) | CTN/CCE/GPP/GSM/BV-02-I  
CTN/CCE/GPP/GSM/BV-04-I |
| CTN 2/1b AND CTN 2/2 | Session Management: multiple CAS and CNS (CCE) | CTN/CCE/GPP/GSM/BV-05-I  
CTN/CCE/GPP/GSM/BV-06-I  
CTN/CCE/GPP/GSM/BV-07-I |
| CTN 4/1a | Session Management: CAS, single account (CSE) | CTN/CSE/GPP/GSM/BV-11-I  
CTN/CSE/GPP/GSM/BV-13-I |
| CTN 4/1a AND CTN 4/2 | Session Management: single CAS and CNS (CSE) | CTN/CSE/GPP/GSM/BV-12-I  
CTN/CSE/GPP/GSM/BV-14-I |
| CTN 4/1b AND CTN 4/2 | Session Management: multiple CAS and CNS (CSE) | CTN/CSE/GPP/GSM/BV-15-I  
CTN/CSE/GPP/GSM/BV-16-I  
CTN/CSE/GPP/GSM/BV-17-I |
| CTN 3/1a | Account Management: Get Account Information (CCE) | CTN/CCE/CAH/BV-01-I |
| CTN 3/1c | Account Management: Sync Account (CCE) | CTN/CCE/GPP/GAH/BV-01-I |
| CTN 5/1a | Account Management: Get Account Information (CSE) | CTN/CSE/CAH/BV-11-I  
CTN/CSE/GPP/GIH/BI-11-I |
<table>
<thead>
<tr>
<th>Item</th>
<th>Feature/ Function</th>
<th>Test Case(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTN 5/1c</td>
<td>Account Management: Sync Account (CSE)</td>
<td>CTN/CSE/GPP/GIH/BV-12-I</td>
</tr>
<tr>
<td>CTN 3/2a</td>
<td>Notification: Send Notification (CCE)</td>
<td>CTN/CCE/CNO/BV-01-I</td>
</tr>
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<td>CTN 5/2a</td>
<td>Notification: Send Notification (CSE)</td>
<td>CTN/CCE/CNO/BV-11-I</td>
</tr>
<tr>
<td>CTN 3/3a</td>
<td>Browsing: CTN Listing (CCE)</td>
<td>CTN/CCE/CBR/BV-01-I</td>
</tr>
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<td></td>
<td>CTN/CCE/CBR/BV-06-I</td>
</tr>
<tr>
<td>CTN 5/3a</td>
<td>Browsing: CTN Listing (CSE)</td>
<td>CTN/CSE/CBR/BV-11-I</td>
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<td>CTN/CSE/COH/BV-16-I</td>
</tr>
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<td>CTN 3/4a</td>
<td>Downloading: Get CTN Object (CCE)</td>
<td>CTN/CCE/COH/BV-01-I</td>
</tr>
<tr>
<td>CTN 3/4b</td>
<td>Downloading: Set CTN Status (CCE)</td>
<td>CTN/CCE/COH/BV-05-I</td>
</tr>
<tr>
<td>CTN 5/4a</td>
<td>Downloading: Get CTN Object (CSE)</td>
<td>CTN/CSE/COH/BV-11-I</td>
</tr>
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<td></td>
<td>CTN/CSE/COH/BI-16-I</td>
</tr>
<tr>
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<td>Downloading: Set CTN Status (CSE)</td>
<td>CTN/CSE/COH/BV-15-I</td>
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<td>Uploading: Push CTN Object (CCE)</td>
<td>CTN/CCE/COH/BV-02-I</td>
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<td>CTN 5/5a</td>
<td>Uploading: Push CTN Object (CSE)</td>
<td>CTN/CSE/COH/BV-12-I</td>
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<tr>
<td>CTN 3/6a</td>
<td>Forward: Forward CTN Object (CCE)</td>
<td>CTN/CCE/COH/BV-04-I</td>
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<tr>
<td>CTN 5/6a</td>
<td>Forward: Forward CTN Object (CSE)</td>
<td>CTN/CSE/COH/BV-14-I</td>
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<td>CTN 3/8a</td>
<td>Delete: Delete CTN Object (CCE)</td>
<td>CTN/CCE/COH/BV-03-I</td>
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<tr>
<td>CTN 5/8a</td>
<td>Delete: Delete CTN Object (CSE)</td>
<td>CTN/CSE/COH/BV-13-I</td>
</tr>
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<td>CTN 1/2</td>
<td>GOEP 2.0 or later: GoepL2capPsm</td>
<td>CTN/CSE/GOEP/CON/BV-02-C</td>
</tr>
<tr>
<td>CTN 10/3</td>
<td>GOEP 2.0 or later: Client sends PUT request with SRM</td>
<td>CTN/CCE/GOEP/SRM/BV-03-C</td>
</tr>
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<td>CTN 16/3</td>
<td>GOEP 2.0 or later: Client sends PUT request with SRM</td>
<td>CTN/CSE/GOEP/SRM/BV-03-C</td>
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<td>CTN 4/2</td>
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<td>CTN/CSE/GOEP/SRM/BV-03-C</td>
</tr>
<tr>
<td>CTN 11/3</td>
<td>GOEP 2.0 or later: Server sends PUT response with SRM</td>
<td>CTN/CCE/GOEP/SRM/BV-04-C</td>
</tr>
<tr>
<td>CTN 2/2</td>
<td></td>
<td>CTN/CSE/GOEP/SRM/BV-04-C</td>
</tr>
<tr>
<td>CTN 15/3</td>
<td>GOEP 2.0 or later: Server sends PUT response with SRM</td>
<td>CTN/CSE/GOEP/SRM/BV-04-C</td>
</tr>
<tr>
<td>CTN 10/4</td>
<td>GOEP 2.0 or later: Client sends GET request with SRM</td>
<td>CTN/CCE/GOEP/SRM/BV-07-C</td>
</tr>
<tr>
<td>Item</td>
<td>Feature/ Function</td>
<td>Test Case(s)</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>CTN 15/4</td>
<td>GOEP 2.0 or later: Server sends GET response with SRM</td>
<td>CTN/CSE/GOEP/SRM/BV-08-C</td>
</tr>
<tr>
<td>CTN 10/3</td>
<td>GOEP 2.0 or later: Client keeps issuing PUT on wait</td>
<td>CTN/CCE/GOEP/SRMP/BV-01-C</td>
</tr>
<tr>
<td>CTN 16/3 AND</td>
<td>GOEP 2.0 or later: Client keeps issuing PUT on wait</td>
<td>CTN/CSE/GOEP/SRMP/BV-01-C</td>
</tr>
<tr>
<td>CTN 4/2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTN 15/4</td>
<td>GOEP 2.0 or later: Server keeps waiting for GET on wait</td>
<td>CTN/CSE/GOEP/SRMP/BV-02-C</td>
</tr>
<tr>
<td>CTN 11/3 AND</td>
<td>GOEP 2.0 or later: Server does not issue PUT with invalid SRMP</td>
<td>CTN/CCE/GOEP/SRMP/BV-03-C</td>
</tr>
<tr>
<td>CTN 12/11 AND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTN 2/2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTN 15/3 AND</td>
<td>GOEP 2.0 or later: Server does not issue PUT with invalid SRMP</td>
<td>CTN/CSE/GOEP/SRMP/BV-03-C</td>
</tr>
<tr>
<td>CTN 17/11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTN 10/4 AND</td>
<td>GOEP 2.0 or later: Client does not issue GET with invalid SRMP</td>
<td>CTN/CCE/GOEP/SRMP/BV-04-C</td>
</tr>
<tr>
<td>CTN 12/11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTN 10/4 AND</td>
<td>GOEP 2.0 or later: Client can GET object with SRMP</td>
<td>CTN/CCE/GOEP/SRMP/BV-05-C</td>
</tr>
<tr>
<td>CTN 12/11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTN 10/4</td>
<td>GOEP 2.0 or later: Client keeps sending GET requests on wait</td>
<td>CTN/CCE/GOEP/SRMP/BV-06-C</td>
</tr>
<tr>
<td>CTN 10/4</td>
<td>GOEP 2.0 or later: Client ignores GET response with invalid SRMP</td>
<td>CTN/CCE/GOEP/SRMP/BI-01-C</td>
</tr>
<tr>
<td>CTN 15/4</td>
<td>GOEP 2.0 or later: Server ignores GET request with invalid SRMP</td>
<td>CTN/CSE/GOEP/SRMP/BI-02-C</td>
</tr>
<tr>
<td>CTN 1/2</td>
<td>GOEP 2.0 or later: Reject Action</td>
<td>CTN/CSE/GOEP/ROB/BV-01-C</td>
</tr>
<tr>
<td>CTN 1/2</td>
<td>GOEP 2.0 or later: Reject Reliable Sessions</td>
<td>CTN/CSE/GOEP/ROB/BV-02-C</td>
</tr>
</tbody>
</table>

**Table 5.1: Test Case Mapping**