Project: H2020-ICT-688712

Project Name:
5G Applications and Devices Benchmarking (TRIANGLE)

D2.2 Appendix 5
Test Specification

Applications Device Resources Usage (RES)

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1 Introduction

1.1 Purpose

The test cases defined in this Test Specification evaluate and verify the use of device resources by the AUT.

1.2 Scope of testing

This Test Specification is applicable to applications..

The test cases included in this test specification are designed to obtain Key Performance Indicators (KPIs) to determine Apps performance in the 'Applications Device Resources Usage' TRIANGLE domain.

The KPIs obtained are used by the Applications Device Resources Usage metric to obtain the App TRIANGLE mark.

The test cases in this Test Specification are initially defined to be implemented in TRIANGLE testbed.

1.3 Definitions and Acronyms

Table 1 – Definitions

State	Description
Application User Flow	The sequence of actions which the user's AUT is expected to perform on the AUT user interface objects in order to execute a test step of this test specification.
AUT Backend Service	Remote endpoint of the AUT service layer
Dummy Battery Fixture	Device designed to replace the usual Host Device battery to facilitate powering the Host device from an external DC source and simulating normal behaviour of the replaced battery
Host Device	Android or iOS device where the AUT is installed in order to test the AUT
Network Scenario	Usage scenario which is defined by a parameterization of the air interface and the core network
Test System	Integrated system used to measure the AUT's performance against this test specification.
TRIANGLE Testbed	TRIANGLE testing framework. It covers all the software, and the coordination/sequencing that control & connects to the test infrastructure. It is in charge of handling and transforming the end user test requests into actionable steps for the software and hardware components of the testbed.

Table 2 – Acronyms

State	Description
AR	Augmented Reality
AUT	Application Under Test
CPU	Central Processing Unit
CS	Content Distribution Streaming Services
CV	Connected Vehicles
DUT	Device Under Test
EM	Emergency Services
GA	Gaming
GPU	Graphics Processing Unit
HS	High Speed Internet
ICS	Implementation Conformance Statement
IXIT	Implementation eXtra Information for Testing
ksps	KiloSamples per second (thousands of samples per second)
LS	Live Streaming services
PM	Patient Monitoring
SG	Smart Grids
SM	Smart Metering
SN	Social Networking
VR	Virtual Reality

1.4 References

[1] D2.2 Formalization of the certification process, requirements and use. Appendix 2: Product characterization.

2 General Test conditions

Unless otherwise specified in a particular test case, the conditions defined in this section will apply for all test cases.

2.1 Test System configuration

The figure below shows a simplified overview of the testing architecture.

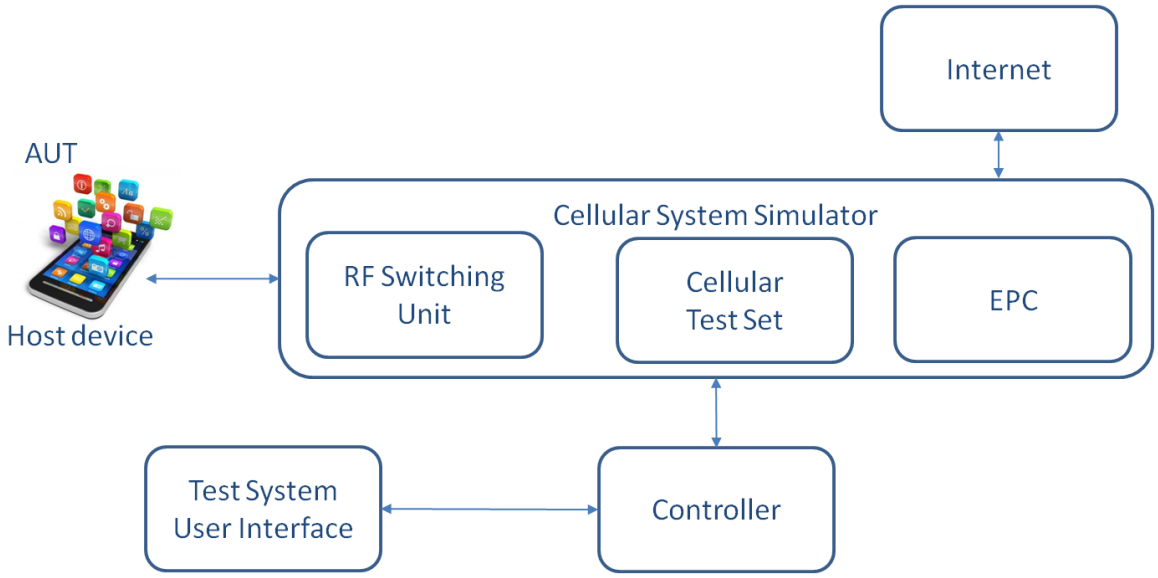

Figure 1 – Test System architecture overview

The App under test (AUT) is installed in the Host Device. The Host Device is connected to the Test System though a conducted RF connection.

The Host Device is grid powered if feasible. If the Host Device is battery powered, the battery of the Host Device is fully charged.

The Test System is configured to perform the test cases will be one of the bands supported by the Host Device. In case any of the bands listed next is supported by the device it will be selected and in the order defined: 1. FDD4; 2.FDD17; 3. FDD14; 4. FDD25; 5. FDD2; 6. FDD5; 7. FDD7; 8. FDD12; 9. FDD12; 10. FDD30.

The Test System network is initially configured as specified by the latest release of 3GPP TS 36.508.

2.2 Host Device configuration

The Host Device will be configured as defined below:

- The Host Device is ON and there are no Apps running other than required system apps.
- No antivirus and/or anti-malware App is running.
- Maximum brightness available.

- Maximum screen resolution available.
- No Energy saving or screen saving option is enabled.
- Vibration is enabled if available.
- The Host Device is allowed to use mobile data.
- There is no restriction configuration for data use.
- The Host Device Audio Volume is configured at the middle of the available range.
- The Host Device has been ON for at least three minutes to allow all boot processes to be completed.
- The Host Device screen is configured with screen always ON.

2.3 Network Scenarios

The test cases will be executed for each of the Network Scenarios applicable for each Use Case as shown in Table 3.

Table 3 – Use Case / Network Scenarios Applicability

Network Scenario	**Use Cases**								
	CS	**LS**	**SN**	**HS**	**VR**	**AR**	**PM**	**ES**	**GA**
Urban-Office	Y		Y	Y	Y	Y		Y	Y
Urban-Pedestrian	Y	Y	Y	Y		Y			Y
Urban-Driving-Normal	Y	Y	Y	Y		Y	Y		Y
Urban-Driving-Traffic jam	Y		Y	Y		Y	Y		Y
Urban-Driving-Emergency driving		Y	Y	Y		Y	Y	Y	
Urban-Internet Café, Busy Hours	Y		Y	Y	Y	Y			Y
Urban-Internet Cafe, Off-Peak	Y		Y	Y	Y	Y			Y
Suburban-Festival	Y	Y	Y	Y		Y		Y	Y
Suburban-Stadium	Y	Y	Y	Y		Y		Y	Y
Suburban-Shopping Mall, Busy Hours	Y		Y	Y		Y		Y	Y
Suburban-Shopping Mall, Off-Peak	Y		Y	Y		Y		Y	Y
High Speed-Relay	Y		Y	Y					Y
High Speed-Direct Passenger Connection	Y		Y	Y					Y

2.4 Number of Test Iterations

In order to obtain statistically relevant measurements out of which the KPIs will be derived, the test cases will be iterated 100 times, except for the following tests that will be iterated as shown in Table 4.

Table 4 – Test case Iterations

Test Case	# of Iterations
Tbd	tbd

2.5 Test Case Initial Conditions (Preamble)

Following initial conditions modes are defined:

REF APP-NOT RUNNING

- The Reference App is not installed on the DUT.
- The DUT is configured as specified in section **¡Error! No se encuentra el origen de la referencia.**.
- The Test System and the DUT are connected as shown in figure 1.
- The Reference App Backend Service is accessible from the Test System.
- Test Environment Lightning: Office conditions with no direct sun light on the Host Device.
- The Test System is configured according to the target Network Scenario as defined in D2.2 Appendix 8 (Network scenarios parameterization).
- The Test System has established a data path with the Host Device.

REF APP-STARTED

- The Reference App is installed on the DUT.
- The DUT is configured as specified in section **¡Error! No se encuentra el origen de la referencia.**.
- The Test System and the DUT are connected as shown in figure 1.
- The Reference App Backend Service is accessible from the Test System.
- Test Environment Lightning: Office conditions with no direct sun light on the Host Device.
- The Test System is configured according to the target Network Scenario as defined in D2.2 Appendix 8 (Network scenarios parameterization).
- The Test System has established a data path with the Host Device.
- The Test System has cleared the AUT stored data and cache.
- The Test System has opened the AUT.

2.6 Test Case Final Condition (Postamble)

Unless stated otherwise in the test case description, the following steps will be executed after the test case steps:

The System closes the Reference App.

The Test System shuts down the data path with the DUT.

2.7 Application User Flows

Following Application User Flows are used by the test cases of this test specification.

The table below contains a list of the common Application User Flows to be used in the Test Specifications. Additional Application User Flows may be defined in each Test Specification.

Table 5 – Applications User Flow

Identifier	Use Case	Application User Flow
1.1	All	Reopen the App 1. Open the App. 2. Perform login step and wait for 5 seconds. 3. Close App and wait for 5 seconds 4. Open the App (no login required).
1.2	All	Navigate menu 1. Open the App. 2. Perform login step and wait for 5 seconds. 3. Enter all available menu options and views. 4. Close the App.
1.3	All	Login 1. Perform login step and wait for 5 seconds.
2.1	CS	Play three reference videos: 1. Perform login step and wait for 10 seconds. 2. Play sequentially the three reference videos: RV1, RV2 and RV3.
2.2	CS	Play and pause 1. Perform login step and wait for 10 seconds. 2. Start playing RV3 during 10 seconds. 3. Pause the reproduction. 4. Resume the reproduction after 2 minutes
2.3	CS	Rewind and Fast Forward 1. Perform login step and wait for 10 seconds. 2. Start playing RV3 for 10 seconds. 3. Perform fast forward during 2 minutes (select X8 speed if supported by the App (ICSA_CSFastForwardX8), else select the highest speed supported).

		4. Change to normal play and keep this mode for 10 seconds. 5. Perform rewind for 2 minutes (select X8 speed if supported by the App (ICSA_CSRewindX8), else select the highest rewind speed supported), 6. Stop the playback.
2.4	CS	Download a media file 1. Perform login step and wait for 10 seconds. 2. Download RV3. 3. Wait until the download is complete.
2.5	CS	Set background state. 1. Perform login step and wait for 10 seconds. 2. Set the App in background state. 3. Wait for 20 minutes 4. Set the App in active state
2.6	CS	Play and Stop 1. Perform login step and wait for 10 seconds. 2. Start playing RV3. 3. Stop the reproduction after 1 minute. 4. Resume the reproduction after 1 minutes
2.7	CS	Search and Seek 1. Perform login step and wait for 10 seconds. 2. Search reference file RV3. 3. Start playing RV3. 4. Seek the player at 15 minutes position.
2.8	CS	Skip forward and backward 1. Perform login step and wait for 10 seconds. 2. Start playing RV2. 3. After 1 minute, skip backward to the beginning of the media file. 4. After 20 seconds, skip forward to the next media file (RV3). 5. After 5 seconds, skip backward to the previous media file (RV2).
3.1	LS	Play an live video from a know user 1. Perform login step and wait for 10 seconds. 2. Select to play the live video set up in the test case initial conditions.
3.2	LS	Broadcast live video 1. Perform login step and wait for 10 seconds.

		2. Broadcast live video
4.1	SN	Post comments 1. Perform login step and wait for 10 seconds. 2. Post reference comment: RC1. 3. Post reference comment: RC2. 4. Post reference comment: RC3.
4.2	SN	Post pictures 1. Perform login step and wait for 10 seconds. 2. Post sequentially the pictures: RP1, RP2 and RP3 and without any delay between the pictures. 3. Wait until the last picture is completely uploaded.
4.3	SN	Post videos 1. Perform login step and wait for 10 seconds. 2. Post sequentially the pictures: RV1, RV2 and RV3 and without any delay between videos. 3. Wait until the last video is completely uploaded.
4.4	SN	Post live video 1. Perform login step and wait for 10 seconds. 2. Post sequentially the pictures: RV1, RV2 and RV3 and without any delay between videos. 3. Wait until the last video is completely uploaded.
4.5	SN	Post location 1. Perform login step and wait for 10 seconds. 2. Post sequentially the reference location: RL1.
4.6	SN	Post files 1. Perform login step and wait for 10 seconds. 2. Post sequentially the reference files: RF1, RF2 and RF3. 3. Wait until all the files are completely uploaded.
4.7	SN	Get comment 1. Perform login step and wait for 10 seconds. 2. Get the first available comment.
4.8	SN	Show picture 1. Perform login step and wait for 10 seconds. 2. Get the first available picture.
4.9	SN	Play video 1. Perform login step and wait for 10 seconds. 2. Get the first available video.

4.10	SN	Play live video 1. Perform login step and wait for 10 seconds. 2. Get reference live video
4.11	SN	Get location 1. Perform login step and wait for 10 seconds. 2. Post sequentially the reference location: RL1.
4.12	SN	Get file 1. Perform login step and wait for 10 seconds. 2. Get the first available file.
4.13	SN	Search objects 1. Perform login step and wait for 10 seconds. 2. Search the most relevant item for which the App has been mainly designed (e.g., contacts, flights, hotels, etc.).
5.1	HS	Download three files sequentially 1. Perform login step and wait for 10 seconds. 2. Download sequentially the reference files: RF1, RF2 and RF3 and without any delay between them. 3. Wait until the last file is completely downloaded.
5.2	HS	Upload three files sequentially 1. Perform login step and wait for 10 seconds. 2. Upload sequentially the reference files: RF1, RF2 and RF3 and without any delay between them. 3. Wait until the last file is completely uploaded.
5.3	HS	Download several files simultaneously 1. Perform login step and wait for 10 seconds. 2. Download simultaneously the reference files: RF1, RF2, RF3, RF4, RF5 and RF6. 3. Wait until the last file is completely downloaded.
5.4	HS	Upload several files sequentially 1. Perform login step and wait for 10 seconds. 2. Upload simultaneously the reference files: RF1, RF2, RF3, RF4, RF5 and RF6. 3. Wait until the last file is completely uploaded.
5.5	HS	Download a huge file 1. Perform login step and wait for 5 seconds. 2. Download the reference file RF7. 3. Wait until the file is completely downloaded.

5.6	HS	Upload a huge file 1. Perform login step and wait for 5 seconds. 2. Upload the reference file RF7. 3. Wait until the last file is completely uploaded.
5.7	HS	Pause and Resume Download 1. Perform login step and wait for 10 seconds. 2. Start downloading the reference file RF7. 3. After 30 seconds, pause the file transfer. 4. Wait for 15 seconds and resume the transfer
5.8	HS	Pause and Resume Upload 1. Perform login step and wait for 10 seconds. 2. Start uploading the reference file RF7. 3. After 30 seconds, pause the file transfer. 4. Wait for 15 seconds and resume the file upload.
6.1	VR	Load Virtual Experience 1. Perform login step and wait for 10 seconds. 2. Load reference virtual experience RVE1. 3. Load until the virtual experience is completely loaded
7.1	AR	Load Augmentation layer on physical marker 1. Perform login step and wait for 10 seconds. 2. Start an augmented reality session. 3. Aim at a physical marker.
7.2	AR	Load Augmentation layer at a location 1. Perform login step and wait for 10 seconds. 2. Start an augmented reality session. 3. Aim at a specific location.
8.x	PM	TBD
9.x	ES	TBD
10.1	GA	Start session game 1. Perform login step and wait for 10 seconds. 2. Set most common configuration (as required) 3. Start session game
10.2	GA	Short Session game 1. Perform login step and wait for 10 seconds. 2. Set game most common configuration.

		3. Start game. 4. Perform standard game session for 2 minutes
10.3	GA	Large Session game 1. Perform login step and wait for 10 seconds. 2. Set game most common configuration. 3. Start game. 4. Perform standard game session for 15 minutes
10.4	GA	Pause and resume game 1. Perform login step and wait for 5 seconds. 2. Set game most common configuration. 3. Start game session. 4. After 2 minutes set the session in pause mode. 5. After 30 seconds resume the game session.
10.5	GA	Start saved session game 1. Perform login step and wait for 5 seconds. 2. Set game most common configuration. 3. Start game session. 4. After 2 minutes save game session data. Note: Some Apps may need a longer time to allow saving game session. 5. Exit the game session. 6. After 10 seconds restart the saved game session. 7. After 20 seconds, exit the game session.
10.6	GA	Start two game sessions 1. Perform login step and wait for 10 seconds. 2. Set most common configuration (as required). 3. Start a new session game. 4. After 1 minute, exit the game session. 5. Exit the game session and wait for 15 seconds. 6. Start a new session game. 7. After 15 seconds, exit the game session.

2.8 Additional configuration requirements

2.8.1 Live Streaming transmission configuration

Some test cases need that a live streaming is generated during test case execution.

If possible, the Test System will avoid the need of using an external camera by replacing the default camera app with a video/image file streamer. This way, a more accurate control over the conditions of what is streamed will be obtained.

If the option of replacing the camera app is not available (e.g. due to limitation of the specific OS), the live streaming will be generated as defined in the figure below:

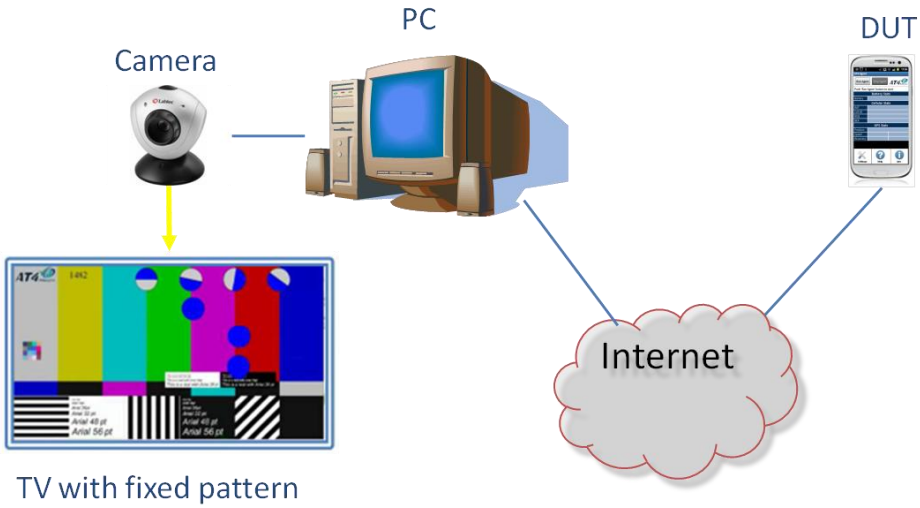

Figure 2 – Live streaming transmission configuration

Personal Computer (or equivalent hardware) connected to an Internet wide band connection.

Camera with video resolution no less than 1080p@30fps that can be connected to the PC.

Live Streaming Services Reference App to stream live videos with operative account valid for live streaming transmission.

The camera will be recording a fixed TV pattern (TBD) in a properly illuminated room.

2.8.2 Reference elements

The following reference elements are used in this Test Specification:

- RV1: Reference video 1 (Short duration video): TBD
- RV2: Reference video 2 (Medium duration video): TBD
- RV3: Reference video 3 (Long duration video (at least 30 minutes)): TBD
- RP1: Reference picture 1 (Small size picture): TBD
- RP2: Reference picture 2 (Medium size picture): TBD
- RP3: Reference picture 3 (Large size picture): TBD
- RC1: Reference comment 1: “The rain in Spain stays mainly in the plain.”
- RL1: Reference location 1: TBD
- RF1: Reference file 1 (Small size file): TBD
- RF2: Reference file 2 (Medium size file): TBD

- RF3: Reference file 3 (Large size file): TBD
- RF4: Reference file 4 (Large size file): TBD
- RF5: Reference file 5 (Large size file): TBD
- RF6: Reference file 6 (Large size file): TBD
- RVE1: Reference Virtual Experience 1: TBD
- RTVP1: Reference Fixed TV Pattern 1: TBD
- RTVP2: Reference TV Pattern 2 (High definition): TBD

3 Test cases

3.1 Common test cases

The tests cases in this section apply to all Use Cases.

3.1.1 Host Device use of resources

Identifier: RES*/CO/001*

Title: Host device use of resources

Objective: Verify the Host Device resources usage when app is not installed and there is no app installed (other than default apps installed in the host device).

Applicability:

(ICSG_ProductType = Application)

Initial Conditions:

AUT is in [AUT NOT RUNNING] mode.

Steps:

1. The Test System measures the Host Device use of resources during 20 minutes.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Average Memory usage:** Average amount of memory used during the measurement in MB.
- **Average CPU usage:** Average percentage of CPU used during the measurement.
- **Average GPU usage:** Average percentage of GPU used during the measurement.

3.1.2 Open the App

Identifier: RES*/CO/002*

Title: Open the App

Objective: Measure the energy that is consumed by the Host Device when the AUT is started, and logged in, and then closed and started again.

Applicability:

(ICSG_ProductType = Application) AND ICSA_Login

Initial Conditions:

AUT is in [AUT NOT RUNNING] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 1.1: Reopen the App.
2. The Test System measures the current consumption from initiating the App to closing it and reopening again.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- Current consumption: Record current samples during the measurement time and calculate the following values:
  - Average current consumption.
  - Standard deviation

3.1.3 Background state

Identifier: RES*/CO/003*

Title: Background state

Objective: Measure the usage of device resources of the AUT when it is in background state.

Applicability:

(ICSG_ProductType = Application)

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 1.3: Login.
2. The Test Systems sets the AUT in background state.
3. The Test System performs the measurements defined below with the AUT in background state.
4. The Test Systems sets the AUT back in active state.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Average Memory usage:** Average amount of memory used in background mode for 20 minutes.
- **Average CPU usage:** Average percentage of CPU used in background mode for 20 minutes.

3.2 CS Content Distribution Streaming Services

3.2.1 Non Interactive Playback

Identifier: RES*/CS/001*

Title: Non Interactive Playback

Objective: Measure the usage of device resources of the AUT when executing the feature media file playing.

Applicability:

(ICSG_ProductType = Mobile device) AND (ICSG_UseCases includes CS)

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 2.1: Play three reference media files.
2. The Test System measures the use of Host Device resources during the reproduction of the three reference videos.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Playback average Memory usage:** Average amount of memory used during the measurement in MB.
- **Playback average CPU usage:** Average percentage of CPU used during the measurement.
- **Playback average GPU usage:** Average percentage of GPU used during the measurement.

3.2.2 Interactive Play and Pause

Identifier: *RES/CS/002*

Title: Interactive Play and Pause

Objective: Measure the usage of device resources of the AUT when a media file is in pause mode.

Applicability:

(ICSG_ProductType = Mobile device) AND (ICSG_UseCases includes CS) AND ICSA_CSPause.

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 2.2: Play and pause.
2. The Test System measures the use of Host Device resources while the reproduction is in pause mode.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Pause average Memory usage:** Average amount of memory used during the measurement in MB.
- **Pause average CPU usage:** Average percentage of CPU used during the measurement.
- **Pause average GPU usage:** Average percentage of GPU used during the measurement.

3.2.3 Rewind and Fast Forward

Identifier: RES*/CS/003*

Title: Rewind and Fast Forward

Objective: Measure the usage of device resources of the AUT when performing rewind and fast forward operations while playing a media file.

Applicability:

(ICSG_ProductType = Mobile device) AND (ICSG_UseCases includes CS) AND ICSA_CSRewind AND ICSA_CSFastForward

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 2.3: Rewind and Fast Forward.
2. The Test System measures the use of Host Device resources while the AUT is in fast forward mode and while it is in rewind mode.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Fast forward average Memory usage:** Average amount of memory used in MB while the reproduction is in fast forward mode.
- **Fast forward average CPU usage:** Average percentage of CPU used while the reproduction is in fast forward mode.
- **Fast forward average GPU usage:** Average percentage of GPU used while the reproduction is in fast forward mode.
- **Rewind average Memory usage:** Average amount of memory used in MB while the reproduction is in rewind mode.
- **Rewind average CPU usage:** Average percentage of CPU used while the reproduction is in rewind mode.
- **Rewind average GPU usage:** Average percentage of GPU used while the reproduction is in rewind mode.

3.2.4 Download content for offline playing

Identifier: RES*/CS/004*

Title: Download content for offline playing

Applicability:

(ICSG_ProductType = Application) AND (ICSG_UseCases includes CS) AND ICSA_CSDownloadMedia

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 2.4: Download a media file.
2. The Test System measures the use of Host Device resources while media file is being downloaded.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Downloading content average Memory usage:** Average amount of memory used in MB while thereference file is being downloaded.
- **Downloading content average CPU usage:** Average percentage of CPU used while thereference file is being downloaded.
- **Downloading content average GPU usage:** Average percentage of GPU used while thereference file is being downloaded.

3.2.5 Non Interactive Playback with screen off

Identifier: RES*/CS/005*

Title: Non Interactive Playback with screen off

Objective: Measure the usage of device resources of the AUT while executing the feature media file playing from the Content Distribution Streaming Services use case and the screen is turned off.

Applicability:

(ICSG_ProductType = Application) AND (ICSG_UseCases includes CS)

Initial Conditions:

AUT is in [AUT STARTED] mode.

Host Device and/or AUT may need to be configured so it can replay videos with screen off (e.g. Host device configured to send the video reproduction to an external screen)

Steps:

1. The Test System commands the AUT to replay the Application User Flow 2.1: Play three reference media files.
2. Five seconds after the start of step 1, the Test Systems turns the Host Device screen off and waits for 5 seconds.
3. The Test System measures the usage of device resources of the AUT while the Host Device is with the screen off and the video is being played.

Postamble:

- The Test System turns the Host Device screen ON.
- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Screen off playback average Memory usage:** Average amount of memory used during the measurement in MB.
- **Screen off playback average CPU usage:** Average percentage of CPU used during the measurement.
- **Screen off playback average GPU usage:** Average percentage of GPU used during the measurement.

3.3 Live Streaming Services

3.3.1 Play Live Video from User

Identifier: RES*/LS/001*

Title: Play Live Video from User

Objective: Measure the usage of device resources of the AUT while executing the feature live video playing from the Live Streaming Services use case.

Applicability:

(ICSG_ProductType = Application) AND (ICSG_UseCases includes LS)

Initial Conditions:

- AUT is in [AUT STARTED] mode.
- A live video is generated as defined in section 2.8.1.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 3.1: Play a live video.
2. The Test System measures the use of Host Device resources during the reproduction of the live video streaming in step 1.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Live video from user average Memory usage:** Average amount of memory used during the measurement in MB.
- **Live video from user average CPU usage:** Average percentage of CPU used during the measurement.
- **Live video from user average GPU usage:** Average percentage of GPU used during the measurement.

3.3.2 Broadcast Live Video

Identifier: *RES/LS/002*

Title: Broadcast Live Video to User

Objective: Measure the usage of device resources of the AUT when broadcasting live content.

Applicability:

(ICSG_ProductType = Application) AND (ICSG_UseCases includes LS).

Initial Conditions:

- AUT is in [AUT STARTED] mode.
- The Host Device camera is focused on the fixed TV pattern RTVP1.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 3.2: Broadcast live video.
2. The Test System measures the use of Host Device resources during the reproduction of the live video streaming.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Live video average Memory usage:** Average amount of memory in MB used during the measurement.
- **Live video average CPU usage:** Average percentage of CPU used during the measurement.
- **Live video average GPU usage:** Average percentage of GPU used during the measurement.

3.3.3 Broadcast live video with screen off

Identifier: *AEC/LS/003*

Title: Broadcast live video with screen off

Objective: Measure the usage of device resources of the AUT while executing the feature broadcast a live video from the Live Streaming Services use case when the screen is turned off.

Applicability:

(ICSG_ProductType = Application) AND (ICSG_UseCases includes LS) AND ICSA_LSBroadcastScreenOff

Initial Conditions:

- AUT is in [AUT STARTED] mode.
- The Host Device camera is focused on the fixed TV pattern RTVP1.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 3.2: Broadcast live video.
2. Five seconds after the start of step 1, the Test Systems turns the Host Device screen off and waits for 5 seconds.
3. The Test System measures the use of Host Device resources after completion of step 2 and during 10 minutes.

Postamble:

- The Test System turns the Host Device screen on.
- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Screen off live video average Memory usage:** Average amount of memory used during the measurement in MB.
- **Screen off live video average CPU usage:** Average percentage of CPU used during the measurement.
- **Screen off live video average GPU usage:** Average percentage of GPU used during the measurement.

3.4 Social Networking

3.4.1 Picture Posting

Identifier: *RES/SN/001*

Title: Picture Posting

Objective: Measure the usage of device resources of the AUT while executing the feature picture posting in the Social Networking use case.

Applicability:

(ICSG_ProductType = Application) AND (ICSG_UseCases includes SN) AND ICSA_SNPostImage

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 4.2: Post pictures.
2. The Test System measures the use of Host Device resources while the pictures are being posted.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Post image average Memory usage:** Average amount of memory in MB used during the measurement
- **Post image average CPU usage:** Average percentage of CPU used during the measurement.
- **Post image average GPU usage:** Average percentage of GPU used during the measurement.

3.4.2 Video Posting

Identifier: *RES/SN/002*

Title: Video Uploading

Objective: Measure the usage of device resources of the AUT while executing the feature vdeo posting in the Social Networking use case.

Applicability:

(ICSG_ProductType = Application) AND (ICSG_UseCases includes SN) AND ICSA_SNPostVideo

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 4.3: Post videos sequentially.
2. The Test System measures the use of Host Device resources while the videos are being posted.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Post video average Memory usage:** Average amount of memory in MB used during the measurement
- **Post video average CPU usage:** Average percentage of CPU used during the measurement.
- **Post video average GPU usage:** Average percentage of GPU used during the measurement.

3.4.3 File Posting

Identifier: *RES/SN/003*

Title: File Posting

Objective: Measure the usage of device resources of the AUT while executing the feature file posting in the Social Networking use case.

Applicability:

(ICSG_ProductType = Application) AND (ICSG_UseCases includes SN) AND ICSA_SNPostFile.

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 4.6: Post three reference files separately.
2. The Test System measures the use of Host Device resources while the files are being posted.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Post file average Memory usage:** Average amount of memory in MB used during the measurement
- **Post file average CPU usage:** Average percentage of CPU used during the measurement.
- **Post file average GPU usage:** Average percentage of GPU used during the measurement.

3.4.4 Show Picture

Identifier: *RES/SN/004*

Title: Show Picture

Objective: Measure the usage of device resources of the AUT while executing the feature show picture in the Social Networking use case.

Applicability:

(ICSG_ProductType = Application) AND (ICSG_UseCases includes SN) AND ICSA_SNGetImage

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 4.8: Show three reference pictures.
2. The Test System measures the use of Host Device resources while each picture is being downloaded and shown.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Show picture average Memory usage:** Average amount of memory in MB used during the measurement
- **Show picture average CPU usage:** Average percentage of CPU used during the measurement.
- **Show picture average GPU usage:** Average percentage of GPU used during the measurement.

3.4.5 Play Video

Identifier: *RES/SN/005*

Title: Play Video

Objective: Measure the usage of device resources of the AUT while executing the feature Play video in the Social Networking use case.

Applicability:

(ICSG_ProductType = Application) AND (ICSG_UseCases includes SN) AND ICSA_SNGetVideo

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 4.9 Play three reference videos.
2. The Test System measures the use of Host Device resources while the videos are being played.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Play video average Memory usage:** Average amount of memory in MB used during the measurement
- **Play video average CPU usage:** Average percentage of CPU used during the measurement.
- **Play video average GPU usage:** Average percentage of GPU used during the measurement.

3.4.6 File Downloading

Identifier: *RES/SN/006*

Title: File Downloading

Objective: Measure the usage of device resources of the AUT while executing the feature file downloading in the Social Networking use case.

Applicability:

(ICSG_ProductType = Application) AND (ICSG_UseCases includes SN) AND ICSA_SNGetFile

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 4.12: Downloading three reference flies.
2. The Test System measures the use of Host Device resources while the files are being downloaded.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Get file average Memory usage:** Average amount of memory in MB used during the measurement
- **Get file average CPU usage:** Average percentage of CPU used during the measurement.
- **Get file average GPU usage:** Average percentage of GPU used during the measurement.

3.5 High Speed Internet

3.5.1 Downloading files sequentially

Identifier: *RES/ HS/001*

Title: Downloading files sequentially

Objective: Measure the usage of device resources of the AUT while executing the feature downloading files sequentially in the High Speed Internet use case.

Applicability:

(ICSG_ProductType = Application) AND (ICSG_UseCases includes HS)

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 5.1: Download three reference flies.
2. The Test System measures the use of Host Device resources while the files are being downloaded.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **File download average Memory usage:** Average amount of memory in MB used during the measurement
- **File download average CPU usage:** Average percentage of CPU used during the measurement.
- **File download average GPU usage:** Average percentage of GPU used during the measurement.

3.5.2 Uploading files sequentially

Identifier: *RES/HS/002*

Title: Uploading files sequentially

Objective: Measure the usage of device resources of the AUT while executing the feature uploading files sequentially in the High Speed Internet use case.

Applicability:

(ICSG_ProductType = Application) AND (ICSG_UseCases includes HS)

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 5.2: Upload three reference flies.
2. The Test System measures the use of Host Device resources while the files are being uploaded.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **File upload average Memory usage:** Average amount of memory in MB used during the measurement
- **File upload average CPU usage:** Average percentage of CPU used during the measurement.
- **File upload average GPU usage:** Average percentage of GPU used during the measurement.

3.5.3 Downloading several files simultaneously

Identifier: *RES/HS/003*

Title: Downloading several files simultaneously

Objective: Measure the usage of device resources of the AUT while executing the feature downloading several files simultaneously in the High Speed Internet use case.

Applicability:

(ICSG_ProductType = Application) AND (ICSG_UseCases includes HS)

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 5.3: Download several reference flies simultaneously.
2. The Test System measures the use of Host Device resources while the files are being downloaded.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Average Memory usage:** Average amount of memory in MB used during the measurement
- **Average CPU usage:** Average percentage of CPU used during the measurement.
- **Average GPU usage:** Average percentage of GPU used during the measurement.

3.5.4 Uploading Several Files simultaneously

Identifier: *RES/HS/004*

Title: Uploading several files simultaneously

Objective: Measure the usage of device resources of the AUT while executing the feature uploading several files simultaneously in the High Speed Internet use case.

Applicability:

(ICSG_ProductType = Application) AND (ICSG_UseCases includes HS)

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 5.4: Upload several reference flies simultaneously.
2. The Test System measures the use of Host Device resources while the files are being uploaded.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Average Memory usage:** Average amount of memory in MB used during the measurement
- **Average CPU usage:** Average percentage of CPU used during the measurement.
- **Average GPU usage:** Average percentage of GPU used during the measurement.

3.5.5 Downloading a file with screen off

Identifier: *RES/HS/005*

Title: Downloading a file with screen off

Objective: Measure the usage of device resources of the AUT while executing the feature downloading a file in the High Speed Internet use case with the screen off.

Applicability:

(ICSG_ProductType = Application) AND (ICSG_UseCases includes HS)

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 5.5: Download a huge file.
2. Five seconds after the start of step 1, the Test System starts measuring the use of Host Device resources while the file is being downloaded.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Average Memory usage:** Average amount of memory in MB used during the measurement
- **Average CPU usage:** Average percentage of CPU used during the measurement.
- **Average GPU usage:** Average percentage of GPU used during the measurement.

3.5.6 Uploading a file with screen off

Identifier: *RES/HS/006*

Title: Uploading a file with screen off

Objective: Measure the usage of device resources of the AUT while executing the feature uploading a file in the High Speed Internet use case with the screen off.

Applicability:

(ICSG_ProductType = Application) AND (ICSG_UseCases includes HS)

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 5.6: Upload a huge file.
2. Five seconds after the start of step 1, The Test System starts measuring the use of Host Device resources while the file is being uploaded.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Average Memory usage:** Average amount of memory in MB used during the measurement
- **Average CPU usage:** Average percentage of CPU used during the measurement.
- **Average GPU usage:** Average percentage of GPU used during the measurement.

3.6 Virtual Reality

3.6.1 Virtual Experience Loading

Identifier: *RES/VR/001*

Title: Virtual Experience Loading

Objective: Measure the usage of device resources of the AUT while loading a Virtual experience from a single point.

Applicability:

(ICSG_ProductType = Mobile device) AND (ICSG_UseCases includes VR)

Initial Conditions:

- AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 6.1 Select a virtual experience.
2. The Test System waits until the AUT recognizes the target object
3. The Test System spins up the Host Device 30 degrees, and waits until the AUT recognizes the target object.
4. The Test System spins down the Host Device 60 degrees and waits until the AUT recognizes the target object.
5. The Test System spins up the Host Device 30 degrees and spins left 60 degrees and waits until the AUT recognizes the target object.
6. The Test System spins right the Host Device 120 degrees and waits until the AUT recognizes the target object.
7. The Test System spins left 60 degrees and waits until the AUT recognizes the target object.
8. The Test System measures the use of the Host Device resources from step 1 to step 7.
9. The Test System spins back the Host Device to the original position.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Experience loading average Memory usage:** Average amount of memory in MB used during the measurement
- **Experience loading average CPU usage:** Average percentage of CPU used during the measurement.
- **Experience loading average GPU usage:** Average percentage of GPU used during the measurement.

3.6.2 Virtual Scene Loading

Identifier: *RES/VR/002*

Title: Virtual Scene Loading

Objective: Measure the usage of device resources of the AUT while moving horizontally from the initial observation point under the user control.

Applicability:

(ICSG_ProductType = Mobile device) AND (ICSG_UseCases includes VR)

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 6.1 Select a virtual experience.
2. The Test System waits until the target object is recognized.
3. The Test System spins up the Host Device a random number of degrees between 10 and 50.
4. The Test System waits until the target object is recognized.
5. The Test System commands the AUT to move horizontally (walking speed, 4 km/h) during 20 seconds in order to change the scene.
6. The Test System measures use of Host Device resources during step 5 execution.
7. The Test System spins back the Host Device to the original position.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Scene loading average Memory usage:** Average amount of memory in MB used during the measurement
- **Scene loading average CPU usage:** Average percentage of CPU used during the measurement.
- **Scene loading average GPU usage:** Average percentage of GPU used during the measurement.

3.7 Augmented Reality

3.7.1 Load augmentation layer on a physical marker

Identifier: *RES/AR/001*

Title: Load augmentation layer on a physical marker

Objective: Measure the usage of device resources of the AUT to render a virtual layer on top of a moving physical marker.

Applicability:

(ICSG_ProductType = Mobile device) AND (ICSG_UseCases includes AR)

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 7.1 Load augmentation layer on a physical marker.
2. The Test System measures the use of Host Device resources until the App displays a virtual layer on top of the physical marker.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Average Memory usage:** Average amount of memory in MB used during the measurement
- **Average CPU usage:** Average percentage of CPU used during the measurement.
- **Average GPU usage:** Average percentage of GPU used during the measurement.

3.7.2 Load Augmentation Layer at Location

Identifier: *RES/AR/002*

Title: Load Augmentation Layer at location

Objective: Measure the usage of device resources of the AUT to render a virtual layer at an specific location.

Applicability:

(ICSG_ProductType = Mobile device) AND (ICSG_UseCases includes AR)

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 7.2 Load augmentation layer at an specific location.
2. The Test System measures the use of Host Device resources until the App displays a virtual layer at the location specified.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Average Memory usage:** Average amount of memory in MB used during the measurement
- **Average CPU usage:** Average percentage of CPU used during the measurement.
- **Average GPU usage:** Average percentage of GPU used during the measurement.

3.7.3 Augmented reality session

Identifier: *RES/AR/003*

Title: Augmented reality session

Objective: Measure the usage of device resources of the AUT when performing an augmented reality session.

Applicability:

(ICSG_ProductType = Mobile device) AND (ICSG_UseCases includes AR)

Initial Conditions:

AUT is in [AUT STARTED] mode.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 7.1 Load augmentation layer on a physical marker.
2. The Test System spins (in one of the three axis) the Host Device 15 degrees, while the physical marker remains in the same position.
3. The Test Systems wait for 5 seconds
4. The Test System measures the use of Host Device resources in steps 2 and 3, and whether the AUT keeps showing the virtual layer on top of the physical marker.
5. The Test System spins in the same axis the Host Device 30 degrees in the opposite direction, while the physical marker remains in the same position.
6. The Test Systems wait for 5 seconds
7. The Test System measures the use of Host Device resources in steps 5 and 6 and whether the AUT keeps showing the virtual layer on top of the physical virtual.
8. The Test System spins the Host device back to the original position.
9. The Test System spins back to the original position.
10. The Test System repeat steps 2 to 9 in the other two axis.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **AR session average Memory usage:** Average amount of memory in MB used during the measurement
- **AR session average CPU usage:** Average percentage of CPU used during the measurement.
- **AR session average GPU usage:** Average percentage of GPU used during the measurement.

3.8 Emergency Services

TBD

3.9 Patient Monitoring

TBD

3.10 Gaming

3.10.1 Start Game session

Identifier: *RES/GA/001*

Title: Start game session

Objective: Measure the usage of device resources of the AUT while starting a game session.

Applicability:

(ICSG_ProductType = Mobile device) AND (ICSG_UseCases includes GA)

Initial Conditions:

- AUT is in [AUT STARTED] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 10.1: Start game session.
2. The Test System measures the use of Host Device resources while the game session is being started.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Game session start average Memory usage:** Average amount of memory in MB used during the measurement
- **Game session start average CPU usage:** Average percentage of CPU used during the measurement.
- **Game session start average GPU usage:** Average percentage of GPU used during the measurement.

3.10.2 Short Game session

Identifier: *RES/GA/002*

Title: Short Game session

Objective: Measure the usage of device resources of the AUT while playing a short game session.

Applicability:

(ICSG_ProductType = Mobile device) AND (ICSG_UseCases includes LS)

Initial Conditions:

- AUT is in [AUT STARTED] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 7.2: Short game session.
2. The Test System measures the use of Host Device resources while the game session is being played.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Short Game session average Memory usage:** Average amount of memory in MB used during the measurement
- **Short Game session average CPU usage:** Average percentage of CPU used during the measurement.
- **Short Game session average GPU usage:** Average percentage of GPU used during the measurement.

3.10.3 Long Game session

Identifier: *RES/GA/003*

Title: Long Game session

Objective: Measure the usage of device resources of the AUT while playing a long game session.

Applicability:

(ICSG_ProductType = Mobile device) AND (ICSG_UseCases includes LS)

Initial Conditions:

- AUT is in [AUT STARTED] mode.
- AUT options are configured to their default values.
- Any AUT screen saving option is disabled.
- AUT resolution is configured to maximum resolution available.
- AUT Music and sound effects are configured to be ON.
- No energy saving option is enabled in the AUT.

Steps:

1. The Test System commands the AUT to replay the Application User Flow 7.3: Long game session.
2. The Test System measures the use of Host Device resources while the game session is being played.

Postamble:

- Execute the Postamble sequence (see section 2.6).

Measurements:

- **Long Game session average Memory usage:** Average amount of memory in MB used during the measurement
- **Long Game session average CPU usage:** Average percentage of CPU used during the measurement.
- **Long Game session average GPU usage:** Average percentage of GPU used during the measurement.

4 Measurements

The table below shows the different states in which an app may be:

Table 6 – Apps states

State	Description
Not running	The app has not been launched or was running but was terminated by the system.
Inactive	The app is running in the foreground but at this moment it is not receiving events. (It may be performing other actions though.).
Active	The app is running in the foreground and it is receiving events.
Background	The app is in the background but it is executing code. Most apps enter this state briefly before being suspended. Apps may request extra execution time and remain in this state for a extra period of time.
Suspended	The app is in the background but is not executing any code. The system moves apps to this state automatically and does not notify them before doing so. While suspended, an app remains in memory but does not execute any code.

This section defines the measurements to be performed in Active and background App states.

4.1 App in Active State

When the application is in active state following measurements will be performed during the measurement time.

Memory usage: The Test System will obtain the total amount of RAM memory that is being used by the host device (by all the open processes during the measurement time). The measurement will provide the average value obtained during the measurement time. The measurement unit is a MB.

CPU usage: The Test System will obtain the central processing unit (CPU) that is being used by the host device (by all the open processes during the measurement time). The measurement will provide the average value obtained during the measurement time as the percentage of CPU used

GPU usage: The Test System will obtain the Graphics Processing Unit used by the host device as a percentage of the total GPU usage during the measurement time.

4.2 App in background state

When the application is in background state following measurements will be performed during the measurement time:

Memory usage: The Test System will obtain the total amount of RAM memory that is being used by the host device (by all the open processes during the measurement time). The measurement will provide the average value obtained during the measurement time. The measurement unit is a MB.

CPU usage: The Test System will obtain the central processing unit (CPU) that is being used by the host device (by all the open processes during the measurement time). The measurement will provide the average value obtained during the measurement time as the percentage of CPU used

5 Test cases applicability

The applicability of each individual test is identified in Table C.1.

The applicability of every test is formally expressed by the use of Boolean expressions that are based on parameters (ICS) included in annex A of the present document.

The columns in Table C.1 have the following meaning:

Test case column

The Test case column indicates the test case number for each test case as described in the Control Panel Service Framework test case specification for which the applicability is identified.

Description column

The Title column indicates the title of each test case as described in the Control Panel Service Framework test case specification for which the applicability is identified.

Release column

The Release column indicates the earliest release from which each test case is applicable, except if otherwise stated of an individual test case.

Status column

The following notations are used for the Status column:

A	applicable - the test is applicable.
O	optional – the capability may be supported or not.
N/A	not applicable – in the given context, the test case is not applicable.
Ci	conditional – the test is applicable ("A") or not ("N/A") depending on the support of other optional or conditional items. "i" is an integer identifying an unique conditional status expression which is defined immediately following the table. For nested conditional expressions, the syntax "IF ... THEN (IF ... THEN ... ELSE...) ELSE ..." is used to avoid ambiguities.

The conditional expressions are added in the last row of the table. These expressions may use ICS as defined in D2.2 Appendix 2. ICS/IXIT. The ICS items will be referred as A.n/m where A.n refers to the table in which the ICS is defined and m refers to the item of the table.

A practical example is detailed below Table 7.

Table 7 – Test cases applicability

Test case	Description	Status
RES/CO/001	Host Device use of resources	A
RES/CO/002	Open the AUT	C08
RES/CO/003	Background state	C08
RES/CS/001	Non Interactive Playback	C01
RES/CS/002	Pause	C20
RES/CS/003	Rewind and Fast Forward	C21
RES/CS/004	Download content for offline playing	C09
RES/CS/005	Non interactive Playback with screen off	C25
RES/LS/001	Play Live Video from User	C02
RES/LS/002	Broadcast Live Video	C02
RES/LS/003	Broadcast Live Video with screen off	C26
RES/SN/001	Picture Posting	C10
RES/SN/002	Video Posting	C11
RES/SN/003	File Posting	C13
RES/SN/004	Show Picture	C14
RES/SN/005	Play Video	C15
RES/SN/006	File Downloading	C16
RES/HS/001	Downloading files sequentially	C04
RES/HS/002	Uploading files sequentially	C04
RES/HS/003	Downloading several files simultaneously	C04
RES/HS/004	Uploading several files simultaneously	C04
RES/HS/005	Downloading a file with screen off	C04
RES/HS/006	Uploading a file with screen off	C04
RES/VR/001	Virtual Experience Loading	C05
RES/VR/002	Virtual Scene Loading	C05
RES/AR/001	Load Augmentation Layer on Physical Marker	C06
RES/AR/002	Load Augmentation Layer at Location	C06
RES/AR/003	Augmented reality Session	C06
RES/GA/001	Start game session	C07
RES/GA/002	Short game session	C07
RES/GA/003	Long game session	C07

Test case	Description	Status
C01	IF (A.1/2= Application) AND (A.1/3 includes CS) THEN A ELSE N/A	
C02	IF (A.1/2= Application) AND (A.1/3 includes LS) THEN A ELSE N/A	
C03	IF (A.1/2= Application) AND (A.1/3 includes SN) THEN A ELSE N/A	
C04	IF (A.1/2= Application) AND (A.1/3 includes HS) THEN A ELSE N/A	
C05	IF (A.1/2= Application) AND (A.1/3 includes VR) THEN A ELSE N/A	
C06	IF (A.1/2= Application) AND (A.1/3 includes AR) THEN A ELSE N/A	
C07	IF (A.1/2= Application) AND (A.1/3 includes GA) THEN A ELSE N/A	
C08	IF (A.1/2= Application) AND A.2/1 THEN A ELSE N/A	
C09	IF (A.1/2= Application) AND (A.1/3 includes CS) AND A.2/14 THEN A ELSE N/A	
C10	IF (A.1/2= Application) AND (A.1/3 includes SN) AND A.2/17 THEN A ELSE N/A	
C11	IF (A.1/2= Application) AND (A.1/3 includes SN) AND A.2/16 THEN A ELSE N/A	
C12	IF (A.1/2= Application) AND (A.1/3 includes SN) AND A.2/15 THEN A ELSE N/A	
C13	IF (A.1/2= Application) AND (A.1/3 includes SN) AND A.2/19 THEN A ELSE N/A	
C14	IF (A.1/2= Application) AND (A.1/3 includes SN) AND A.2/20 THEN A ELSE N/A	
C15	IF (A.1/2= Application) AND (A.1/3 includes SN) AND A.2/21 THEN A ELSE N/A	
C16	IF (A.1/2= Application) AND (A.1/3 includes SN) AND A.2/17 THEN A ELSE N/A	
C17	IF (A.1/2= Application) AND (A.1/3 includes SN) AND A.2/24 THEN A ELSE N/A	
C18	IF (A.1/2= Application) AND (A.1/3 includes GA) AND A.2/26 THEN A ELSE N/A	
C19	IF (A.1/2= Application) AND (A.1/3 includes GA) AND A.2/25 THEN A ELSE N/A	
C20	IF (A.1/2= Application) AND (A.1/3 includes CS) AND A.2/11 THEN A ELSE N/A	
C21	IF (A.1/2= Application) AND (A.1/3 includes CS) AND A.2/8 AND A.2/10 THEN A ELSE N/A	
C22	IF (A.1/2= Application) AND (A.1/3 includes CS) AND A.2/27 THEN A ELSE N/A	
C23	IF (A.1/2= Application) AND (A.1/3 includes CS) AND A.2/7 AND A.2/9 THEN A ELSE N/A	
C24	IF (A.1/2= Application) AND (A.1/3 includes CS) AND A.2/4 THEN A ELSE N/A	
C25	IF (A.1/2= Application) AND (A.1/3 includes CS) AND A.2/28 THEN A ELSE N/A	
C26	IF (A.1/2= Application) AND (A.1/3 includes LS) AND A.2/29 THEN A ELSE N/A	

Example of expression interpretation in the table above.

Test case	Test case title	Status
RES/CS/001	Non Interactive Playback	C01

The status (applicability) of test case ‘RES/CS/001’ is defined by condition’ C01’

C01 IF (A.1/1= Application) AND (A.1/3 includes CS) THEN A ELSE N/A

Where:

C01: Condition to be used in the test cases to define applicability

A.1/1 Value of Item 1 of table A.1 defined in D2.2 Appendix 2. ICS/IXIT In this case, value of ICS 'ICSG_ProductType' (Table A.1, item 1)

A.1/3 includes CSCS is one of the values of ICS 'ICSG_UseCases' (table A.1, item 3). (ICSG_UseCases ICS status is Mn, meaning that several options may be supported.

If the value of the sub-expresion *(A.1/1= Application)* is TRUE AND the value of the sub-expression *(A.1/3 includes CS) is TRUE, the test case status is Applicable (A); In any other case, the status is Not-applicable (N/A).*

6 Annex 1: Key Performance Indicators

The following table summarizes the Key Performance Indicators that will be obtained based on the measurements obtained by the execution of the test cases and each test case repetition.

Table 8 – Application User Experience Key Performance Indicators

Measurements	**Use Cases**	**Type**	**Unit**	**Summarization**	**KPI**
Memory Usage	All	Unsigned Integer	Byte, %	Average, Deviation, CDF	Use of memory
CPU Usage	All	Unsigned Integer	%	Average, Deviation, CDF	Use of CPU
GPU Usage	All	Unsigned Integer	%	Average, Deviation, CDF	Use of GPU