Supporting Document

Mandatory Technical Document

PP-Module for Audio Input Devices

Version: 1.0

2019-07-19

National Information Assurance Partnership

Foreword

This is a Supporting Document (SD), intended to complement the Common Criteria version 3 and the associated Common Evaluation Methodology for Information Technology Security Evaluation.

SDs may be "Guidance Documents", that highlight specific approaches and application of the standard to areas where no mutual recognition of its application is required, and as such, are not of normative nature, or "Mandatory Technical Documents", whose application is mandatory for evaluations whose scope is covered by that of the SD. The usage of the latter class is not only mandatory, but certificates issued as a result of their application are recognized under the Common Criteria Recognition Arrangement (CCRA).

Technical Editor:

National Information Assurance Partnership (NIAP)

Document history:

V1.0, 19 July 2019 (Initial)

General Purpose:

The purpose of this SD is to define evaluation methods for the functional behavior of peripheral sharing devices that support analog audio input peripherals.

Field of special use:

This Supporting Document applies to the evaluation of TOEs claiming conformance with the PP-Module for Audio Input Devices.

Acknowledgements:

This SD was developed with support from NIAP Technical Community members, with representatives from industry, Government agencies, Common Criteria Test Laboratories, and members of academia.

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1 Introduction

1.1 Technology Area and Scope of Supporting Document

The scope of the PP-Module for Audio Input Devices is to describe the security functionality of analog audio input types of peripheral devices in terms of [CC] and to define functional and assurance requirements for such products. The PP-Module is intended for use with the following Base-PPs:

- Protection Profile for Peripheral Sharing Devices, version 4.0 (PP_PSD_V4.0 or PSD PP)

This SD is mandatory for evaluations of TOEs that claim conformance to the following PP-Module:

- PP-Module for Audio Input Devices, version 1.0 (MOD_AI_V1.0)

Although Evaluation Activities (EAs) are defined mainly for the evaluators to follow, in general they will also help Developers to prepare for evaluation by identifying specific requirements for their TOE. The specific requirements in EAs may in some cases clarify the meaning of Security Functional Requirements (SFR), and may identify particular requirements for the content of Security Targets (ST) (especially the TOE Summary Specification), user guidance documentation, and possibly supplementary information (e.g. for isolation documentation).

1.2 Structure of the Document

EAs can be defined for both SFRs and Security Assurance Requirements (SAR). These are defined in separate sections of the SD.

If any EA cannot be successfully completed in an evaluation then the overall verdict for the evaluation is a 'fail'. In rare cases, there may be acceptable reasons why an EA may be modified or deemed not applicable for a particular TOE, but this must be agreed with the Certification Body for the evaluation.

In general, if all EAs (for both SFRs and SARs) are successfully completed in an evaluation then it would be expected that the overall verdict for the evaluation is a 'pass'. To reach a 'fail' verdict when the EAs have been successfully completed would require a specific justification from the evaluator as to why the EAs were not sufficient for that TOE.

Similarly, at the more granular level of Assurance Components, if the EAs for an Assurance Component and all of its related SFR EAs are successfully completed in an evaluation then it would be expected that the verdict for the Assurance Component is a 'pass'. To reach a 'fail' verdict for the Assurance Component when these EAs have been successfully completed would require a specific justification from the evaluator as to why the EAs were not sufficient for that TOE.

1.3 Terminology

1.3.1 Glossary

Reference the terms sections of the PSD PP and MOD_AI_V1.0 in addition to the terms listed below.

Term	Definition
Amplified Speaker	Computer audio peripheral device that uses an amplifier to amplify weak analog audio signals to stronger signals that drive one or more speakers.

1.3.2   Acronyms

Reference the acronyms section of the PSD PP and MOD_AI_V1.0 in addition to the acronyms listed below.

Acronym	Meaning
mV	Millivolt

2 Evaluation Activities for SFRs

The EAs presented in this section are intended to supplement those defined in the PSD PP.

This SD relies on several PSD PP SFRs to help in the implementation of its required functionality. These PSD PP SFRs are listed in this section along with any impact to how they are to be evaluated in a TOE that includes the PP-Module for Audio Input Devices. This section also defines the EAs for the mandatory SFRs that are introduced in the PP-Module for Audio Input Devices.

Successful completion of these EAs assists in the completion of the relevant portions of ASE_TSS.1, ADV_FSP.1, AGD_OPE.1, and ATE_IND.1, which are required to be applied to the entire TOE.

2.1 Test Environment for Evaluation Activities

In order to ensure that the TOE demonstrates the functionality required by the EAs, it is necessary for the evaluator to ensure that they have appropriate equipment to conduct the required testing. The additional equipment needed to perform the testing described in this SD is listed below along with the purpose of each piece of equipment.

- **Amplified speakers** – the tests in this SD depend upon the use of high-quality system 2.0 standard or higher amplified speakers. The number of sets required is the same as the number of computers supported by the TOE. All sets must be identical.
- **Tone generator software application** – the tests in this SD require the use of a tone generator software application that can generate sine wave audio at configurable pitch (in Hz) and volume levels.
- **Computer microphone (analog)** – the tests in this SD require the use of a microphone to be connected to the TOE.
- **Digital voltmeter / multimeter** – the tests in this SD require the use of a digital voltmeter to measure the DC voltage over TOE peripheral interfaces.
- **Audio signal generator** – the tests in this SD require the use of an audio signal generator that is capable of generating a sine wave with positive/negative bias from DC up to 100 kHz.
- **Oscilloscope** – the tests in this SD require the use of an oscilloscope to detect signal leakage between peripheral interfaces. Any general purpose single channel or more oscilloscope may be used. Oscilloscope bandwidth shall be at least 1 MHz. One single ended probe is also required.

This equipment is required in addition to that which is relevant for testing any PSD as defined in the PSD PP.

When conducting testing, the evaluator must ensure that all combinations of computer port group connections and switch selections are tested. For example, if testing a 16-port device, the evaluator may use four connected computers, but must change the connected ports many times to ensure that each of the possible permutations are tested.

2.2 PSD Evaluation Activities

The EAs defined in this section are additional activities for the PSD PP that the evaluator shall perform when the ST claims the PP-Module for Audio Input Devices. The evaluator shall perform these actions in addition to those required by the PSD PP.

2.2.1 User Data Protection (FDP)

2.2.1.1 Active PSD Connections (FDP_APC_EXT)

FDP_APC_EXT.1 Active PSD Connections

Because of the specific nature of the audio input data that transits the TOE, there are additional EAs for this SFR.

Isolation Document
The evaluator shall examine the Isolation Documentation to determine that it describes the logic under which the TSF permits audio flows from a connected audio input peripheral to a connected computer interface.

The evaluator shall examine the Isolation Documentation to determine that it describes how the TOE enforces audio input data flow isolation from other TOE functions, such that it is not possible for two computers connected to the TOE to use the TOE to communicate with one another. The description shall ensure the signal attenuation in the extended audio frequency range between any TOE audio input interface and any other computer audio input interface is at least 45 dB measured with a 2V input pure sine wave at the extended audio frequency range, including negative swing signal.

The evaluator shall examine the Isolation Documentation to determine that it describes how the TOE prevents the audio input signal from traversing the TOE while the TOE is powered off.

TSS
There are no TSS EAs for this component beyond what the PSD PP requires.

Guidance
If the ability of the TOE to route analog audio input signals is configurable, the evaluator shall verify that the operational guidance describes how to configure the TSF to behave in the manner specified by the SFR. This includes the possibility of both administratively configured TOE settings and any peripherals/connectors that are included with the TOE that cause data flows to behave differently if peripherals are connected through them.

Test
The evaluator shall then perform the following tests:

Test 1-AI: Positive and Negative Analog Audio Input Switching Functionality and Leakages

Test 1-AI verifies that the switching functionality works as expected and checks for leakage to non-selected computers when the audio source is connected to the peripheral interface.
In the following steps, the evaluator shall confirm that an analog audio signal traversing the TOE from an analog audio source to one user-selected connected computer does not leak to the non-selected computers' analog audio interfaces.

Part 1a: Peripheral to selected computer flow

1. Connect the microphone to the TOE Analog Audio Input Peripheral Interface.
2. Connect a computer to each TOE Analog Audio Input Computer Interface, and configure the computers' ports for microphone input.
3. For each connected computer, select its interface and perform steps 4-5.

4. Speak into the microphone. Verify that the connected computer picks up the audio by recording the audio or viewing the microphone audio level.
5. [Conditional: This step is performed if "the TOE supports only one connected computer" is selected for FDP_SWI_EXT.1.1] Speak into the microphone. Verify that each non-selected connected computer does not pick up the audio by recording the audio or viewing the microphone audio level.
6. Power down the TOE.
7. For each connected computer, select its interface and perform step 8.
8. Speak into the microphone. Verify that the connected computer does not pick up the audio by recording the audio or viewing the microphone audio level.

Part 1b: Peripheral to non-selected computer flow and frequency verification

1. Power on the TOE and connect a tone generator to the TOE audio input Peripheral Interface and set it to maximum line output level.
2. Connect amplified speakers to each of the TOE Computer Interfaces and set the volume to 0%.
3. For each connected computer, select its interface and perform steps 4-6.
4. Use the tone generator to generate a sine wave audio tone for each of the following frequencies: 100 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, 10 kHz, 12 kHz, 15 kHz, 20 kHz, 30 kHz, 40 kHz, 50 kHz, and 60 kHz. Gradually turn up the volume on each set of speakers until the tone can be heard or the volume reaches 100%. Reset the volume to 0% after testing each channel. Note: Depending on shielding the speakers might pick up air-conditioning (50 or 60 Hz). This is not considered a failure.
5. Verify that the injected test tone is heard only on the speakers connected to the selected computer.
6. Replace the speakers attached to a Computer Interface with an oscilloscope and set to measure the peak-to-peak voltage.
7. Attach computers to the other TOE Computer Interfaces.
8. Select a Computer Interface other than the one to which the oscilloscope is connected.
9. Replace the tone generator with an external audio signal generator and perform step 10 with the signal generator set to the following settings:

   - Pure sine wave around the average voltage of half output (positive signal only), with the output signal set to 2.00 V peak-to-peak, calibrating the signal with the oscilloscope as needed
   - Signal average to 0v (negative swing)

10. Set the signal generator to generate 100 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, 10 kHz, 12 kHz, 15 kHz, 20 kHz, 30 kHz, 40 kHz, 50 kHz, and 60 kHz and use the oscilloscope to detect the leaked signal. Verify the detected signal is 11.2 mV (or well below noise level). This level of signal ensures signal attenuation of 45 dB in the extended audio frequency range.

[Conditional: The below steps are performed if *switching through express user action* is selected for FDP_SWI_EXT.1.1]

11. Repeat steps 8-11 with each of the other Computer Interfaces selected.
12. Repeat steps 8-12 with the oscilloscope attached to a different Computer Interface until all Computer Interfaces have been tested.
13. Power down the TOE, repeat steps 8-13, verifying that the results are the same as previously tested in those steps.

Test 2-AI: Computer Isolation

[Conditional: This test is performed if "*switching can be initiated only through express user action*" is selected for FDP_SWI_EXT.1.1]

Test 2-AI verifies that audio data cannot flow between computer interfaces whether or not any computer interfaces are selected. It intends to test every combination of audio source, selected computer interface, and oscilloscope location for all computer interfaces.

Note: When the signal inserted on one TOE computer interface audio input is 2.00 V peak-to-peak sine wave, the maximum allowed output signal voltage measured at another TOE computer interface is therefore 11.2mV (or well below noise level). The extended audio frequency range is 1Hz to 60 kHz. Negative swing is measured when the generated audio signal average voltage is 0V.

In the following steps the evaluator shall verify that the TOE does not allow significant leakage between Audio In Computer Interfaces:

1. Disconnect the tone generator from the Analog Audio Input Peripheral Interface. Leave the receptacle empty.
2. For each computer interface, perform steps 3-6.
3. Connect the tone generator to the selected first computer interface and ensure it is not selected.
4. Connect amplified speakers to each remaining computer interface. Set the volume of the speakers to 0%.
5. Use the tone generator to generate a sine wave audio tone for each of the following frequencies: 100 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, 10 kHz, 12 kHz, 15 kHz, 20 kHz, 30 kHz, 40 kHz, 50 kHz, and 60 kHz. Gradually turn up the volume on each set of speakers until the tone can be heard or the volume reaches 100%. Reset the volume to 0% after testing each channel. Note: Depending on shielding the speakers might pick up AC (50 or 60 Hz). This is not considered a failure.
6. Verify that a tone is not heard.
7. Attach an external audio signal generator to a computer interface and set to pure sine wave around the average voltage of half output (positive signal only). Set the output signal to 2.00V peak-to-peak. (The oscilloscope may be used to calibrate the signal.)
8. Attach the oscilloscope to the next Computer Interface.
9. Select the interface with the signal generator.
10. Set the signal generator to generate 100 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, 10 kHz, 12 kHz, 15 kHz, 20 kHz, 30 kHz, 40 kHz, 50 kHz, and 60 kHz and use the oscilloscope to detect the leaked signal. Verify the detected signal is 11.2mV (or well below noise level). This level of signal ensures signal attenuation of 45 dB in the extended audio frequency range.
11. Repeat step 10 with the audio generator set to signal average to 0V (negative swing). Verify the detected signal is 11.2mV (or well below noise level). This level of signal ensures signal attenuation of 45 dB in the extended audio frequency range.
12. Disconnect the power to the TOE and repeat Steps 10-11 without the assignment of specific computers. Verify the attenuation results are the same as for the powered on TOE.
13. Power up the TOE again. Repeat steps 10-12 for each selected Computer Interface. (This tests both for leakage between selected and non-selected Computer Interfaces, and between pairs of non-selected Computer Interfaces).
14. Repeat steps 10-13 with the oscilloscope connected to each Computer Interface not connected to the signal generator.

15. Repeat steps 10-14 with the signal generator connected to each of the other Computer Interfaces

Test 3: Behavior of TOE in Failure State and Powered Off Mode
Test 3 verifies that analog audio data cannot traverse the TOE when the TOE is in a failure state or powered off.

The evaluator shall confirm that an analog audio signal does not traverse the TOE while the TOE is in a failure state:

1. Power off the TOE.
2. Connect a tone generator to the TOE Peripheral Interface.
3. Connect amplified speakers to each of the TOE Audio In Computer Interfaces.
4. Perform steps 5 and 6 while the TOE is powered off and while the TOE is powered on and entered into a failure state.
5. Use the tone generator to generate a sine wave audio tone for each of the following frequencies: 100 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, 10 kHz, 12 kHz, 15 kHz, 20 kHz, 30 kHz, 40 kHz, 50 kHz, and 60 kHz. Gradually turn up the volume on each set of speakers until the tone can be heard or the volume reaches 100%. Reset the volume to 0% after testing each channel. Note: Depending on shielding the speakers might pick up AC (50 or 60 Hz). This is not considered a failure.
6. Verify that a tone is not heard.

2.2.1.2   Peripheral Device Connection (FDP_PDC_EXT)

FDP_PDC_EXT.1 Peripheral Device Connection

Because of additions to the Peripheral Device Connections Policy, there are additional EAs for this SFR.

Isolation Document
There are no additional Isolation Document evaluation activities for this component.

TSS
The evaluator shall verify that the TSS describes the peripherals that are supported by the TOE to ensure that it does not support any peripherals other than audio input devices.

Guidance
The evaluator shall verify that the operational user guidance describes devices authorized for use with the TOE in accordance with the Peripheral Device Connection Policy.

Test
Test 1: The evaluator shall verify that the TOE ports properly reject unauthorized devices and devices with unauthorized protocols as per the Peripheral Device Connection Policy.

For this test, verify device rejection through TOE user indication in accordance with the operational user guidance, an immediate cessation of traffic following device detection or enumeration, or incompatibility of the device interface with the peripheral interface.

Repeat this test for each of the following devices: digital microphone, keyboard, mouse, any device using digital video protocol, any device using USB protocol.

Step 1: Ensure the TOE is powered off.

Step 2: Attempt to connect an unauthorized device to the TOE peripheral interface.

Step 3: Power on the TOE. Verify the device is rejected.

Step 4: Ensure the unauthorized device is disconnected, then attempt to connect it to the TOE peripheral interface again.

Step 5: Verify the device is rejected.

Test 2: The evaluator shall verify that the TOE ports do not reject authorized devices and devices with authorized protocols as per the Peripheral Device Connection Policy.

Step 1: Ensure the TOE is powered off.

Step 2: Connect the authorized device to the TOE peripheral interface.

Step 3: Power on the TOE. Verify the TOE user indication described in the operational user guidance is not present.

Step 4: Speak into the microphone. Verify that the connected computer picks up the audio by recording the audio or viewing the microphone audio level.

Step 5: Disconnect the microphone, then reconnect it to the TOE peripheral interface.

Step 6: Verify the TOE user indication described in the operational user guidance is not present.

Step 7: Speak into the microphone. Verify that the connected computer picks up the audio by recording the audio or viewing the microphone audio level.

2.3 TOE SFR Evaluation Activities

2.3.1 User Data Protection (FDP)

2.3.1.1 Peripheral Device Connection (FDP_PDC_EXT)

FDP_PDC_EXT.2/AI Authorized Devices (Analog Audio Input)

Isolation Document
There are no Isolation Document evaluation activities for this component.

TSS
TSS evaluation activities for this SFR are performed under FDP_PDC_EXT.1 above.

Guidance
Guidance evaluation activities for this SFR are performed under FDP_PDC_EXT.1 above.

Test
Testing of this component is performed through evaluation of FDP_PDC_EXT.1 Test 2 as specified in section 2.2.1.2 above.

2.3.1.2 Unidirectional Data Flow (FDP_UDF_EXT)

FDP_UDF_EXT.1/AI Unidirectional Data Flow (Analog Audio Input)

Isolation Document
There are no Isolation Document evaluation activities for this component.

TSS

The evaluator shall examine the TSS or the Isolation Document to determine that it describes how the TOE enforces audio input data flow isolation from other TOE functions, such that the audio input peripheral interface is unidirectional and no data can be transmitted from a connected computer back to a connected peripheral. The description shall ensure the signal attenuation in the extended audio frequency range between any TOE audio input interface and any other computer audio input interface is at least 45 dB measured with a 2V input pure sine wave at the extended audio frequency range, including negative swing signal.

Guidance

There are no guidance EAs for this component.

Test

The evaluator shall perform the following test:

1. Configure the TOE in accordance with the operational guidance. Power on the TOE.
2. Connect an oscilloscope to the TOE Peripheral Interface. Perform step 3-4 for each TOE Audio In Computer Interface.
3. Connect an external audio signal generator to the TOE Audio In computer interface and perform step 4 with the signal generator set to the following settings:

   - Pure sine wave around the average voltage of half output (positive signal only), with the output signal set to 2.00 V peak-to-peak, calibrating the signal with the oscilloscope as needed;
   - Signal average to 0v (negative swing)
4. Set the signal generator to generate 100 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, 10 kHz, 12 kHz, 15 kHz, 20 kHz, 30 kHz, 40 kHz, 50 kHz, and 60 kHz and use the oscilloscope to detect the leaked signal. Verify the detected signal is 11.2 mV (or well below noise level). This level of signal ensures signal attenuation of 45 dB in the extended audio frequency range.

3 Evaluation Activities for Optional Requirements

There are currently no optional requirements defined for this SD.

4 Evaluation Activities for Selection-Based Requirements

There are currently no selection-based requirements defined in this SD. There are additional EAs for some selection-based SFRs included in the PSD PP.

5   Evaluation Activities for SARs

To evaluate the SARs specified by CFG_PSD-AI_V1.0, the evaluator shall perform the SAR EAs defined in the PSD PP against the entire TOE as applicable (i.e., both the generic PSD portion and the portion(s) related to support for specific peripheral types).

6   Required Supplementary Information

This Supporting Document refers in various places to the possibility that 'supplementary information' may need to be supplied as part of the deliverables for an evaluation. This term is intended to describe information that is not necessarily included in the Security Target or operational guidance, and that may not necessarily be public. Examples of such information could be a Letter of Volatility or isolation documentation. The requirement for any such supplementary information will be identified in the relevant PP, PP-Module, or Supporting Document.

The PSD PP requires an Isolation Document to be included with the TOE for evaluation of isolation requirements. The EAs the evaluator is to perform are captured under the appropriate SFR.

7 References

Identifier	Title
[CC]	Common Criteria for Information Technology Security Evaluation – Part 1: Introduction and General Model, CCMB-2017-04-001, Version 3.1 Revision 5, April 2017 Part 2: Security Functional Components, CCMB-2017-04-002, Version 3.1 Revision 5, April 2017 Part 3: Security Assurance Components, CCMB-2017-04-003, Version 3.1 Revision 5, April 2017
[CEM]	Common Methodology for Information Technology Security Evaluation, Evaluation Methodology, CCMB-2017-04-004, Version 3.1 Revision 5, April 2017
[PP_PSD_V4.0 or PSD PP]	Protection Profile for Peripheral Sharing Devices, Version 4.0, July 2019
[MOD_AI_V1.0]	PP-Module for Audio Input Devices, Version 1.0, July 2019
[CFG_PSD-AI_V1.0]	PP-Configuration for Peripheral Sharing Device and Audio Input Devices, Version 1.0, July 2019