PP-Module for Client Virtualization Systems

Version: 1.1
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National Information Assurance Partnership

Revision History

Version	Date	Comment
1.0	2016-11-17	Initial Publication
1.1	2020-11-17	Converted to PP-Module and applied all active TDs

Contents

1 Introduction

1.1 Overview

The scope of this PP-Module is to define the security functionality of a Client Virtualization product in terms of [CC] and to define functional and assurance requirements for such products. This PP-Module is not complete in itself, but rather is intended for use with the following base PP:

- Protection Profile for Virtualization, Version 1.1.

This base PP is valid because Client Virtualization is a specific type of Virtualization System and is expected to implement security functionality that is not common to all Virtualization Systems. One additional SFR has been defined in this PP-Module to define security functionality that is unique to this particular type of Virtualization System.

1.2 Terms

The following sections list Common Criteria and technology terms used in this document.

1.2.1 Common Criteria Terms

Assurance	Grounds for confidence that a TOE meets the SFRs [CC].
Base Protection Profile (Base-PP)	Protection Profile used as a basis to build a PP-Configuration.
Common Criteria (CC)	Common Criteria for Information Technology Security Evaluation (International Standard ISO/IEC 15408).
Common Criteria Testing Laboratory	Within the context of the Common Criteria Evaluation and Validation Scheme (CCEVS), an IT security evaluation facility, accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) and approved by the NIAP Validation Body to conduct Common Criteria-based evaluations.
Common Evaluation Methodology (CEM)	Common Evaluation Methodology for Information Technology Security Evaluation.
Distributed TOE	A TOE composed of multiple components operating as a logical whole.
Operational Environment (OE)	Hardware and software that are outside the TOE boundary that support the TOE functionality and security policy.
Protection Profile (PP)	An implementation-independent set of security requirements for a category of products.
Protection Profile Configuration (PP-Configuration)	A comprehensive set of security requirements for a product type that consists of at least one Base-PP and at least one PP-Module.
Protection Profile Module (PP-Module)	An implementation-independent statement of security needs for a TOE type complementary to one or more Base Protection Profiles.
Security Assurance Requirement (SAR)	A requirement to assure the security of the TOE.
Security Functional Requirement (SFR)	A requirement for security enforcement by the TOE.
Security Target (ST)	A set of implementation-dependent security requirements for a specific product.

TOE Security Functionality (TSF)	The security functionality of the product under evaluation.
TOE Summary Specification (TSS)	A description of how a TOE satisfies the SFRs in an ST.
Target of Evaluation (TOE)	The product under evaluation.

1.2.2 Technical Terms

Administrator	Administrators perform management activities on the VS. These management functions do not include administration of software running within Guest VMs, such as the Guest OS. Administrators need not be human as in the case of embedded or headless VMs. Administrators are often nothing more than software entities that operate within the VM.
Domain	A Domain or Information Domain is a policy construct that groups together execution environments and networks by sensitivity of information and access control policy. For example, classification levels represent information domains. Within classification levels, there might be other domains representing communities of interest or coalitions. In the context of a VS, information domains are generally implemented as collections of VMs connected by virtual networks. The VS itself can be considered an Information Domain, as can its Management Subsystem.
Guest Operating System (OS)	An operating system that runs within a Guest VM.
Guest VM	A Guest VM is a VM that contains a virtual environment for the execution of an independent computing system. Virtual environments execute mission workloads and implement customer-specific client or server functionality in Guest VMs, such as a web server or desktop productivity applications.
Host Operating System (OS)	An operating system onto which a VS is installed. Relative to the VS, the Host OS is part of the Platform.
Hypercall	An API function that allows VM-aware software running within a VM to invoke VMM functionality.
Hypervisor	The Hypervisor is part of the VMM. It is the software executive of the physical platform of a VS. A Hypervisor’s primary function is to mediate access to all CPU and memory resources, but it is also responsible for either the direct management or the delegation of the management of all other hardware devices on the hardware platform.
Management Subsystem	Components of the VS that allow VS Administrators to configure and manage the VMM, as well as configure Guest VMs. VMM management functions include VM configuration, virtualized network configuration, and allocation of physical resources.
Platform	The hardware, firmware, and software environment into which a VS is installed and executes.
User	Users operate Guest VMs and are subject to configuration policies applied to the VS by Administrators. Users need not be human as in the case of embedded or headless VMs, users are often nothing more than software entities that operate within the VM.
Virtual Machine (VM)	A Virtual Machine is a virtualized hardware environment in which an operating system may execute.
Virtual Machine Manager (VMM)	A VMM is a collection of software components responsible for enabling VMs to function as expected by the software executing within them. Generally, the VMM consists of a Hypervisor, Service VMs, and other components of the VS, such as virtual devices, binary translation systems, and physical device drivers. It manages concurrent execution of all VMs and virtualizes platform resources as needed.
Virtualization System (VS)	A software product that enables multiple independent computing systems to execute on the same physical hardware platform without interference from one other. For the purposes of this document, the VS consists of a Virtual Machine Manager (VMM), Virtual Machine abstractions, a management subsystem, and other components.

1.3 Compliant Targets of Evaluation

Client Virtualization, for the purposes of this PP-Module, refers to a Virtualization System that implements virtualized hardware components locally on an endpoint machine. Endpoints are typically client hardware such as desktop or laptop computers that a user interacts with directly, but may also include headless embedded systems without direct human interaction. A Virtualization System creates a virtualized hardware environment for each instance of a guest operating system (a virtual machine) permitting these environments to execute concurrently while maintaining isolation and the appearance of exclusive control over assigned computing resources. Client virtualization is generally used on endpoint systems, making use of the local machine's resources (memory, CPU, etc.) to provide isolated user environments.

This document does not address virtualization on mobile devices (typically devices that use a baseband processor or connect to a cellular network), nor does it address application virtualization or containers.

1.3.1 TOE Boundary

The TOE boundary is the same as that which is defined for a Virtualization System in general. Refer to the base Virtualization PP for an outline of the TOE boundary.

1.4 Use Cases

Requirements in this PP-Module are designed to address the security problem in the following use cases.The description of these use cases provides examples for how the TOE and its Operational Environment could support the functionality required by this PP-Module.

[USE CASE 1] Locally Managed Client

A local administrator creates and runs one or more VMs locally. This client could be stand-alone or connected to a network.

[USE CASE 2] Enterprise Managed Client

An enterprise administrator for the VS centrally manages one or more client hypervisors, creating and configuring VMs which are then pushed to the clients. These VMs are then available for users on that client to run using the computing resources of that client. (Note that this is not Virtual Desktop Infrastructure where the hypervisors and the VMs run on remote servers. While both can be centrally managed and accessed from clients, for client virtualization, the VMs are local to the endpoint machine.)

[USE CASE 3] Headless Client

A VM is used by a program without direct human interaction.

2 Conformance Claims

Conformance Statement

This PP-Module inherits exact conformance as required from the Virtualization PP and as defined in the CC and CEM addenda for Exact Conformance, Selection-Based SFRs, and Optional SFRs (dated May 2017).

There are no other PP-Modules that are allowed to be specified in a PP-Configuration with this PP-Module.

CC Conformance Claims

This PP Module is conformant to Parts 2 (extended) and 3 (conformant) of Common Criteria Version 3.1, Release 5 [CC].

3 Security Problem Description

The security problem is described in terms of the threats that the TOE is expected to address, assumptions about its operational environment, and any organizational security policies that the TOE is expected to enforce.

3.1 Threats

This PP-Module defines no additional threats beyond those defined in the base Virtualization PP. Note however that the SFRs defined in this PP-Module will assist in the mitigation of the following threats defined in the base PP:

T.UNAUTHORIZED_UPDATE
See Virtualization PP, Section 3.1.

T.UNAUTHORIZED_ACCESS
See Virtualization PP, Section 3.1.

3.2 Assumptions

This PP-Module does not define any assumptions.

3.3 Organizational Security Policies

This PP-Module defines no additional Organizational Security Policies.

4 Security Objectives

4.1 Security Objectives for the TOE

This PP-Module defines no additional TOE security objectives beyond those defined in the base Virtualization PP. Note however that the SFR defined in this PP-Module will assist in the achievement of the following objectives defined in the base PP:

O.VMM_INTEGRITY
See Virtualization PP, Section 4.1.

O.MANAGEMENT_ACCESS
See Virtualization PP, Section 4.1.

4.2 Security Objectives for the Operational Environment

This PP-Module does not define any objectives for the Operational Environment. Because this Module does not define any additional assumptions or organizational security policies, there are no additional security objectives for the Operational Environment to satisfy.

4.3 Security Objectives Rationale

This section describes how the assumptions, threats, and organization security policies map to the security objectives.

Table 1: Security Objectives Rationale

Threat, Assumption, or OSP	Security Objectives	Rationale
T.UNAUTHORIZED_UPDATE	O.VMM_INTEGRITY	Integrity of a Virtualization System can be maintained by ensuring that the only way to modify the VS is through a trusted update process initiated by an authorized Administrator as required by FMT_MOF_EXT.
T.UNAUTHORIZED_ACCESS	O.MANAGEMENT_ACCESS	Access to management functions must be limited to authorized Administrators as managed through controls required by FMT_MOF_EXT.1.

5 Security Requirements

This chapter describes the security requirements which have to be fulfilled by the product under evaluation. Those requirements comprise functional components from Part 2 and assurance components from Part 3 of [CC]. The following conventions are used for the completion of operations:

- **Refinement** operation (denoted by **bold text** or ~~strikethrough text~~): is used to add details to a requirement (including replacing an assignment with a more restrictive selection) or to remove part of the requirement that is made irrelevant through the completion of another operation, and thus further restricts a requirement.
- **Selection** (denoted by *italicized text*): is used to select one or more options provided by the [CC] in stating a requirement.
- **Assignment** operation (denoted by *italicized text*): is used to assign a specific value to an unspecified parameter, such as the length of a password. Showing the value in square brackets indicates assignment.
- **Iteration** operation: is indicated by appending the SFR name with a slash and unique identifier suggesting the purpose of the operation, e.g. "/EXAMPLE1."

5.1 Virtualization PP Security Functional Requirements Direction

In a PP-Configuration that includes the Virtualization PP, the TOE is expected to rely on some of the security functions implemented by the Virtualization System as a whole and evaluated against the Base-PP. This section describes any modifications that the ST author must make to Base-PP SFRs to satisfy the required VS functionality.

5.1.1 Modified SFRs

This PP-Module does not modify any SFRs defined by the Virtualization PP.

5.2 TOE Security Functional Requirements

The following section describes the SFRs that must be satisfied by any TOE that claims conformance to this PP-Module. These SFRs must be claimed regardless of which PP-Configuration is used to define the TOE.

5.3 Auditable Events for Mandatory SFRs

Table2: Auditable Events for Mandatory SFRs

Requirement	Auditable Events	Additional Audit Record Contents
FMT_MOF_EXT.1	Attempts to invoke any of the management functions listed in Table 3	Success or failure of attempt Identity of actor

5.3.1 Security Management (FMT)

FMT_MOF_EXT.1 Management of Security Functions Behavior

FMT_MOF_EXT.1.1

The TSF shall be capable of supporting [**selection**: *local*, *remote*] administration.

Application Note: Selection of “remote” requires the selection-based requirement FTP_TRP.1 defined in the base PP to be included in the ST.

FMT_MOF_EXT.1.2

The TSF shall be capable of performing the following management functions, controlled by an Administrator or User as shown in Table 3, based on the following key:

Table 3: Client Virtualization Management Functions

X = Mandatory (TOE must provide that function to that role) O = Optional (TOE may or may not provide that function to that role) N = Not Permitted (TOE must not provide that function to that role) S = Selection-Based (TOE must provide that function to that role if the TOE claims a particular selection-based SFR)

Number	Function	Administrator	User	Notes (all SFR references are from the base Virtualization PP
1	Ability to update the Virtualization System	X	N	See FPT_TUD_EXT.1
2	[**selection**: *Ability to configure Administrator password policy as defined in FIA_PMG_EXT.1*, *Not applicable*.]	S	N	Must be selected if ST includes FIA_PMG_EXT.1.
3	Ability to create, configure and delete VMs	X	O	
4	Ability to set default initial VM configurations	X	O	
5	Ability to configure virtual networks including VM	X	O	See FDP_VNC_EXT.1
6	Ability to configure and manage the audit system and audit data	X	N	
7	Ability to configure VM access to physical devices	X	O	See FDP_PPR_EXT.1
8	Ability to configure inter-VM data sharing	X	O	See FDP_VMS_EXT.1 and FMT_MSA_EXT.1
9	Ability to enable/disable VM access to Hypercall functions	X	O	See FPT_HCL_EXT.1
10	Ability to configure removable media policy	X	O	See FPT_RDM_EXT.1
11	Ability to configure the cryptographic functionality	O	O	See FCS_CKM.1, FCS_CKM.2, and FCS_COP.1/HASH. See also, the Functional Packages for Transport Layer Security (TLS) and for Secure Shell (SSH) if claimed for methods to configure their respective cryptographic functionality.
12	Ability to change default authorization factors	X	N	See FIA_PMG_EXT.1
13	Ability to enable/disable screen lock	O	O	
14	Ability to configure screen lock inactivity	O	O	

	timeout			
15	Ability to configure remote connection inactivity timeout	X	N	
16	Ability to configure lockout policy for unsuccessful authentication attempts through [**selection**: *timeouts between attempts, limiting number of attempts during a time period*]	X	N	See FIA_AFL_EXT.1
17	[**selection**: *Ability to configure name/address of directory server to bind with, Not applicable*]	S	O	Must be selected if "directory-based" is selected anywhere in FIA_UAU.5.1 in the base Virtualization PP.
18	Ability to configure name/address of audit/logging server to which to send audit/logging records	X	N	See FAU_STG_EXT.1. Must be selected if "directory-based" is selected anywhere in FIA_UAU.5.1 in the base Virtualization PP.
19	Ability to configure name/address of network time server	X	O	
20	Ability to configure banner	X	N	See FTA_TAB.1
21	Ability to connect/disconnect removable devices to/from a VM	O	O	See FPT_RDM_EXT.1
22	Ability to start a VM	O	O	
23	Ability to stop/halt a VM	O	O	
24	Ability to checkpoint a VM	O	O	
25	Ability to suspend a VM	O	O	
26	Ability to resume a VM	O	O	
27	[**selection**: *Ability to configure action taken if unable to determine the validity of a certificate, Not applicable*]	S	N	This function must be selected if "allow the administrator to choose whether to accept the certificate in these cases" in FIA_X509_EXT.2.2 in the base PP.

Application Note: The ST author is expected to update Table 3 with an indication as to whether any of the ‘optional’ or ‘selection-based’ functions are included as part of the TOE. The ST author may also omit the ‘Notes’ column as it is provided in this PP-Module as an aid to the ST author in constructing the table.

This SFR addresses the roles of the CC Part 2 SFRs FMT_MOF.1, FMT_SMF.1, and FMT_SMR.2.

Administration is considered “local” if the Administrator is physically present at the machine on which the VS is installed.

Administration is considered “remote” if communications between the Administrator and the Management Subsystem travel on a network.

There is no requirement to authenticate Users of the Virtualization System. Users that have access to VMs but not to the Management Subsystem need not authenticate to the Virtualization System in order to use Guest VMs. Requirements for authentication of VM users is determined by the policies of the domains running within the Guest VMs.

For a VS where the OS is part of the platform and not part of the TOE, it is acceptable for the VS to invoke the Host OS screen lock.

Evaluation Activities

FMT_MOF_EXT.1:

5.4 TOE Security Functional Requirements Rationale

The following rationale provides justification for each security objective for the TOE, showing that the SFRs are suitable to meet and achieve the security objectives:

Table 4: SFR Rationale

OBJECTIVE	ADDRESSED BY	RATIONALE
O.VMM_INTEGRITY	FMT_MOF_EXT.1	Integrity of a Virtualization System can be maintained by ensuring that the only way to modify the VS is through a trusted update process initiated by an authorized Administrator as required by FMT_MOF_EXT.1.
O.MANAGEMENT_ACCESS	FMT_MOF_EXT.1	Access to management functions must be limited to authorized Administrators as managed through controls required by FMT_MOF_EXT.1.

6 Consistency Rationale

6.1 Protection Profile for Virtualization

6.1.1 Consistency of TOE Type

When this PP-Module is used to extend the Virtualization PP, the TOE type for the overall TOE is still a Virtualization System. The TOE boundary does not change.

6.1.2 Consistency of Security Problem Definition

The threats, assumptions, and OSPs defined by this PP-Module (see section 3.1) supplement those defined in the Virtualization PP as follows:

PP-Module Threat, Assumption, OSP	Consistency Rationale
T.UNAUTHORIZED_UPDATE	This threat applies to functionality that is described in the base PP, but is managed through functionality described in this PP-module.
T.UNAUTHORIZED_ACCESS	This threat applies to functionality that is described in the base PP, but is managed through functionality described in this PP-module.

6.1.3 Consistency of Objectives

The objectives for the TOEs are consistent with the Virtualization PP based on the following rationale:

PP-Module TOE Objective	Consistency Rationale
O.VMM_INTEGRITY	This objective comes directly from the PP.
O.MANAGEMENT_ACCESS	This objective comes directly from the PP.

6.1.4 Consistency of Requirements

This PP-Module identifies several SFRs from the Virtualization PP that are needed to support Client Virtualization Systems functionality. This is considered to be consistent because the functionality provided by the Virtualization PP is being used for its intended purpose. The rationale for why this does not conflict with the claims defined by the Virtualization PP are as follows:

PP-Module Requirement	Consistency Rationale
Modified SFRs	
This PP-Module does not modify any requirements when the Virtualization PP is the base.	
Mandatory SFRs	
FMT_MOF_EXT.1	This SFR requires the Client Virtualization product to manage security functionality defined in the Virtualization PP in FPT_TUD_EXT.1, FIA_PMG_EXT.1, FDP_VNC_EXT.1, FDP_PPR_EXT.1, FDP_VMS_EXT.1, FMT_MSA_EXT.1, FPT_HCL_EXT.1, FPT_RDM_EXT.1, FCS_CKM.1, FCS_CKM.2, FCS_COP.1/HASH, FIA_AFL_EXT.1, FAU_STG_EXT.1, FIA_X509_EXT.2.2, and FTA_TAB.1.
Optional SFRs	
This PP-Module does not define any Optional requirements.	
Selection-based SFRs	
This PP-Module does not define any Selection-based requirements.	
Objective SFRs	
This PP-Module does not define any Objective requirements.	
Implementation-Dependent SFRs	
This PP-Module does not define any Implementation-Dependent requirements.	

Appendix A - Optional SFRs

A.1 Strictly Optional Requirements

This PP-Module does not define any Optional SFRs.

A.2 Objective Requirements

This PP-Module does not define any Objective SFRs.

A.3 Implementation-Dependent Requirements

This PP-Module does not define any Implementation-Dependent SFRs.

Appendix B - Selection-based SFRs

This PP-Module does not define any selection-based SFRs.

Appendix C - Extended Component Definitions

This appendix contains the definitions for all extended requirements specified in the PP-Module.

C.1 Extended Components Table

All extended components specified in the PP are listed in this table:

Table 5: Extended Component Definitions

Functional Class	Functional Components
Security Management (FMT)	FMT_MOF_EXT Management of Security Functions Behavior

C.2 Extended Component Definitions

FMT_MOF_EXT Management of Security Functions Behavior

This family is defined in the Virtualization PP. This Module augments the extended family by adding one additional component, FMT_MOF_EXT.1.

Component Leveling

FMT_MOF_EXT.1, Management of Security Functions Behavior, defines required management functions and responsibilities.

Management: FMT_MOF_EXT.1

There are no additional management functions beyond those already described in FMT_MOF_EXT.1.

Audit: FMT_MOF_EXT.1

There are no auditable events defined for this SFR.

FMT_MOF_EXT.1 Management of Security Functions Behavior

Hierarchical to: No other components.

Dependencies to: No other dependencies.

FMT_MOF_EXT.1.1

The TSF shall be capable of supporting [**selection**: *local*, *remote*] administration.

FMT_MOF_EXT.1.2

The TSF shall be capable of performing the following management functions [**assignment**: *description of management functions*].

Appendix D - Entropy

The TOE does not require any additional supplementary information to describe its entropy source(s) beyond the requirements outlined in the ‘Entropy Documentation and Assessment’ section of the Base Virtualization PP. As with other base PP requirements, the only additional requirement is that the entropy documentation also applies to the specific Client Virtualization capabilities of the TOE in addition to the functionality required by the base PP.

Appendix E - Bibliography

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.
[VirtPP]	Protection Profile for Virtualization, Version: 1.1, 2020-11-17

Appendix F - Acronyms

Acronym	Meaning
Base-PP	Base Protection Profile
CC	Common Criteria
CEM	Common Evaluation Methodology
OE	Operational Environment
OS	Operating System
PP	Protection Profile
PP-Configuration	Protection Profile Configuration
PP-Module	Protection Profile Module
SAR	Security Assurance Requirement
SFR	Security Functional Requirement
ST	Security Target
TOE	Target of Evaluation
TSF	TOE Security Functionality
TSFI	TSF Interface
TSS	TOE Summary Specification
VM	Virtual Machine
VMM	Virtual Machine Manager
VS	Virtualization System