



Moving Picture, Audio and Data Coding
by Artificial Intelligence
www.mpai.community

MPAI Technical Specification

Governance of the MPAI Ecosystem (MPAI-GME)

V1

WARNING

Use of the technologies described in this Document may infringe patents, copyrights or intellectual property rights of MPAI Members or non-members.

MPAI and its Members accept no responsibility whatsoever for damages or liability, direct or consequential, which may result from the use of this Technical Specification.

Readers are invited to review Annex 2 - Notices and Disclaimers..

Governance of the MPAI Ecosystem

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1 Introduction (Informative)

In recent years, Artificial Intelligence (AI) and related technologies have been applied to a broad range of applications, have started affecting the life of millions of people and are expected to do so even more in the future. As digital media standards have positively influenced industry and billions of people, so AI-based data coding standards are expected to have a similar positive impact. Indeed, research has shown that data coding with AI-based technologies is generally *more efficient* than with existing technologies for, e.g., compression and feature-based description.

However, some AI technologies may carry inherent risks, e.g., in terms of bias toward some classes of users. Therefore, the need for standardisation is more important and urgent than ever.

The international, unaffiliated, not-for-profit MPAI – Moving Picture, Audio and Data Coding by Artificial Intelligence Standards Developing Organisation has the mission to develop *AI-enabled data coding standards*. MPAI Application Standards enable the development of AI-based products, applications, and services.

As a part of its mission, MPAI has developed standards operating procedures to enable users of MPAI implementations to make informed decision about their applicability. Central to this is the notion of Performance, defined as a set of attributes characterising a reliable and trustworthy implementation.

Therefore, to fully achieve the MPAI mission, Technical Specifications must be complemented by an ecosystem designed, created and managed to underpin the life cycle of MPAI standards through the steps of specification, technical testing, assessment of product safety and security, and distribution.

In the following, Terms beginning with a capital letter are defined in *Table 1* if they are specific to this Standard and in *Table 4* if they are common to all MPAI Standards.

The MPAI Ecosystem is fully specified in this document. It is composed of:

- MPAI as provider of Technical, Conformance and Performance Specifications.
- Implementers of MPAI standards.

- MPAI-appointed Performance Assessors.
- The MPAI Store which assigns Implementer identifiers (ImplementerID's) and distributes validated Implementations.
- Users of MPAI Standard Implementations.

Figure 1 depicts the MPAI-AIF Reference Model under which Implementations of MPAI Application Standards and user-defined MPAI-AIF conforming applications operate.

An AIF Implementation allows execution of AI Workflows (AIW), composed of basic processing elements called AI Modules (AIM).

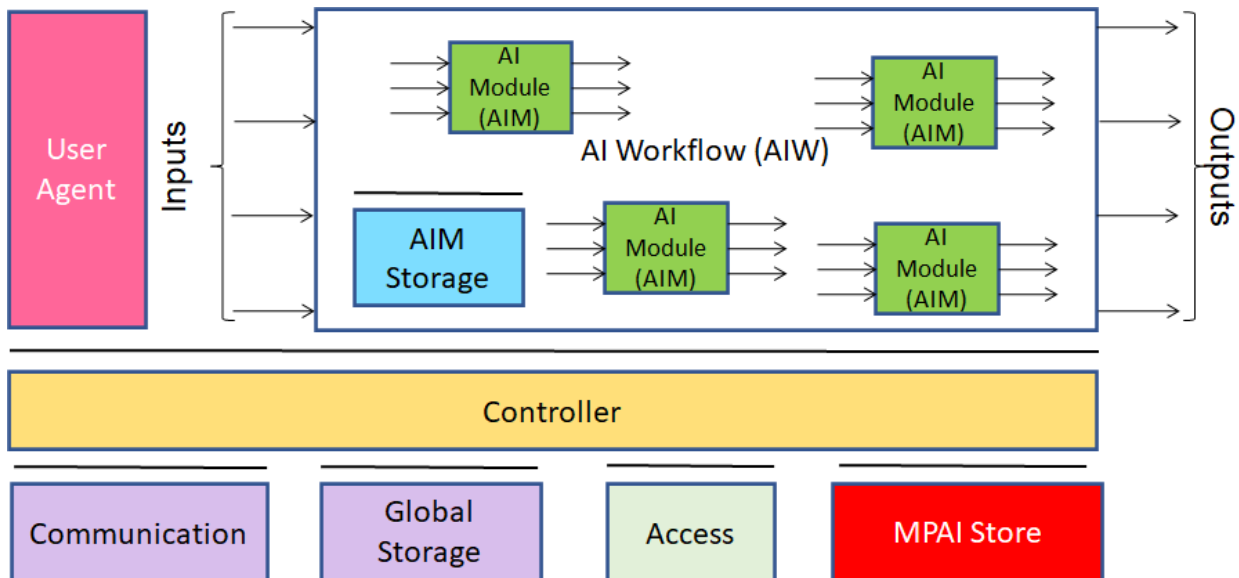


Figure 1 – The AI Framework (AIF) Reference Model and its Components

MPAI Application Standards normatively specify Syntax and Semantics of the input and output data and the Function of the AIW and the AIMs, and the Connections between and among the AIMs of an AIW.

In particular, an AIM is defined by its Function and data, but not by its internal architecture, which may be based on AI or data processing, and implemented in software, hardware or hybrid software and hardware technologies.

MPAI defines Interoperability as the ability to replace an AIW or an AIM Implementation with a functionally equivalent Implementation. MPAI also defines 3 Interoperability Levels of an AIW executed in an AIF:

Level 1 – Implementer-specific and satisfying the MPAI-AIF Standard.

Level 2 – Specified by an MPAI Application Standard.

Level 3 – Specified by an MPAI Application Standard and validated by Quality Validator.

MPAI offers Users access to the promised benefits of AI with a guarantee of increased transparency, trust and reliability as the Interoperability Level of an Implementation moves from 1 to 3.

The chapters and the annexes of this Technical Specification are Normative unless they are labelled as Informative.

2 Scope of this document

This document sets the rules governing the MPAI Ecosystem composed of:

1. *MPAI.*
2. *Implementers.*
3. *The MPAI Store.*

4. *Performance Assessors.*
5. *Users.*

3 Terms and definitions

The terms whose first letter is a capital letter used in this document are defined by *Table 1*.

Table 1 –Terms used in this document

Term	Definition
Accessory Technical Specification	A Technical Specification specifying how to assess the impact of functionalities additional to those specified in a Technical Specification.
AI Framework (AIF)	The environment where AIWs are executed.
AI Module (AIM)	A data processing element receiving AIM-specific Inputs and producing AIM-specific Outputs according to its Function. An AIM may be an aggregation of AIMs.
AI Workflow (AIW)	An aggregation of AIMs implementing a Use Case receiving AIM-specific inputs and producing AIM-specific inputs according to its Function.
Application-oriented Technical Specification	An MPAI Technical Specification designed to enable domain-specific applications.
Conformance	The attribute of an Implementation of being a technically correct reification of a Technical Specification.
Conformance Tester	An entity authorised by MPAI to Test the Conformance of an Implementation.
Conformance Testing Specification	The normative document specifying the Means to Test the Conformance of an Implementation.
Conformance Testing Means	Procedures, tools, data sets and/or data set characteristics to Test the Conformance of an Implementation.
Conformance Testing Specification	The Normative document specifying the Means to Test the Conformance of an Implementation.
Data Format	The standard digital representation of Data and their semantics.
Data Semantics	The meaning of Data.
Ecosystem	The ensemble of MPAI, MPAI Store, Implementers, Performance Assessors, and Users of Implementations enabling a market of Implementations with certified Interoperability Levels.
Explainability	The ability to trace the output of an Implementation back to the inputs that have produced it.
Fairness	The attribute of an Implementation describing to which extent the Implementation does not produce biased or unanticipated results.
Function	The operation of an AIW of an AIM on Input Data as specified by an Application-oriented Specification to produce Output Data.
Grade	The Performance of an Implementation measured against a scale specified in the relevant Performance Assessment Specification.
Implementation	1. An embodiment of the MPAI-AIF Technical Specification.

	<p>2. An embodiment of an AIW or AIM of a particular Interoperability Level.</p> <p>An Implementation shall carry an ImplementerID.</p>
Implementer	A legal entity implementing MPAI Technical Specifications.
ImplementerID (IID)	A unique name assigned by the ImplementerID Registration Authority to an Implementer.
ImplementerID Registration Authority (IIDRA)	The function within the MPAI Store to assign ImplementerID's to Implementers.
Interoperability	The ability to functionally replace an AIM or an AIW with another AIM having the same Interoperability Level.
Interoperability Level	<p>The attribute of an AIW and its AIMs to be executable in an AIF Implementation and to:</p> <ol style="list-style-type: none"> 1. Pass the AIF Conformance Testing (Level 1). 2. Pass the Conformance Testing (Level 2) of an Application Standard. 3. Pass the Performance Assessment (Level 3) of an Application Standard.
Means	The procedures, tools, data sets and/or the definition of suitable data sets used to Test the Conformance or Assess the Performance of an implementation.
Performance	The attribute of an Implementation to have Replicability, Robustness, Replicability, and Fairness.
Performance Assessment Specification	<p>The document that:</p> <ol style="list-style-type: none"> 1. Specifies the Means to Validate the Replicability of an Implementation. 2. Provides guidelines on how to assess Robustness, Replicability and Fairness of an Implementation.
Performance Assessment Means	Procedures, tools, data sets and/or data set characteristics to Assess the Performance of an Implementation.
Performance Assessor	An entity appointed by MPAI to assess that the Replicability of an Implementation is above Performance of an Implementation is above a Grade specified by a Performance Assessment Specification.
Profile	A particular subset of the technologies that are used in AIF, AIW or AIM and, where applicable, the classes, other subsets, options, and parameters relevant to that subset.
Reference Model	The AIMs and their Connections in an AIW.
Reference Software Specification	The Normative document specifying the characteristics of the associated Reference Software Implementation.
Reference Software Implementation	A technically correct software implementation of a Technical Specification containing source code, or source and compiled code.
Registration Authority	An entity assigning Identifier.
Reliability	The attribute of an Implementation that performs as specified by the Application Standard, profile and version the Implementation refers to, e.g., within the application scope, stated limitations, and for the period of time specified by the Implementer.
Replicability	The attribute of an Implementation describing to which extent its operation can be replicated, within an agreed level, by another user.
Reputation	The collection of reviews of an Implementation made by Users.

Robustness	The attribute of an Implementation describing to which confidence degree it can cope with data outside of its stated application scope.
Security Validation	The result of the application of the procedure specified in the MPAI-AIF Conformance Testing on an implementation.
Service Provider	An entrepreneur who offers an Implementation as a service (e.g., a recommendation service) to Users.
Standard	The ensemble of Technical Specification, Reference Software, Conformance Testing and Performance Assessment of an MPAI Standard.
Technical Specification	(Framework) the normative specification of the AIF. (Application) the normative specification of the set of AIWs belonging to an application domain along with the AIMs required to Implement the AIWs that includes: <ol style="list-style-type: none"> 1. The formats of the Input/Output data of the AIWs implementing the AIWs. 2. The Connections of the AIMs of the AIW. 3. The formats of the Input/Output data of the AIMs belonging to the AIW.
Topology	The set of AIM Connections of an AIW.
Use Case	A particular instance of the Application domain targeted by an Application Standard.
User	A user of an Implementation.
User Agent	The Component interfacing the User with an AIF through the Controller
Version	A revision or extension of a Standard or of one of its elements.

4 References

4.1 Normative references

The Governance of the MPAI Ecosystem normatively references the following Technical Specifications:

1. MPAI Technical Specification: AI Framework (MPAI-AIF) V1.1; <https://mpai.community/standards/resources/#AIF>.

4.2 Informative references

2. MPAI Technical Specification: Context-based Audio Enhancement (MPAI-CAE) V1.4; <https://mpai.community/standards/resources/#CAE>.
3. MPAI Technical Specification: Compression and Understanding of Industrial Data (MPAI-CUI); <https://mpai.community/standards/resources/#CUI>.
4. MPAI Technical Specification: Multimodal Conversation (MPAI-MMC) V1.2; <https://mpai.community/standards/resources/#MMC>.

5 Technical Documents produced by MPAI

The technical foundations of the MPAI Ecosystem are currently provided by the following documents developed and maintained by MPAI:

1. Technical Specification.
2. Reference Software Specification.
3. Conformance Testing.
4. Performance Assessment.

5. Technical Report

An MPAI Standard is a collection of the 5 document types. In some cases, a Standard may include only the first four or even only the first three.

5.1 Technical Specifications

Technical Specifications are of three types:

1. *System-oriented*: address the context in which Application-Oriented Technical Specifications are handled and executed:
 - a. This Technical Specification.
 - b. The AI Framework [1].
2. *Accessory*: specify how to assess the impact of functionalities additional to those specified in a Technical Specification.
3. *Application-oriented*: are container standards, e.g., [2], [3] and [4], specifying:
 - a. The Functions performed, and the Syntax and Semantics of the input and output data of AI Workflows (AIW) and the corresponding AI Modules (AIM).
 - b. The Topology and Connections of the AIMs.

Technical Specifications shall include:

1. Normative chapters:
 - a. Scope.
 - b. References.
 - c. Terms and Definitions.
 - d. Use Case Architectures.
 - e. AI Modules.
2. Normative Annexes
 - a. MPAI-wide terms and definitions.
 - b. Notices and disclaimers.
 - c. The Governance of the MPAI Ecosystem
 - d. Patent Declarations.
 - e. AIW and AIM Metadata (not required by System-oriented and Accessory Technical Specifications).

5.2 Reference Software Specifications

Reference Software Specifications specify the characteristics of the associated Reference Software Implementation composed of:

1. A source code implementation of the MPAI-AIF or a link to an implementation of MPAI-AIF downloadable from the MPAI website or the MPAI Store.
2. Optionally, a set of libraries for use by the Reference Software Implementation in a particular execution environment.
3. Implementations of AIWs and their AIMs.
4. Associated metadata of the AIFs, AIWs and their AIMs.
5. Documentation.

The Reference Software Implementation shall behave in a manner that is Conformant with the Technical Specification and is Normative in the sense that the computer code in the Software and the natural language in the Technical Specification specify equivalent functionalities.

The Reference Software Implementations of the AIMs composing the AIWs shall be made available in one or more than one of the following Software Forms:

1. Source code providing a satisfactory user experience and/or functionality.
2. Source code that provides a limited user experience, but sufficient to assess the value of the Technical Specification.
3. Compiled AIMs providing a satisfactory user experience and/or functionality.

4. Source code software wrapping access to a third-party service enabling a conforming AIM Implementation (Wrapper AIM).

The Reference Software Implementation need not claim that it has passed Performance Assessment.

The Reference Software Specification shall include:

1. Normative chapters:
 - a. Scope.
 - b. References.
 - c. Terms and Definitions.
 - d. Reference Software Architectures.
2. Normative Annexes
 - a. MPAI-wide terms and definitions.
 - b. Notices and disclaimers.
 - c. The Governance of the MPAI Ecosystem
 - d. Patent Declarations.

5.3 Conformance Testing Specifications

Conformance Testing Specifications allow a user to ascertain whether an implementation is a correct reification of a Technical Specification by using the Technical Specification and the Means included in the Conformance Testing Specification.

MPAI defines Interoperability as the ability to replace an AIW or an AIM Implementation with a functionally equivalent AIW or AIM Implementation and defines 3 Interoperability Levels of an AIW that executes an AIM:

Level 1 – Conforming to the MPAI-AIF Standard.

Level 2 – Conforming to the MPAI-AIF Standard and an Application-oriented Technical Specification.

Level 3 – Conforming to the MPAI-AIF Standard, and an Application-oriented Technical Specification, and assessed for Performance by a Performance Assessor.

The MPAI Store Tests the Conformance of a submitted implementation to properly label it as a Level 1, Level 2, or Level 3 Implementation, and making it available for Distribution.

Conformance Assessment Specifications shall include:

1. Normative chapters:
 - a. Scope.
 - b. References.
 - c. Terms and Definitions.
 - d. Definition of Conformance Assessment.
 - e. The Means to Test the Conformance of the relevant AIMs and AIWs.
2. Normative Annexes
 - a. MPAI-wide terms and definitions.
 - b. Notices and disclaimers.
 - c. The Governance of the MPAI Ecosystem.
 - d. Patent Declarations.

5.4 Performance Assessment Specifications

Performance Assessment Specifications allow Performance Assessors to assess the Performance of an Implementation.

The Performance Assessment Specification shall:

1. Define Reliability, and optionally Replicability, Robustness, and Fairness of an Implementation.
2. Include the Means used to carry out Performance Assessment for Reliability.

3. Optionally provide guidelines with respect to Replicability, Robustness, and Fairness of an Implementation.
4. Specify the minimum amount of information that an Implementer shall provide to the Performance Assessor regarding their Implementation.
5. Specify the nature and minimum amount of information that a Performance Assessor shall disclose to an Implementer in case the Performance Assessment has failed.

The MPAI Store may record results obtained through a publicly described methodology provided by external experts regarding Replicability, Robustness, and Fairness and post them alongside the metadata of an Implementation.

5.5 Technical Report

A technical description of the issues and possible solutions regarding an application area or implementation guidelines, etc.

6 The players of the MPAI Ecosystem

The MPAI Ecosystem is composed of the following cooperating entities:

1. *MPAI*
 - a. Acts as the root of trust of the MPAI Ecosystem.
 - b. Defines the rules of Governance.
 - c. Develops the 4 components of an MPAI Standard.
 - d. Establishes the MPAI Store.
 - e. Appoints Performance Assessors.
2. *MPAI Store*
 - a. Operates on a cost-recovery basis based on a mandate received from MPAI.
 - b. Identifies implementers of MPAI Standards (see Annex 4).
 - c. Establishes distribution agreements with Implementers.
 - d. Tests implementations submitted by implementers for:
 - i. Security Validation.
 - ii. Conformance with MPAI-AIF.
 - iii. Conformance with an Application-Oriented Technical Specification.
 - iv. Conformance with an Accessory Specification (if applicable).
 - e. May receive notifications from Performance Assessors.
 - f. Labels Implementations as:
 1. Level 1, if d.i and d.ii tests have been passed.
 2. Level 2, if d.iii tests have been passed.
 3. Level 3, if a Performance Assessor has notified that the Implementation has a Grade above the minimum level.
 - g. Posts software Implementations for download.
 - h. Manages a reputation system where the MPAI Store publishes report of their user experience of an Implementation, after moderation, if this becomes necessary.
 - i. Manages the Implementer ID Registration Authority (IIDRA).
 - j. The MPAI Store is a not-for-profit commercial organisation.
 - k. However, the MPAI Store may recover the costs (e.g., ICT infrastructure, personnel, consultants) deriving from MPAI Store operation from Implementers, Service Providers and Users.
3. *Implementers*
 - a. Obtain an Implementer ID (IID).
 - b. Make implementations.
 - c. Submit implementations to the MPAI Store.
 - d. May submit Implementations to Performance Assessors.

4. *Performance Assessors* assess the Grade of an Implementation.
 - a. May be implementers or qualified companies.
 - b. May not Assess the Performance of their Implementations if Implementers.
 - c. Are appointed for a particular domain and Performance category (Reliability, Replicability, Robustness, and Fairness) for an indefinite duration but MPAI may revoke the appointment.
 - d. May charge Implementers, Service Providers, and Users for their services.
 - a. The Performance Assessment process is confidential, unless the Implementor and the Assessor decide otherwise.

Table 2 gives the operations of the actors enabling the MPAI ecosystem to operate.

Table 2 – The actors of the MPAI ecosystem

Actor	Role
MPAI Store	<ol style="list-style-type: none"> 1. Independent commercial not-for-profit entity established by MPAI. 2. Assigns ImplementerID's to Implementers as ImplementerID Registration Authority. 3. Charges Implementers, Service Providers and Users on a cost recovery basis. 4. Receives Implementations from Implementers. 5. Tests Implementations submitted by Implementers for security and Conformance. 6. Receives results of Performance Assessment of Implementations from Performance Assessors. 7. AIWs and AIMs may be implementations of MPAI standards or independently developed but suitable to be executed in AIFs. 8. Assigns AIWs and AIMs to security experts for testing (either employees or consultants). 9. Receives commercial distribution licences of AIFs, AIWs and AIMs Implementations from Implementers. 10. Distributes to Service Providers and Users Implementations that are approved by security experts and Tested for Conformance after assigning: <ol style="list-style-type: none"> a. A Level 1 label to non-MPAI-specified AIWs and AIMs. b. A Level 2 label to AIWs and AIMs Conforming to an MPAI Application Standard. c. Assign a Level 3 label to AIWs and AIMs Conforming to an MPAI Application Standard and whose Performance has been Assessed. 11. Undertakes to make Implementations available through high availability ICT infrastructure.
Standard developer	An expert contributing to the development of MPAI Standards.
Implementer	An entity providing Implementations of AIFs, AIWs and AIMs.
Performance Assessor	An entity certified by MPAI to determine whether an AIW or AIM: <ol style="list-style-type: none"> 1. Conforms with one or more MPAI standards. 2. Offers a Performance Grade.
Security expert	An entity authorised by MPAI to develop tests establishing whether an AIF or an AIW or an AIM presents security issues.
Service Provider	An entity running AIWs e.g., a private or public cloud. A Service Provider does not acquire the right to redistribute Implementations.

End User	The ultimate beneficiary of the execution of AIWs. They may execute AIWs and AIMs in a local environment.
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7 The operation of the MPAI ecosystem

Figure 2 depicts the operation of the MPAI ecosystem.

TS Technical Specification
 RS Reference Software
 CT Conformance Testing
 PA Performance Assessment
 OK Passed

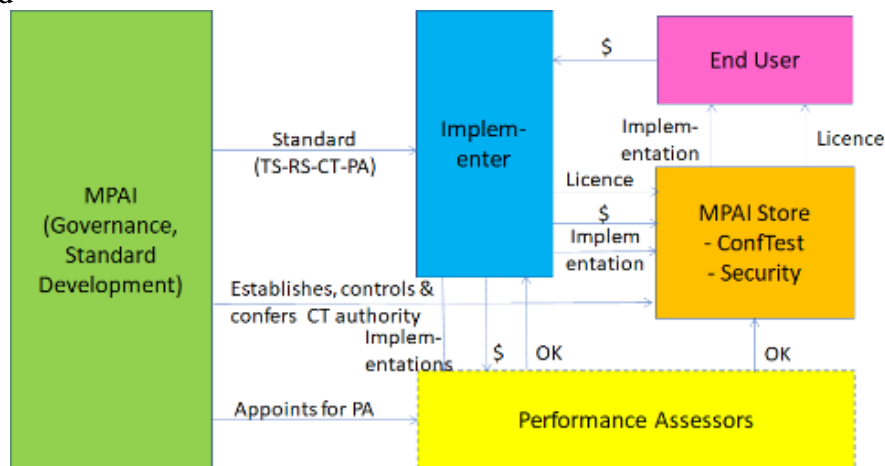


Figure 2 – The operation of the MPAI ecosystem

8 Data types

The data types proper of the MPAI ecosystem are

Table 3 – The data types of the MPAI ecosystem

Data type	Definition
Conformance data	Data developed by MPAI to test the Conformance of an Implementation. It is defined and its version is controlled by MPAI and freely accessible from the MPAI Store.
Performance data	Data developed or specified by MPAI to assess the Performance of an Implementation. It is version-controlled by MPAI and may be accessible from a qualified third party (e.g., a Performance Assessor).
Implementations	Software implementing AIF, AIWs and AIMs submitted by Implementers and <ol style="list-style-type: none"> 1. Verified for security issues by MPAI security experts. 2. Tested for Conformance by the MPAI Store. 3. Assessed for Performance upon request of Implementer. Implementations available on the MPAI Store can be commercial or non-commercial.
Licence	A token describing the rights of a User to an Implementation.

Annex 1 - MPAI-wide terms and definitions

The Terms used in this standard whose first letter is capital and are not already included in *Table 1* are defined in *Table 4*.

Table 4 – MPAI-wide Terms

Term	Definition
Access	Static or slowly changing data that are required by an application such as domain knowledge data, data models, etc.
AI Framework (AIF)	The environment where AIWs are executed.
AI Module (AIM)	A processing element receiving AIM-specific Inputs and producing AIM-specific Outputs according to according to its Function. An AIM may be an aggregation of AIMs.
AI Workflow (AIW)	A structured aggregation of AIMs implementing a Use Case receiving AIW-specific inputs and producing AIW-specific inputs according to its Function.
AIF Metadata	The data set describing the capabilities of an AIF set by the AIF Implementer.
AIM Metadata	The data set describing the capabilities of an AIM set by the AIM Implementer.
Application Programming Interface (API)	A software interface that allows two applications to talk to each other
Application Standard	An MPAI Standard specifying AIWs, AIMs, Topologies and Formats suitable for a particular application domain.
Channel	A physical or logical connection between an output Port of an AIM and an input Port of an AIM. The term “connection” is also used as a synonym.
Communication	The infrastructure that implements message passing between AIMs.
Component	One of the 9 AIF elements: Access, AI Module, AI Workflow, Communication, Controller, Internal Storage, Global Storage, MPAI Store, and User Agent.
Conformance	The attribute of an Implementation of being a correct technical Implementation of a Technical Specification.
Conformance Tester	An entity authorised by MPAI to Test the Conformance of an Implementation.
Conformance Testing	The normative document specifying the Means to Test the Conformance of an Implementation.
Conformance Testing Means	Procedures, tools, data sets and/or data set characteristics to Test the Conformance of an Implementation.
Connection	A channel connecting an output port of an AIM and an input port of an AIM.
Controller	A Component that manages and controls the AIMs in the AIF, so that they execute in the correct order and at the time when they are needed.
Data	Information in digital form.
Data Format	The standard digital representation of Data.

Data Semantics	The meaning of Data.
Device	A hardware and/or software entity running at least one instance of an AIF.
Ecosystem	The ensemble of the following actors: MPAI, MPAI Store, Implementers, Conformance Testers, Performance Testers and Users of MPAI-AIF Implementations as needed to enable an Interoperability Level.
Event	An occurrence acted on by an Implementation.
Explainability	The ability to trace the output of an Implementation back to the inputs that have produced it.
Fairness	The attribute of an Implementation whose extent of applicability can be assessed by making the training set and/or network open to testing for bias and unanticipated results.
Function	The operations effected by an AIW or an AIM on input data.
Global Storage	A Component to store data shared by AIMs.
Identifier	A name that uniquely identifies an Implementation.
Implementation	1. An embodiment of the MPAI-AIF Technical Specification, or 2. An AIW or AIM of a particular Level (1-2-3).
Implementer	A legal entity implementing MPAI Technical Specifications.
ImplementerID (IID)	A unique name assigned by the ImplementerID Registration Authority to an Implementer.
ImplementerID Registration Authority (IIDRA)	The function within the MPAI Store to assign ImplementerID's to Implementers.
Internal Storage	A Component to store data of the individual AIMs.
Interoperability	The ability to functionally replace an AIM/AIW with another AIM/AIW having the same Interoperability Level
Interoperability Level	The attribute of an AIW and its AIMs to be executable in an AIF Implementation and to be: 1. Implementer-specific and satisfying the MPAI-AIF Standard (<i>Level 1</i>). 2. Specified by an MPAI Application Standard (<i>Level 2</i>). 3. Specified by an MPAI Application Standard and certified by a Performance Assessor (<i>Level 3</i>).
Knowledge Base	Structured and/or unstructured information made accessible to AIMs via MPAI-specified interfaces
Message	A sequence of Records.
Normativity	The set of attributes of a technology or a set of technologies specified by the applicable parts of an MPAI standard.
Performance	The state of an Implementation of having at least one of the following attributes: Reliable, Robust, Fair, or Replicable.
Performance Assessment	The normative document specifying the procedures, the tools, the data sets and/or the data set characteristics to Assess the Grade of Performance of an Implementation.
Performance Assessment Means	Procedures, tools, data sets and/or data set characteristics to Assess the Performance of an Implementation.
Performance Assessor	An entity authorised by MPAI to Assess the Performance of an Implementation in a given Application domain
Port	A physical or logical communication interface of an AIM.

Profile	A particular subset of the technologies used in MPAI-AIF or an AIW of an Application Standard and, where applicable, the classes, other subsets, options and parameters relevant to that subset.
Record	Data with a specified structure.
Reference Model	The AIMs and their Connections in an AIW.
Reference Software	A technically correct software implementation of a Technical Specification containing source code, or source and compiled code.
Reliability	The attribute of an Implementation that performs as specified by the Application Standard, profile and version the Implementation refers to, e.g., within the application scope, stated limitations, and for the period of time specified by the Implementer.
Replicability	The attribute of an Implementation whose Performance, as Assessed by a Performance Assessor, can be replicated, within an agreed level, by another Performance Assessor.
Robustness	The attribute of an Implementation that copes with data outside of the stated application scope with an estimated degree of confidence.
Scope	The domain of applicability of an MPAI Application Standard.
Service Provider	An entrepreneur who offers an Implementation as a service (e.g., a recommendation service) to Users.
Specification	A collection of normative clauses.
Standard	The ensemble of Technical Specification, Reference Software, Conformance Testing and Performance Assessment of an MPAI application Standard.
Technical Specification	(Framework) the normative specification of the AIF. (Application) the normative specification of the set of AIWs belonging to an application domain along with the AIMs required to Implement the AIWs that includes: <ol style="list-style-type: none"> 1. The formats of the Input/Output data of the AIWs implementing the AIWs. 2. The Connections of the AIMs of the AIW. 3. The formats of the Input/Output data of the AIMs belonging to the AIW.
Testing Laboratory	A laboratory accredited by MPAI to Assess the Grade of Performance of Implementations.
Time Base	The protocol that specifies how AIF Components can access timing information.
Topology	The set of AIM Connections of an AIW.
Use Case	A particular instance of the Application domain target of an Application Standard.
User	A user of an Implementation.
User Agent	The Component interfacing the user with an AIF through the Controller
Version	A revision or extension of a Standard or of one of its elements.
Zero Trust	A cybersecurity model primarily focused on data and service protection that assumes no implicit trust.

Annex 2 - Notices and Disclaimers Concerning MPAI Standards (Informative)

The notices and legal disclaimers given below shall be borne in mind when [downloading](#) and using approved MPAI Standards.

In the following, “Standard” means the collection of four MPAI-approved and [published](#) documents: “Technical Specification”, “Reference Software” and “Conformance Testing” and, where applicable, “Performance Testing”.

Life cycle of MPAI Standards

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Annex 3 - The Governance of the MPAI Ecosystem (Informative)

Level 1 Interoperability

With reference to *Figure 1*, MPAI issues and maintains a standard – called MPAI-AIF – whose components are:

1. An environment called AI Framework (AIF) running AI Workflows (AIW) composed of interconnected AI Modules (AIM) exposing standard interfaces.
2. A distribution system of AIW and AIM Implementation called MPAI Store from which an AIF Implementation can download AIWs and AIMs.

A Level 1 Implementation shall implement the MPAI-AIF Technical Specification executing AIWs composed of AIMs able to call the MPAI-AIF APIs.

Implementers' benefits	Upload to the MPAI Store and have globally distributed Implementations of
	- AIFs conforming to MPAI-AIF.
	- AIWs and AIMs performing proprietary functions executable in AIF.
Users' benefits	Rely on Implementations that have been tested for security.
MPAI Store's role	- Tests the Conformance of Implementations to the relevant MPAI Technical Specifications ¹ .
	- Verifies Implementations' security, e.g., absence of malware.
	- Indicates unambiguously that Implementations are Level 1.

Level 2 Interoperability

In a Level 2 Implementation, the AIW must be an Implementation of an MPAI Use Case and the AIMs must conform with an MPAI Application Standard.

Implementers' benefits	Upload to the MPAI Store and have globally distributed Implementations of
	- AIFs conforming to MPAI-AIF.
	- AIWs and AIMs conforming to MPAI Application Standards.
Users' benefits	- Rely on Implementations of AIWs and AIMs whose Functions have been reviewed during standardisation.
	- Have a degree of Explainability of the AIW operation because the AIM Functions and the data Formats are known.
Market's benefits	- Open AIW and AIM markets foster competition leading to better products.
	- Competition of AIW and AIM Implementations fosters AI innovation.
MPAI Store's role	- Tests Conformance of Implementations with the relevant MPAI Technical Specifications ² .
	- Verifies Implementations' security.
	- Indicates unambiguously that Implementations are Level 2.

Level 3 Interoperability

MPAI does not generally set standards on how and with what data an AIM should be trained. This is an important differentiator that promotes competition leading to better solutions. However, the

¹ At the time of this publication, MPAI has promoted the establishment of the MPAI Store, an entity in charge of distributing implementations checked for security and tested for conformance to ensure that Users can assemble and operate AIWs. This information is given for the convenience of users of this standard and does not constitute an endorsement of the implementations downloaded from the MPAI Store. Equivalent products may be used but they will be outside of the MPAI Ecosystem.

² See footnote 1.

performance of an AIM is typically higher if the data used for training are in greater quantity and more in tune with the scope. Training data that have large variety and cover the spectrum of all cases of interest in breadth and depth typically lead to Implementations of higher “quality”. For Level 3, MPAI normatively specifies the process, the tools and the data or the characteristics of the data to be used to Assess the Grade of Performance of an AIM or an AIW.

- Implementers’ benefits - May claim their Implementations have passed Performance Assessment.
- Users’ benefits - Get assurance that the Implementation being used performs correctly, e.g., it has been properly trained.
- Market’s benefits - Implementations’ Performance Grades stimulate the development of more Performing AIM and AIW Implementations.
- MPAI Store’s role - Verifies the Implementations’ security
- Indicates unambiguously that Implementations are Level 3.

The MPAI ecosystem

The following **Error! Not a valid bookmark self-reference.** is a high-level description of the MPAI ecosystem operation applicable to fully conforming MPAI implementations:

1. MPAI establishes the not-for-profit MPAI Store (Step 1).
2. MPAI appoints Performance Assessors (Step 2).
3. MPAI publishes Standards (Step 3).
4. Implementers must request ImplementerID’s from the MPAI Store (Step 4) to be Interoperable with other Implementations that are part of the Ecosystem. The IID registration process is established and managed by the MPAI Store.
5. Implementers may submit Implementations to Performance Assessors (Step 5).
6. Performance Assessors Assess Performance and inform Implementers and the MPAI Store if the Implementation Performance is acceptable (Step 6).
7. Implementers submit Implementations to the MPAI Store (Step 7).
8. The Store verifies security and Tests Conformance of the Implementation.
9. Users download Implementations (Step 8).
10. Users may send reviews of their experience to the MPAI Store (Step 9) who publishes the reviews.

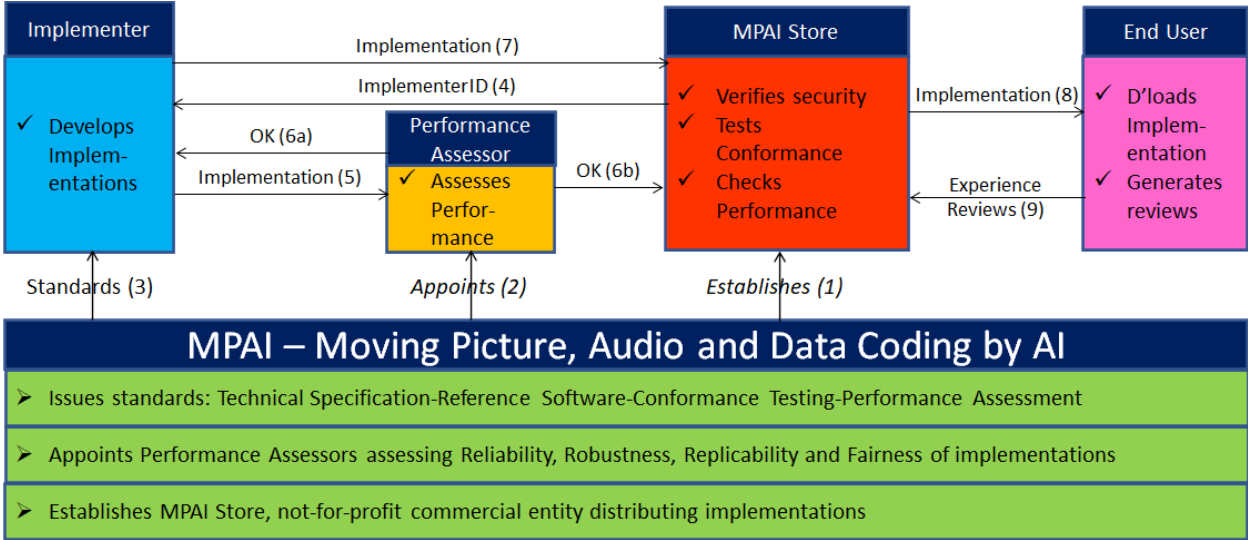


Figure 3 – The MPAI ecosystem operation

Implementers shall obtain an ImplementerID (IID) from the ImplementerID Registration Authority (IIDRA). The IIDRA is managed by the MPAI Store. An Implementer is allowed to obtain only one IID. That IID shall be unique in the MPAI Ecosystem.

MPAI is not involved in the IIDRA. The MPAI Store executes its IIDRA role based on an agreement between MPAI and the MPAI Store that sets the MPAI Store's obligations, including the IID registration process and ImplementerID syntax.

Annex 4 - The ImplementerID Registration Authority

An Implementation shall carry an identifier as specified in [1].

The implementation identifier includes an implementer identifier (ImplementerID) which is assigned by the ImplementerID Registration Authority (IIDRA) function of the MPAI Store according to a process designed to ensure that the entity requesting an identifier is unambiguously identified.

The ImplementerID is represented by a string and designed to ensure that:

1. The ImplementerID is unique in the MPAI Ecosystem.
2. An entity submitting an implementation to the MPAI Store is unambiguously identified as the holder of an ImplementerID and that the submitted implementation carries that ImplementerID.

The IIDRA is a function of the MPAI Store which operates on the basis of an Agreement between MPAI and the MPAI Store defining “the rights and obligations of the MPAI Store vis a vis MPAI in the execution of its mission” and “the rights and obligations of MPAI vis a vis the MPAI Store in recognition of the MPAI Store’s role in the MPAI ecosystem.”