CNS 國家標準草案：教材與學習管理系統溝通之資料模型

(IEEE 1484.11.1—IEEE Standard for Learning Technology—Data Model for Content to Learning Management System Communication)

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研譯

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規劃與建置數位內容與數位生活應用之技術標準環境

(案號：1D15960125-20)

Data Model for Content to Learning Management System Communication

目錄

1.適用範圍

1.1 範圍

本標準旨在描述一資料模型，用以支援已協同的資料元件及其值能於學習相關教材物件及執行時期服務(RTS)之間進行交換；其中並未指定教材物件和執行時期服務(RTS)間的溝通方法，也未說明任一學習環境組件在接收資料時應如何以可區分的型式予以回應。本標準值基於美國航空工業電腦輔助訓練委員會(Aviation Industry CBT Committee，以下簡稱 AICC)於「電腦管理教學(Computer Managed Instruction，以下簡稱 CMI) 互通性指引(3.5版)」[B1]中所定義的相關資料模型。為了平衡現有實作與新措施所需之技術修正間的兩者需求，本標準選擇性地包含：(1) CMI 規格中普為實作的資

料元件；(2)重新命名取自 CMI 規格中的資料元件, 以闡明日後使用的意義；(3)修改 CMI 規格中資料元件的資料類型, 以映現 ISO 標準資料類型和國際化的需求；(4)去除 AICC 獨有、非一般實用且於 CMI 規格中用以群組資料元件的若干組織結構；(5)介紹一些 CMI 規格中未提及的資料元件, 以改正已知的技術不足。

This Standard describes a data model to support the interchange of agreed upon data elements and their values between a learning-related content object and a runtime service (RTS) used to support learning management. This Standard does not specify the means of communication between a content object and an RTS nor how any component of a learning environment shall behave in response to receiving data in the form specified. This Standard is based on a related data model defined in “Computer Managed Instruction (CMI) Guidelines For Interoperability,” version 3.5 [B1], by the Aviation Industry CBT Committee (AICC). To balance the need to support existing implementations with the need to make technical corrections and support emerging practice, this Standard selectively includes those data elements from the CMI specification that are commonly implemented, renames some data elements taken from the CMI specification to clarify their intended meaning, modifies the data types of data elements taken from the CMI specification to reflect ISO standard data types and internationalization requirements, removes some organizational structures used in the CMI specification to group data elements that are specific to the AICC community of practice and not generally applicable, and introduces some data elements not present in the CMI specification to correct known technical deficiencies in data elements taken from that specification.

1.2 目標

眾所周知，AICC「電腦管理教學互通性指引(3.5 版)」[B1]中所定義的教材物件溝通之資料模型，已廣為應用於學習管理系統。本標準的目的在建立一致性，解釋不明確的意義，並補足學習相關教材物件與學習管理執行時期服務(RTS)的交換缺陷。

There is widespread acknowledgement that the data model for content object communication defined in the AICC “Computer Managed Instruction (CMI) Guidelines for Interoperability,” version 3.5 [B1], has broad applicability to systems used for learning management. The purpose of this Standard is to build consensus around, resolve ambiguities in, and correct defects in the AICC data model for the data exchanged between learning-related content objects and an RTS used to support learning management.

2.用語釋義

2.1 定義

下述係用語及其定義，其中未定義者可參照 IEEE 官方辭典的標準辭彙。

2.1.1 教材物件(content object)：學習技術系統呈現給學習者大量的數位內容，可能包括學習素材和處理碼。例如：教材物件可能是具有嵌入式影像剪輯，與符合 IEEE 1484.11.2™-2003 標準之 ECMAScript 的 HTM L 網頁。

備考：想知道更多 IEEE 1484.11.2-2003 標準的資訊，請看[B3]。

2.1.2 依實作定義 (implementation defined)：指出實作者應定義與記載程式圖、資料值、運轉性能的修正構想。當此實作的資料值或運轉性能被設計成每一可變或客製的系統實例，實作者應將其變化的本質和程度加以

文件化。

2.1.3 互動(interaction)：從學習者到教材物件之間，經確認且可記錄的輸入或輸入群組。

2.1.4 啟動(launch)：傳遞教材物件給學習者。

2.1.5 學習者(learner)：在學習技術系統上取得知識或技能的獨立個體。

2.1.6 學習者嘗試(learner attempt)：學習者藉由歷程追蹤(tracked effort)來滿足使用教材物件從事學習活動之需要。此可能跨越了一或甚多的學習者交談時間(learner session)，也可能中止於兩個學習者交談時間。參閱：學習者交談時間。

備考：學習者嘗試始於最初交談時間之起始，並持續到該活動終止。

2.1.7 學習者交談時間(learner session)：學習者不停存取(accessing)教材物件的期間。參閱：學習者嘗試。

2.1.8 學習管理系統(learning management system (LMS))：提供註冊學習者如後功能的電腦系統：表列學習資源，控管和引導學習過程，分析和報告學習者表現，以及安排和追蹤學習者。參閱：執行時期服務(RTS)。

備考：學習管理系統的部分實作同樣擁有啟動及傳遞內容之能力，而這些功能為本標準視作執行時期服務。

2.1.9 執行時期服務(runtime service, RTS)：管控學習內容製作和傳遞的軟體，可能提供的服務包括資源配置(allocation)、排程、輸入輸出控制、及資料管理等。參閱：學習管理系統。

2.1.10 分數(score)：敘述量表上的一個數值或一點。一個分數可能是一位學習者測驗的結果。

2.2 縮寫

AICC	美國航空工業電腦輔助訓練委員會(Aviation Industry CBT Committee)
CMI	電腦管理教學 (computer managed instruction)
IANA	網際網路地址指派機構(Internet Assigned Numbers Authority)

LMS	學習管理系統(learning management system)
RTS	執行時期服務(runtime service)
SPM	最小允許上限值 (smallest permitted maximum)
URI	通用資源識別符(Uniform Resource Identifier)
URN	通用資源名稱(Uniform Resource Name)

3. Definitions, acronyms, and abbreviations

3.1 Definitions

For purposes of this Standard, the following terms and definitions apply. *The Authoritative Dictionary of IEEE Standards Terms* [B2] should be referenced for terms not defined in this Clause.

3.1.1 content object: A collection of digital content that is intended for presentation to a learner by a learning technology system. It may include learning material and processing code. *Example:* A content object might be an HTML page with an embedded video clip and an ECMAScript component written in accordance with IEEE Std 1484.11.2™-2003.

NOTE—For more information on IEEE Std 1484.11.2-2003, see [B3].5

3.1.2 implementation defined (adj.): An indication that the implementation provider shall define and document the requirements for correct program constructs and correct data of a value or behavior. When the value or behavior in the implementation is designed to be variable or customizable on each instantiation of the system, the implementation provider shall document the nature and permissible ranges of this variation.

3.1.3 interaction: A recognized and recordable input or group of inputs from a learner to a content object.

3.1.4 launch (v.): To cause a content object to be delivered to a learner.

3.1.5 learner: An individual engaged with a learning technology system to acquire knowledge or skills.

3.1.6 learner attempt: A tracked effort by a learner to satisfy the requirements of a learning activity that uses a content object. It may span one or more learner sessions and be suspended between learner sessions.

See also: learner session.

NOTE—The learner attempt begins with the beginning of the first learner session and continues until the learning activity terminates.

3.1.7 learner session: An uninterrupted period of time during which a learner is accessing a content object.

See also: learner attempt.

3.1.8 learning management system (LMS): A computer system that may include the capabilities to register learners, schedule learning resources, control and guide the learning process, analyze and report learner performance, and schedule and track learners. See also: runtime service.

NOTE—Some implementations of learning management systems also have the ability to launch and deliver content. For this Standard, these capabilities are known as a runtime service.

3.1.9 runtime service (RTS): Software that controls the execution and delivery of learning content and that may provide services such as resource allocation, scheduling, input–output control, and data management.

See also: learning management system.

3.1.10 score: A numerical value or a point on a descriptive scale. A score may be the result of a learner assessment.

3.2 Acroynms and abbreviations

AICC	Aviation Industry CBT Committee

CMI	computer managed instruction
IANA	Internet Assigned Numbers Authority
LMS	learning management system
RTS	runtime service
SPM	smallest permitted maximum
URI	Uniform Resource Identifier
URN	Uniform Resource Name

3.參考標準

以下是本標準應用的必要參考文件。有日期的文獻，僅引版本為證；無日期的文獻則列出含任何修正的最新版參考文件。

IETF RFC 2396 Uniform Resource Identifiers (URI): Generic Syntax.

ISO 639-1 Codes for the representation of names of languages—Part 1: Alpha-2 code.

ISO 639-2 Codes for the representation of names of languages—Part 2: Alpha-3 code.

ISO 3166-1 Codes for the representation of names of countries and their subdivisions—Part 1: Country codes.

ISO 8601：2000 Data elements and interchange formats – Information interchange – Representation of dates and times

ISO/IEC 646：1991 Information technology-ISO 7-bit coded character set for information interchange.

ISO/IEC10646-1 Information technology—Universal Multiple-Octet Coded Character Set (UCS)—Part 1: Architecture and Basic Multilingual Plane.

ISO/IEC 11404：1996 Information technology-Programming languages, their environments and system software interfaces-Language-independent datatypes

4.符合性

本標準的符合程度將在第4.1節至第4.6節中探討。

在本標準中，「應」指實作的必要條件；「不應」則指禁止。

Conformance to this Standard is discussed in 4.1 – 4.6.

In this Standard, “shall” is to be interpreted as a requirement on an implementation; “shall not” is to be interpreted as a prohibition.

4.1 資料實例(data instance)

每一個符合的資料實例皆「應」為第6.1 節中所定義的資料模型實例。

4.2 發傳端實作(sending implementation)

每一個符合發送端實作「應」傳送符合此標準的資料實例。

4.3 接收端實作(receiving implementation)

每一個符合接收端實作「應」接受符合此標準的資料實例。

4.4 儲存庫實作(repository implementation)

一個符合儲存庫的實作「應」依要求接受、儲存和提供符合此標準的資料實例。

4.5 依實作定義值(implementation-defined value)

本標準在處理及含意上未詳細說明的值(例如：標兵值(sentinel)、遺漏值及空值。

即為已定義的實作值。

備考：舉例來說，繫結(binding)、應用設定檔(application profile)、實作，都能指定特定資料元件之預設值(default values)或標兵值。應用設定檔能詳細說明無它值時，對程式的預設值是正常的。

4.6 最小允許上限值(smallest permitted maximum values)

本標準將包含紀錄袋、陣列、集合(set)及字元串(character string)資料類型的資料元件定義為 SPM 值。對此資料元件而言，符合此標準的接收端實作或儲存庫實作，應接受並處理至少數個或多量由 SPM 為元件所詳細定義的進入或字元。

備考：1. SPM 值的目的為適用於大多數的實例。

2. 在此，「處理」(processing)的含意需依應用性質而定。

3. 本標準並未定義傳送系統如何或是否能決定，接收系統能否處理一個超出 SPM 值的特殊資料元件。

4.1 Data instances

A conforming data instance shall be an instance of the data model as defined in 6.1.

4.2 Sending implementations

A conforming sending implementation shall send data instances that conform to this Standard.

4.3 Receiving implementations

A conforming receiving implementation shall accept data instances that conform to this Standard.

4.4 Repository implementations

A conforming repository implementation shall accept, store, and provide data that conform to this Standard upon request.

4.5 Implementation-defined values

The processing and meanings of values that are not specified by this Standard (e.g., sentinel, missing, and empty values) are implementation-defined.

NOTE—For example, bindings, application profiles, or implementations may specify the processing or meanings of default values or sentinel values for specific data elements. An application profile might specify that in the absence of another value, the default value for mode is normal.

4.6 Smallest permitted maximum values

This Standard defines SPM values for data elements with data types that include bag, array, set, and characterstring. For these data elements, a receiving implementation or a repository implementation that conforms to this Standard shall accept and process at least that number of entries or characters

specified by the SPM for the element and may accept and process a larger number.

NOTES

1—The intent is for the SPM values to cover most cases.

2—In this subclause, the meaning of “processing” is dependent on the nature of the application.

3—This Standard defines no provisions for how and whether a sending system can determine whether a receiving system can process more than the SPM for a particular data element.

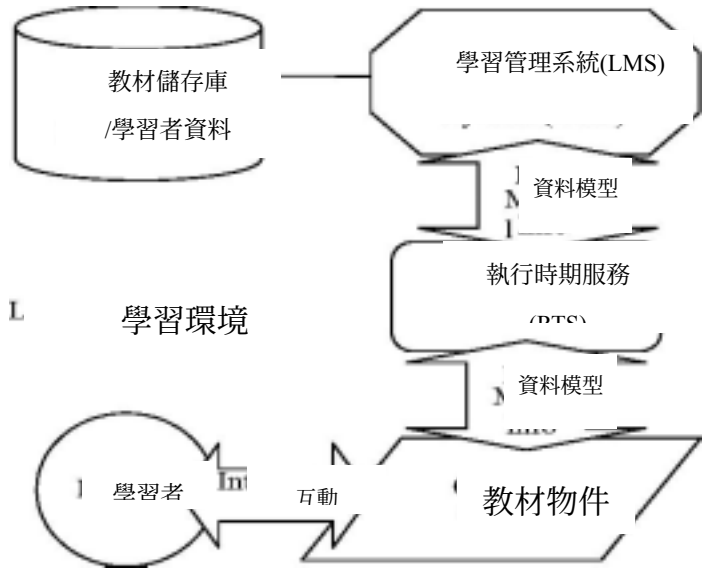
5.概念模型

使用本標準的概念模型如圖 1 所示, 為學習者於學習環境中與教材物件互動, 而教材物件能透過 RTS 依次從 LMS 取得學習者資訊。

當學習者與教材物件互動時, 教材物件會收集透過 RTS 傳給 LMS 的學習者表現資訊。

其他的概念模型可能會使用到資料模型, 即使圖 1 的概念模型包含了不需利用資料模型的 RTS 和 LMS, 此設計之概念模型僅用來描述資料模型的一種可能使用方式。

圖 1-概念模型圖

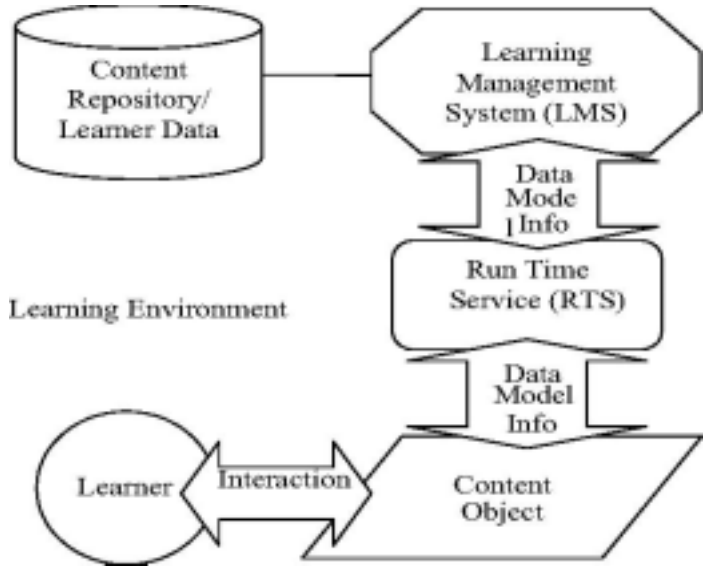


In one conceptual model for the use of this Standard, shown in Figure 1, the learner interacts with a content object in the learning environment. The content object may require information about the learner. It acquires this information through an RTS, which, in turn, gets the information from an LMS.

As the learner interacts with the content object, the content object may gather information on the learner's performance. This information is passed to the RTS, which passes it on to the LMS.

Other conceptual models exist that may use the data model. Although this conceptual model includes an RTS and an LMS, they are not required for the use of the data model. This conceptual model is designed to describe only one possible use of the data model.

Figure 1—Conceptual model diagram



6.資料模型

此段定義一個資料模型，使教材物件自 RTS 獲得資訊以執行預期的功能，並且使 RTS 自教材物件獲得資訊以適當地管理教材物件，此資料模型描述了傳給或得自教材物件的資訊。

本標準並無詳述資訊如何、何時及流往何方，也未細指資料的持續性，多久被寫入或修改，或被誰建立或破壞。

若無註明，資料實例中的任何「紀錄」是非必要的。

備考 1. 第 6.1 節和第 6.2 節概要中 ISO/IEC 11404 標記法的用途僅在描述目的，ISO/IEC 11404 定義中的完整實作並未要求一致。

2. ISO/IEC 11404 標記法描述遍及所有繫結之非獨立性語言的資料類型(例如：資料類型本身的實作，它的子類型、子類別及特定化)。舉例來說，一個 ISO/IEC 11404 之「陣列」可能被實作成 SQL 表格 (因為 SQL 表格支援陣列所需要的索引)；一個 ISO/IEC 11404 之「態」可能被實作成 C 語言位元攔；一個 ISO/IEC 11404 之「字元串」可以任何編碼來實作(如 ISO 646，ASCII，ISO 8859-1， UTF-8，UTF-16，UTF-32 等)，支援字元串資料類型之參數中詳載的全部功能。

3. 第 6.1 節和第 6.2 節的所有例子屬參考性用途，並不批註任何特定繫

結。

4. ISO/IEC 11404 定義的非獨立性語言資料類型，包括：陣列、紀錄袋、字元串、選取、實數、集合、態、時間、區間時間。
5. 第 6.1 節及第 6.2 節概要中所使用的資料元件和資料類型標記化僅供參考，實作不需用到確切相同的表格，只要資料元件與資料類型語義上相同。建議使用拼字標記化的實作於和本標準相似的明註拼字。
6. 本標準未定義資料模型的延伸機制，實作可以為教材物件溝通產生額外的資料模型。此類額外的資料模型可用來擴大資料模型，以支援不同群體間的溝通。

This Clause defines a data model that a content object can use for obtaining information from an RTS to enable the content object to perform its expected functions and that an RTS can use for obtaining information from a content object to enable the RTS to manage the content object properly. The data model provides a description of the information that may pass to and from the content object.

This Standard does not specify how, when, or in which direction the information may flow. In addition, this Standard does not specify persistence of the data, how often it may be written or rewritten, or by whom it may be created or destroyed.

Unless noted otherwise, all components of “records” are optional in a data instance.

NOTES

1—The use of ISO/IEC 11404 notation in the synopses in 6.1 and 6.2 is for descriptive purposes only. A complete implementation of the operations defined in ISO/IEC 11404 is not required for conformance.

2—The ISO/IEC 11404 notation describes the semantics of the language-independent data types across all bindings(e.g., implementation of

a data type as itself, its subtypes, its subclasses, and its specializations). For example, an ISO/IEC 11404 “array” may be implemented as an SQL table (because SQL tables support indexing, a requirement for arrays); an ISO/IEC 11404 “state” may be implemented as a C programming language bit field; an ISO/IEC 11404 “characterstring” may be implemented in any encoding (e.g., ISO 646, ASCII, ISO 8859-1, UTF-8, UTF-16, UTF-32, etc.) that supports the repertoire specified in the parameter for the characterstring data type.

3—All examples in 6.1 and 6.2 are informative and do not endorse any particular binding.

4—The following language-independent data types are defined in ISO/IEC 11404: array, bag, characterstring, choice, real, record, set, state, time, and timeinterval.

5—The data element and data type labels used in the synopses in 6.1 and 6.2 are for reference only. Implementations are not required to use the exact same labels, as long as the data elements and data types are semantically equivalent. It is recommended that implementations use spellings for labels similar to the spellings specified in this Standard.

6—This Standard does not define an extension mechanism for the data model. Implementers may create additional data models for content object communications. Such additional data models may be used to augment this data model to support different communities of practice.

6.1 教材物件溝通

(1) 概要(Synopsis)

content_object_communication :

```
record
(
  comments_from_learner :
     array(0..249) of comment_type,
          // the SPM for the array is 250
  comments_from_lms :
     array(0..99) of comment_type,
        // the SPM for the array is 100
  completion_status :
     completion_status_type,
  completion_threshold :
     real(10,7) range(0..1),
  credit :
     state( credit, no_credit ),
  data_model_version :
     characterstring(iso-10646-1),
        // SPM: 250 characters
  entry :
     state( ab_initio, resume, _nil_ ),
  exit :
     state( timeout, suspend, logout, normal, _nil_ ),
  interactions :
     bag of interaction_type,
        // SPM: 250 interaction_type records in the bag
  launch_data :
     characterstring(iso-10646-1),
        // SPM: 4000 characters
  learner_id :
     long_identifier_type,
  learner_name :
     localized_string_type(250),
        // the parameter value is the SPM
  learner_preference_data :
     learner_preference_type,
  lesson_status :
     state( passed, completed, failed, incomplete, browsed,
       not_attempted ),
```

```
    location :
      characterstring(iso-10646-1),
        // SPM: 1000 characters
    max_time_allowed :
      timeinterval(second,10,2),
    mode :
      state( browse, normal, review ),
    objectives :
      set of objective_type,
        // SPM: 100 objective_type records in the bag
    progress_measure :
      progress_measure_type,
    raw_passing_score :
      real(10,7),
    scaled_passing_score :
      real(10,7) range(-1..1),
    score :
      score_type,
    session_time :
      timeinterval(second,10,2),
    success_status :
      success_status_type,
    suspend_data :
      characterstring(iso-10646-1),
        // SPM: 4000 characters
    time_limit_action :
      state( exit_message, continue_message, exit_no_message,
          continue_no_message ),
    total_time :
      timeinterval(second,10,2),
),
```

(2) 描述

教材物件溝通(content_object_communication)的要件已定義於第 6.1.1 節至第 6.1.27 節，基於方向、目標溝通的目的，一個教材物件溝通的實例應包括零個或更多已定義要件。

The components of content_object_communication are defined in 6.1.1 – 6.1.27. Depending on the direction, destination, and purpose of the communication, an instance of content_object_communication shall include zero or more of the defined components.

6.1.1 學習者評論(Comments from learner)

(1) 概要(Synopsis)

comments_from_learner :

array(0..249) of comment_type,

// the SPM for the array is 250

(2) 描述

此資料元件值由學習者評論(Comments from learner)而來，第6.2.1節中定義了評論類型(comment_type)。

備考：1. 此資料元件值提供有關教材物件的回饋, 或是隨著教材物件而來的特定學習經驗 回饋。根據其他目的使用此資料元件可能會有相反的影響。

2. 本標準未指定收集評論的機制。

The values of this data element are comments from the learner.

Subclause 6.2.1 defines comment_type.

NOTES

1—The values of this data element are intended to provide feedback about the content object or the learning experience with the content object from a specific learner. Using this data element for other purposes may adversely affect interoperability.

2—This Standard does not specify the mechanism for collecting comments.

6.1.2 LMS評論(Comments from LMS)

(1) 概要(Synopsis)

comments_from_lms :

array(0..99) of comment_type,

// the SPM for the array is

100

(2) 描述

此資料元件值是學習者用來評論及註解的，第 6.2.1 節中定義了評論類型。

備考：1. 此資料元值提供有關教材物件的回饋，或是隨著教材物件而來的特定學習經驗回饋。根據其他目的使用此資料元件可能會有相反的影響。

2. 本標準未指定收集評論的機制。

The values of this data element are comments and annotations intended to be made available to the learner.

Subclause 6.2.1 defines comment_type.

NOTES

1—The values of this data element are intended to provide information about the content object or the learning experience with the content object. Using this data element for other purposes may adversely affect interoperability.

2—This Standard does not specify the mechanism for collecting comments.

6.1.3 完成狀態(Completion status)

(1) 概要(Synopsis)

completion_status :

completion_status_type,

(2) 描述

此資料元件值指出學習者是否已經完成教材物件，第 6.2.2 節中定義了完

成狀態類型(completion_status_type)。

備考：本標準並未指定如何形成完成狀態，有可能由教材物件來記述，透過 RTS 與進展測量的門檻比較、依據目標集的外部代理人(如教師)、或是由其他工具或方法來形成完成狀態。

The value of this data element indicates whether the learner has completed the content object. Subclause 6.2.2 defines completion_status_type.

NOTE—This Standard does not specify how to determine completion_status. It may be reported by a content object, determined by an RTS by comparing a progress measure with a threshold, determined on the basis of objectives set by an outside agent (e.g., an instructor), or determined by some other means.

6.1.4 完成門檻(Completion threshold)

(1) 概要(Synopsis)

completion_threshold :

real(10,7) range(0..1),

(2) 描述

資料元件值是學習者完成教材物件的進展測量所參照的值，作為是否決定完成教材物件的對照。

備考：完成的門檻(completion_threshold)係同時與進展測量使用的(參照第 6.1.19 節)。舉例而言，如果一個教材物件的完成門檻是 0.85，一位學習者所達到的進展測量是 0.9，則完成狀態的完成 (參照第 6.1.3 節)會分派教材物件學習者。然而，本標準沒有指定或需要 RTS、教材物件或任何系統組件，或對完成門檻(completion_threshold)做解釋或採取行動。

The value of this data element is a value against which the measure of the progress the learner has made toward completing the content object can be compared to determine whether the content object should be considered completed.

NOTE—The completion_threshold is designed to be used in conjunction with the progress_measure (see 6.1.19). For example, if the completion_threshold for a content object is 0.85 and a learner achieves a progress_measure of 0.90, a completion_status of

completed(see 6.1.3) may be assigned to that content object for that learner. However, this Standard does not specify or require that an RTS, content object, or any other system component, interpret or take action in response to a completion_threshold.

6.1.5 學分(Credit)

(1) 概要(Synopsis)

credit :

state(credit, no_credit),

(2) 描述

此資料元件值指出，學習者是否因於教材物件中的表現而獲學分。此資料元件應有下述的任一允許值：

(a) credit：學習者獲得教材物件的學分。

(b) no_credit：學習者無法獲得教材物件的學分。

備考：本標準未指定如何決定學分的值或它所賦予的學分意義。

The value of this data element indicates whether the learner will be credited for performance in this content object. This data element shall have one of the following permissible values:

— credit: The learner is taking the content object for credit.

— no_credit: The learner is taking the content object for no credit.

NOTE—This Standard does not specify how to determine the value of credit or what it means to give credit for performance.

6.1.6資料模型版本(Data model version)

(1) 概要(Synopsis)

data_model_version :

characterstring(iso-10646-1

),

// SPM: 250 characters

(2) 描述

此資料元件值指出，本標準所定義的資料模型版本，此值應由包含較大和較小整數的釋放值(如1.0)所構成。較小釋放值後出現的任一字元應以句點 “. ” 與較小釋放值隔開。本標準無指定較小釋放值後的字元語法及語義。

此版標準的較大版本數是「1」，較小版本數是「0」，因此前三個字元值應是「1.0」。據此，一個實作可能附加額外的字元給資料元件值，前四個字元應是「1.0.」。

The value of this data element indicates the version of the data model defined in this Standard. The value shall consist of a period-delimited string containing major and minor release values as whole numbers, for example, “1.0”. Any characters appearing after the minor release value shall be separated from the minor release value by a period (“.”). The syntax and semantics of any characters following the minor release value are not specified by this Standard.

For this edition of this Standard, the major version number shall be “1” and the minor version number shall be “0”. Therefore, the first three characters of the value shall be “1.0”.

An implementation may append additional characters to the value of this data element, in which case, the first four characters shall be “1.0.”.

6.1.7 進入(Entry)

(1) 概要(Synopsis)

entry :

state(ab_initio, resume, _nil_),

(2) 描述

此資料元件值顯示學習者是否事先存取教材物件的資訊，此資料元件應有下述的任一允許值：

(a) ab_initio：指出學習者在整個學習者嘗試期間都沒有存取教材物件。

(b) resume：指出(1)學習者在目前學習者嘗試期間，有存取教材物件，以及(2)退出，而退出的資料元件有懸置值(參照第6.1.8節)。

(c) _nil_：指出其餘所有的條件，並無先前存取，或無特定進入的條件。

備考：如果進入值是resume，係指任一位置(location)或可能包含儲存於先前或與學習者連線期有關的懸置資料(分別參照第 6.1.15 節至第 6.1.25 節)。

The value of this data element is information that asserts whether the learner has previously accessed the content object. This data element shall have one of the following permissible values:

— ab_initio: Indicates that the learner has not accessed the content object during the current learner attempt.

— resume: Indicates that (1) the learner has previously accessed the content object during the current learner attempt, and (2) upon exiting, the exit data element had the value suspend (see 6.1.8).

— _nil_: Indicates all other conditions. There is no knowledge of previous access, or no specific entry condition is indicated.

NOTE—If the value for entry is resume, it indicates that either location or suspend_data may contain data stored in a previous learner session that is relevant to resuming the learner session (see 6.1.15 and 6.1.25, respectively).

6.1.8 退出(Exit)

(1) 概要(Synopsis)

exit :

state(timeout, suspend, logout, normal, _nil_),

(2) 描述

此資料元件的值指出學習者如何或為何離開教材物件; 此資料元件應有下

列其中一個可允許的值：

(a) timeout：教材物件終止，因為最大允許時間(max_time_allowed)所標定的期限已被超越 (參照第 6.1.16 節)。

(b) suspend：學習者帶著重返的意圖退出教材物件。

(c) logout：教材物件標誌一個要求終止該物件所屬整個學習活動的信號。

(d) normal：教材物件正規地退出。

(e) _nil_：退出的情況未確定。

The value of this data element indicates how or why the learner left the content object. This data element shall have one of the following permissible values:

— timeout: The content object terminated because the time limit specified by max_time_allowedhad been exceeded (see 6.1.16).

— suspend: The learner exited the content object with the intent of returning to it.

— logout: The content object signaled a desire to terminate the entire learning activity of which the content object is a part.

— normal: The content object exited normally.

— _nil_: The exit conditions are undetermined.

6.1.9 互動(Interactions)

(1) 概要(Synopsis)

interactions :

bag of interaction_type,

// SPM: 250 interaction records in the bag

type interaction_type =

```
record
(
        i d :
            long_identifier_type,
        type :
            state( true_false, multiple_choice, fill_in,
                long_fill_in, likert, matching, performance,
                sequencing, numeric, other ),

       objectives_id :
            array(0..9) of long_identifier_type,
            // the SPM for the array is 10
        time_stamp :
                date_time_type,
        correct_responses :
                correct_responses_type,
        weighting :
                real(10,7),
        learner_response :
                learner_response_type,
        result :
                choice
                (
                    state( result_state, numeric ),
                )
                of
```

```
(
   result_state :
        state( correct, incorrect, unanticipated,
              neutral ),
   numeric :
        real(10,7),
),
latency :
     timeinterval(second,10,2),
description :
     localized_string_type(250),
        // the parameter value is the SPM
),
```

(2) 描述

此資料元件的值所定義的資訊與為測量或評價目的所行之互動(interaction)有關，互動類型(interaction_type)紀錄中的一個例子應包括一個互動的識別符(參照第 6.1.9.1 節)。如果例子中包括任何一個正確回應(correct_responses)或學習者回應(learner_response)，則此例子應包括類型(type) (參照第 6.1.9.2 節)。所有其他的組件都是都是可選擇的。

互動類型組件的定義在第 6.1.9.1 節至第 6.1.9.10 節。

備考：1.互動用於答覆內容開發者想要記錄的個別問題或任務，本標準沒有指定互動資料如何被記錄或做解釋。

2.互動資料模型包含符合一個有限互動類型之集合的資料元件，但它並無支援不連續的學習者事件登錄。

3.本標準沒有指定互動如何被顯示或被表達。

4.本標準沒有指定互動如何在一個問題中被分群(例如，一個問題中的單個或

多個互動)。

5.互動資料的主要目的是傳達關於互動物件狀態的資訊，例如一個測試項目，一個模擬或教材物件的其它互動特徵，互動資料或許也會用來傳達互動事件，但此情況中，只有帶有該事件特定資訊之資料元件會被傳達。

The values of this data element define information pertaining to an interaction for the purpose of measurement or assessment. An instance of an interaction_type record shall include an interaction identifier (see 6.1.9.1). If an instance includes either correct_responses or learner_response, then the instance shall include type (see 6.1.9.2). All other components are optional.

The components of interaction_type are defined in 6.1.9.1 – 6.1.9.10.

NOTES

1—Interactions are intended to be responses to individual questions or tasks that the content developer wants to record. This Standard does not specify how interaction data are to be recorded, used, or interpreted.

2—The interactions data model includes data elements that correspond to a limited set of interaction types, but it does not support logging of discrete learner events.

3—This Standard does not specify how interactions are presented or rendered.

4—This Standard does not specify how interactions are grouped in a question (i.e., one or multiple interactions per question).

5—The primary intent of interaction data is to communicate information about the status of an interaction object, such as a test item, a simulation, or another interactive feature of the content object. Interaction data also may be used to communicate interaction events as they occur, but in that case, only the data elements that carry information specific to the event should be communicated.

6.1.9.1 識別符(ID)

(1) 概要(Synopsis)

id :

long_identifier_type,

(2) 描述

此資料元件的值是一個互動的標記，此標記在教材物件範圍裡至少必須唯一。

第 6.2.6 節定義了長識別符類型(long_identifier_type)。

備考：本標準沒有指定ID如何被創建、分派或解析。

The value of this data element is a label for the interaction. This label shall be unique at least within the scope of the content object.

Subclause 6.2.6 defines long_identifier_type.

NOTE—This Standard does not specify how IDs are created, assigned, or resolved.

6.1.9.2 類型(Type)

(1) 概要(Synopsis)

type :

state(true_false, multiple_choice, fill_in, long_fill_in,

likert, matching, performance, sequencing, numeric,

other),

(2) 描述

此資料元件的值指出何種類別的互動被記錄在一個互動實例裡，它也用來決定互動的答覆應該要如何做解釋，此資料元件應有下列其中一個可允許的值。內容開發者也可使用其他來創建延伸的類型。

(a) true_false：此互動有兩個可能的答覆，例如“對或錯”、“是或否”及“同意或不同意”。

(b) multiple_choice：此互動有一組兩個或多個可能的答覆，此互動類型會被用在學習者只有一個選項做選擇的互動及學習者能夠選擇多於一個選項的互動。

(c) fill_in：此互動需要學習者提供一個一或多個字元串類型的簡短答覆。

備考：典型的狀況，正確答覆是由字的一部份、一個字或一些字所組成的。

(d) long_fill_in：此互動需要學習者提供一個長字元串類型的答覆。

備考：1. 典型的狀況，正確答覆是一個句子、段落或短作文，但是長作文的格式也是可以的。

2. 典型的狀況，互動被表現如同一個查問的形式，學習者必須分析並藉由一個指定長度之書寫答案來做回答，例如一個短或長的論說文。

(e) likert：此互動要求學習者在一個標度內的選項集合中進行選擇。

備考：本標準沒有指定選項的數目，標度，或標度的意義。例如：一個典型答覆的標度有五個由“非常不同意”到“非常同意”的選項。

(f) matching：此互動由兩組項目所組成，第一組的成員與第二組中零或多個成員相關。答覆此互動需要學習者在第一組成員與第二組成員之間指出配對者。

(g) performance：此互動需要學習者完成一個需多個步驟的任務，例如：此任務是一個變更汽車引擎火星塞的模擬，模擬包括六個步驟：1.脫下塞子的橡皮靴；2.旋出火星塞；3.使替代的塞子豁裂成一個特定的尺寸；4.旋上要更換的；5.用一個12尺磅的扳手使塞子沿軸轉動；及6.把靴子推回原處。

(h) sequencing：此互動需要學習者為列表中的成員識別出邏輯順序，例如：學習者可能會被要求依時間前後的順序來放置一系列的事件，或依照它們的重要性來排列一組項目。

(i)numeric：此互動需要一個學習者數值的回應。

(j)other：任何其它類型的互動在此標準中都未被定義，當其他的互動類型時，正確回應及學習者回應資料元件之值的語義和結構都沒有在此標準中被定義(分

別參照第 6.1.9.5 節和第 6.1.9.7 節)。

備考：當互動類型是其它，資訊標示此延伸類型應該內含正確回應及學習者回應資料元件之值，例如，其可能採取字首字串的類型來傳達這些值。

The value of this data element indicates which category of interaction is recorded in an instance of an interaction. It is also used to determine how the interaction response should be interpreted. This data element shall have one of the following permissible values. The content developer may create extended types using other.

— rue_false: The interaction has two possible responses. *Examples*: “True or False,” “Yes or No,” and “Agree or Disagree.”

— multiple_choice: The interaction has a set of two or more possible responses. This interaction type can be used for interactions in which the learner selects just one choice and for interactions in which the learner can select more than one choice.

— fill_in: The interaction requires the learner to supply a short response in the form of one or more strings of characters. Note: Typically, the correct response consists of part of a word, one word, or a few words.

— long_fill_in: The interaction requires the learner to supply a response in the form of a long string of characters. Notes: (1) Typically, the correct response is a sentence, paragraph, or short composition, but long composition forms are also possible. (2) Typically, the interaction is presented as an examination statement the learner must analyze and respond to by creating a written answer of a specified length, such as a short or long essay.

— likert: The interaction asks the learner to select from a discrete set of choices on a scale. Note: This Standard does not specify the number of choices, the scale, or the meaning of the scale. Example: A typical response

scale has five choices ranging from “strongly disagree” to “strongly agree.”

— matching: The interaction consists of two sets of items. Members of the first set are related to zero or more members of the second set. Responding to the interaction requires the learner to indicate matches between members of the first set and members of the second set.

— performance: The interaction requires the learner to perform a task that requires multiple steps. Example: The task is a simulation for the changing of a spark plug on an automobile engine involving six steps: (1) pull off the rubber boot from the plug, (2) unscrew the spark plug, (3) gap the replacement plug to a specific dimension, (4) screw in the replacement, (5) torque the plug using a torque wrench set to 12 foot-pounds, and (6) push the boot back on.

— sequencing: The interaction requires the learner to identify a logical order for the members of a list. Example: The learner may be asked to place a series of events in chronological order or to rank a group of items by the order of their importance.

— numeric: The interaction requires a numeric response from the learner.

— other: Any other type of interaction not defined by this Standard. The semantics and structure of the correct_responses and learner_response data element values are not defined by this Standard when the interaction type is other (see 6.1.9.5 and 6.1.9.7, respectively). Note: When the interaction type is other, information identifying this extended type should be embedded in the correct_responses and learner_response data element values. For example, this may take the form of a prefix in the string used to communicate those values.

6.1.9.3 目標ID (Objectives ID)

(1) 概要(Synopsis)

objectives_id :

array(0..9) of long_identifier_type,

// the SPM for the array is 10

(2) 描述

此資料元件的值是對與互動有關聯之目標(參照第 6.1.18 節)的標記，此標記在教材物件範圍裡至少必須唯一。
第 6.2.6 節定義了長識別符類型(long_identifier_type)。
備考：此標準沒有指定目標 ID 如何被創建、分派或解析。

The values of this data element are labels for objectives (see 6.1.18) associated with the interaction. The labels shall be unique at least within the scope of the content object.

Subclause 6.2.6 defines long_identifier_type.

NOTE—This Standard does not specify how objective IDs are created, assigned, or resolved.

6.1.9.4時戳(Time stamp)

(1) 概要(Synopsis)

time_stamp :

date_time_type,

(2) 描述

此資料元件的值是學習者互動及回應之互動有效啟動的瞬間，第 6.2.3 節定義了資料時間類型(date_time_type)。

備考：1. 本標準沒有指定如何獲得時戳值。

2. 如果數個互動同時提出，它們有相同的時戳值，對回應而言，若一個互動從未有效，例如一個互動未被用在一個適合的測驗裡，則無有效的互

動時戳值。

3. 如果一個時戳值在一個互動中有效，但無有效的學習者回應的資料，其應該被假定該互動對學習者有效但是學習者沒有回應。

The value of this data element is the point in time at which the interaction was first made available to the learner for learner interaction and response.

Subclause 6.2.3 defines date_time_type.

NOTES

1—This Standard does not specify how the time_stamp value is obtained.

2—If several interactions are presented at the same time, they have the same time_stamp value. If an interaction was never available for response, such as an interaction that is not used in an adaptive test, no time_stamp value is available for that interaction.

3—If a time_stamp value is available for an interaction but no learner response data are available, it should be assumed that the interaction was made available to the learner but the learner did not respond.

6.1.9.5 正確回應(Correct responses)

(1) 概要(Synopsis)

```
correct_responses :
    correct_responses_type,

type correct_responses_type =
    choice
    (
        state( true_false, multiple_choice, fill_in, long_fill_in,
```

```
    likert, matching, performance, sequencing, numeric,
    other ),
  )
of
  (
true_false :
  state( true,
  false ),
multiple_choic
  e :
  set of set of short_identifier_type,
      // set of set SPM: 10 sets
      // set of short_identifier_type SPM: 36
      // short identifiers
fill_in :
  bag of record
      // SPM: 5
  records
  (


  case_matters :
          boolean,
      order_matt
  ers :
          boolean,
      match_text
```

```
:
        array(0..9) of localized_string_type(250),
            // the SPM for the array is 10
            // the parameter value is the SPM for the
            // localized string

),
long_fill_in :
    bag of record
        // SPM: 5 records
(
 case_matters :
      boolean,
 match_text :
      localized_string_type(4000),
          // the parameter value is the SPM
),
likert :
    short_identifier_type,
matching :
     bag of bag of record
         // outer bag SPM: 5 inner bags
         // each inner bag SPM: 36 records
(
       source :
           short_identifier_type,
```

```
        target :
            short_identifier_type,
    ),
    performance :
        bag of record
            // SPM: 5 records
    (
        order_matters :
            boolean,
        answers :
            array(0..124) of record
            // the SPM for the array is 125
            (
                step_name :

short_identifier_type,
                step_answer :
                    choice
                    (
                        state( literal, numeric ),
                    )
                    of
                    (
                        literal :
                            characterstring(iso-10646-1),
                                // SPM: 250 characters
```

```
                                numeric :
                                    record
                                    (
                                        min :
                                            real(10,7),
                                        max :
                                            real(10,7),
                                    ),
                                ),
                            ),
                        ),
    sequencing :
            bag of array(0..35) of
    short_identifier_type,
                // bag SPM: 5 arrays
                // the SPM for the array is 36
    numeric :
    record
    (
        min :
            real(10,7),
        max :
            real(10,7),
    ),
other :
        characterstring(iso-1046-1),
```

// SPM: 4000 characters

),

(2) 描述

此資料元件的值表示對互動的正確回應, 此資料元件應具有十個可能變型中的一個, 這些變型對應於下面描述的情況, 內容開發者可能運用其他方式來創建延伸的類型。

數個回應類型支援多於一個的正確回應, 對這些類型來說, 正確回應的列表(紀錄袋)要被提供, 一個正確回應可能需要多個輸入。對這些回應來說, 輸入的收集要被提供。

(a) true_false：一個包含真值與假值的狀態, 真值的狀態意味正確的或在特定情境脈絡中相等的正確(例如：同意、是)。假值的狀態意味不正確的或在特定情境脈絡中相等的不正確(例如：不同意、不)。

(b) multiple_choice：一個集合包含一或多個短識別符集合, 任何一個短識別符集合滿足一個正確回應的需求。如果存在多於一個的正確回應時多個集合可能會被定義。一個短識別符集合可能包含零或多個識別符, 對一個正確回應而言, 其全部被需要。每一個短識別符都代表一個預期中的選擇。如果一的短識別符集合是空的, 便代表此正確回應並無選擇。例如：(1)一個單一選擇可能被允許：“alpha”。(2)多個選擇的集合可能被允許：“alpha ”、“bravo ”、 “charlie” 及 “alpha” 、“bravo ”、 “delta”。

(c) fill_in：一可允許重覆值之紀錄袋, 紀錄袋包含一或多個紀錄, 其中任何一個都滿足一個正確回應的需求。每一個紀錄由一個定位字串的陣列和兩個旗標構成。定位字串代表一個正確回應。

case_matters 旗標指出字串的案例是否被用來評估回應的正確性。如果旗標的值是真的(true), 則次序具有關係, 及學習者回應的次序應會被用來評估回應的正確性。如果旗標的值是假的(false), 則次序不會具有關係, 及學習者回應的次序不應被用來評

估回應的正確性。如果 case_matters 未被指定，則假定是假的(false)。order_matters 的旗標指出對一個正確回應輸入的次序是否具有關係。如果旗標的值是真的(true)，則次序具有關係，及學習者回應的次序應會被用來評估回應的正確性。如果旗標的值是假的(false)，則次序不會具有關係，及學習者回應的次序不應被用來評估回應的正確性。如果 order_matters 未被指定，則假定為真的(true)。

(d) long_fill_in：一可允許重覆值之紀錄袋，此紀錄袋包含一或多個紀錄，其中任何一個都滿足對一個正確回應的必要條件。每一個紀錄都包括一個定位字串和一個旗標。定位字串代表一個正確回應。旗標指出此字串的案例是否被用來評估學習者回應的正確性。如果旗標的值是真的(true)，此學習者回應的案例應符合正確回應。如果旗標的值是假的(false)，則此學習者回應的案例應無法被用來評估回應。如果 case_matters 未被指定，則假定為假的(false)。

備考：儘管一個對 long_fill_in 的正確回應可以被指定，一個 long_fill_in 回應的評估典型的包括一個解釋的過程，此解釋過程是在此標準範圍之外的。

(e) likert：一個符合標度內其中一個選擇的短識別符。

備考：儘管一個對 likert 正確回應可以被指定，likert 互動典型的不包括正確回應。

(f) matching：多袋紀錄袋，單個 outer 紀錄袋包含一或多個 inner 記錄袋，每一個 inner 紀錄袋包括一或多個紀錄，如果超過一個的 inner 紀錄袋存在時，任何一個 inner 紀錄袋滿足對一個正確回應的必要條件。如果超過一個紀錄被一個 inner 紀錄袋所包含，則所有的紀錄都被由 inner 紀錄袋具體指定的正確回應所需要。每一個紀錄都是一對代表一個預期中對應輸入的短識別符。每一個正

確回應都是由一個來源和一個標的配對構成，每一個來源和每一個標的應由一個短識別符所代表。用在來源和標的中短識別符的範圍應會是互動，相同的短識別符可能出現在超過一個來源－標的的配對中。

(g) performance：一可允許重覆值之紀錄袋，此紀錄袋包含一或多個紀錄，其中任一個都滿足對正確回應的必要條件，每一個紀錄都包含一個旗標與一個陣列。陣列代表一個正確回應的集合，order_matters 旗幟指出輸入的次序是否對正確回應具有關係。如果旗標的值是真的(true)，對學習者回應的次序應被用來評估回應的正確性。如果旗標的值是假的(false)，則對學習者回應的次序不應無法用來評估回應的正確性。如果 order_matters 未被指定，則假定為真的(true)。每一個正確回應包含一個 name 和任何一個單一文字值(literal value)或一個數值範圍(numeric range)。如果正確回應被表示成一個單一文字值(literal value)，本標準沒有指定如何用此值來評估符合的答覆。如果正確回應被表示成一個數值範圍(numeric range)，學習者在指定值域的範圍內的回應應被審判為正確的。

(h) sequencing：一短識別符陣列之紀錄袋，此紀錄袋包含一或多個陣列，其中任何一個都滿足對正確回應的必要條件。每一個陣列代表對一個正確回應的一連串零或多個短識別符，當互動被呈現給學習者時，每一個短識別符識別一個可被序列化的可用元件，每一個陣列應包含一連串不同的短識別符，不同的陣列可能包含不同的短識別符。

(i) numeric：兩個實數，這些實數可能被用來表示一個正確回應包括的範圍。如果一個最小值指定不含最大值，則此範圍的上限是無限的。如果一個最大值指定不含最小值，則此範圍的下限是無限

的，如果最小與最大值兩者皆未被指定，則上限與下限兩者皆是無限的。如果最小值與最大值是相同的，則此範圍是一個單獨的值。

備考：本標準沒有指定應被考慮來評估與指定範圍相比成果之有意義位元的個數。

(j) other：由指定的“other”互動類型(參照第 6.1.9.2 節)定義的字串，此字串的內容在本標準中未被定義。

第 6.2.5 節和第 6.2.9 節分別定義了長識別符類型(localized_string_type) 和短識別符類型(short_identifier_type)。

備考：正確回應之資料元件是一個組織的結構，用來識別正確的學習者答覆或在第 6.1.9.2節中描述的每一個互動類型之答覆。確定正確性是一個實作的定義的功能(參照第 6.1.9.8 節)。

The values of this data element indicate the correct response(s) to the interaction. This data element shall have one of ten possible variants that shall match the conditions described below. The content developer may create extended types using other.

Several response types support more than one correct response. For these types, a list (bag) of correct response(s) is provided. A correct response may require multiple inputs. For these responses, a collection of input(s) is provided.

— true_*false*: A state that contains the values true and false. The state true means true or an equivalence of true in a particular context (e.g., agree, yes, richtig). The state false means false or an equivalence of false in a particular context (e.g., disagree, no, falsch).

— multiple_choice: A set that contains one or more sets of short identifiers. Any of the sets of short identifiers satisfies the requirement for a correct response. Multiple sets may be defined if more than one correct response exists. A set of short identifiers may contain zero or more short identifiers, all of which are required for a correct response. Each of the short identifiers represents an expected choice. If a set of short

identifiers is empty, it represents that the correct response is no choice. Examples: (1) A single choice may be allowed: “alpha.” (2) Multiple sets of choices may be allowed: “alpha,” “bravo,” “charlie,” and “alpha,” “bravo,” “delta.”

— fill_in: A bag of records. The bag contains one or more records, any of which satisfies the requirement for a correct response. Each record consists of an array of localized strings and two flags. The localized strings represent a correct response. The case_matters flag indicates whether the case of the string is used to evaluate the correctness of the response. If the value of the flag is true, the case of the learner response shall match the correct response. If the value of the flag is false, the case of the learner response is not used in evaluating the response. If case_matters is not specified, it is assumed to be false. The order_matters flag indicates whether the order of the inputs for a correct response matters. If the value of the flag is true, then order matters, and the order of the learner’s responses should be used to evaluate correctness of the response. If the value of the flag is false, then order does not matter, and the order of the learner’s responses should not be used to evaluate correctness of the response. If order_matters is not specified, it is assumed to be true.

— long_fill_in: A bag of records. The bag contains one or more records, any of which satisfies the requirement for a correct response. Each record consists of a localized string and a flag. The localized string represents a correct response. The flag indicates whether the case of the string is used to evaluate the correctness of the learner response. If the value of the flag is true, the case of the learner response shall match the correct response. If the value of the flag is false, the case of the learner response is not used in evaluating the response. If case_matters is not specified, it is assumed to be false. Note: Although a correct response for long_fill_in can be specified, the evaluation of a long_fill_in response typically involves an interpretative process that is outside of the scope of this Standard.

— likert: A short identifier that matches a choice on a scale. Note: Although a correct response for likert can be specified, likert interactions typically do not include correct responses.

— matching: A bag of bags of records. The single outer bag contains one or more inner bags. Each inner bag contains one or more records. If more than one inner bag exists, any of the inner bags satisfies the requirement for a correct response. If more than one record is contained by an inner bag, all records are required for the correct response specified by that inner bag. Each of the records is a pair of short identifiers representing an expected matching input. Each correct response pair consists of a source and a target. Each source and each target shall be represented by a short identifier. The scope for the short identifiers used for sources and targets shall be the interaction. The same short identifier may appear in more than one source-target pair.

— performance: A bag of records. The bag contains one or more records, any of which satisfies the requirement for a correct response. Each record consists of a flag and an array. The array represents a set of correct responses. The order_matters flag indicates whether the order of the inputs matters for a correct response. If the value of the flag is true, the order of the learner's responses should be used to evaluate correctness of the response. If the value of the flag is false, the order of the learner's responses should not be used to evaluate correctness of the response. If order_matters is not specified, it is assumed to be true. Each correct response consists of a name and either a single literal value or a numeric range. If the correct response is expressed as a literal value, this Standard does not specify how to use the value to evaluate the corresponding response. If the correct response is expressed as a numeric range, the learner's response should be within the specified range to be judged correct.

— sequencing: A bag of arrays of short identifiers. The bag contains one or more arrays, any of which satisfies the requirement for a correct response. Each array represents a

sequence of zero or more short identifiers for a correct response. Each short identifier identifies one element available to be sequenced when the interaction is presented to the learner. Each array shall contain a different sequence of short identifiers. Different arrays may contain different short identifiers.

— numeric: Two real numbers. The numbers may be used to express an inclusive range for the correct response. If a min value is specified with no max value, the upper limit of the range is unbounded. If a max value is specified with no min value, the lower limit of the range is unbounded. If both the min and max values are unspecified, both the upper and lower limits of the range are unbounded. If the min and max values are equal, the range is a single value. Note: This Standard does not specify the number of significant digits that should be considered in evaluating results against the specified range.

— other: A string defined by the specific “other” interaction type (see 6.1.9.2).

The content of this string is not defined by this Standard.

Subclauses 6.2.5 and 6.2.9 define localized_string_type and short_identifier_type, respectively.

NOTE—The correct_responses data element is a structured mechanism for identifying the correct learner response or responses relating to each of the types of interactions described in 6.1.9.2. The determination of correctness is an implementation-defined feature (see 6.1.9.8).

6.1.9.6 加權(Weighting)

(1) 概要(Synopsis)

weighting :

real(10,7),

(2) 描述

此資料元件的值是一個給予互動之權重，能被教材物件用來計算分數的值。

備考：對一個目標或教材物件(分別參照第 6.1.18.2 節和第 6.1.22 節)而言，互動

權重典型地被用來解釋分數資料元件值上之互動的效應，但是它們不是預期被系統使用，除非是用教材物件來計算分數。

The value of this data element is a weight given to the interaction that may be used by the content object to compute a value for a score.

NOTE—Interaction weights typically are used to explain the effect of an interaction on the value of the score data element for an objective or for the content object (see 6.1.18.2 and 6.1.22, respectively), but they are not intended to be used by systems other than the content object to compute a score.

6.1.9.7 學習者回應(Learner response)

(1) 概要(Synopsis)

```
learner_response :
  learner_response_type,

type learner_response_type =
choice
(
   state( true_false, multiple_choice, fill_in, long_fill_in,
   likert, matching, performance, sequencing, numeric,
   other ),
)
of
(
   true_false :
      state( true, false ),
```

```
multiple_choice :
   set of short_identifier_type,
      // SPM: 36 short identifiers
fill_in :
 array(0..9) of localized_string_type(250),
      // the SPM for the array is 10
      // the parameter value is the SPM for the localized
      // string
long_fill_in :
   localized_string_type(4000),
      // the parameter value is the SPM
likert :
   short_identifier_type,
matching :
   bag of record
   // SPM: 36 records
   (
     source :
       short_identifier_type,
     target :
       short_identifier_type,
   ),
performance :
   array(0..249) of record
   // the SPM for the array is 250
   (
```

```
        step_name :
            short_identifier_type,
        step_answer :
            choice
            (
                state( literal, numeric ),
            )
        of
        (
        literal :
                characterstring(iso-106
                    46-1),
                    // SPM: 250
                    characters
        numeric :
                real(10,7),
        ),
    ),
sequencing :
    array(0..35) of short_identifier_type,
    // the SPM for the array is 36
numeric :
    real(10,7),
other :
    characterstring(iso-1046-1),
    // SPM: 4000 characters
```

),

(2) 描述

此資料元件的值由學習者對於互動的回應所產生的資料所組成，此資料元件之值應符合後述情況中，十個可能變數中的一個，教材開發者可運用其他方式創建延伸的類型。

(a) true_false：一個包含真值與假值的狀態，真值的狀態意味正確的或相等於正確的情境(例如：同意、對)，假值(false)的狀態意味錯誤的或同等於錯誤的情境(例如：不同意、不)。

(b) multiple_choice：一個短識別符類型的集合，此短識別符類型集合中的值代表學習者所做的選擇，短識別符集合可能包含零或多個短識別符，例如：如果單一選擇是被允許的，則此集合應包含一個單一識別符，例如，“alpha”。如果一組選擇被允許的，則此集合應包含多個識別符，例如，“alpha ”、“bravo”及“delta”，其中排序是無意義的。

(c) fill_in：一個定位字串之陣列。

(d) long_fill_in：一個定位字串。

(e) likert：一個短識別符。此集合中短識別符的值代表學習者所做的選擇。

(f)matching：一袋包含零或多個紀錄之紀錄袋，每一個紀錄都包含用短識別符呈現的來源和目標，每一個紀錄都代表一個由學習者所做的配對。

(g) performance：學習者對互動之回應所產生的有序陣列，每一個回應包含一個步驟名稱(短識別符)或單一文字值(一個字元串)或一個數值。此步驟名稱和回應之類型應符合互動中之正確回應所提供之值，(參照第 6.1.9.5 節)，但是在學習者回應中之回應次序可能不相同。因為學習者可能會多次進行相同的步驟，而回應的步驟名稱可能不是唯一(例如，一個步驟名稱可能以相同的值或不同

的值出現多次)。例如：如果此回應是要在將多個活門裝在多個位置上，學習者可能在回應的期間內多次調整相同的活門。回應的配對可能是“活門 1：打開，活門 2：關閉，活門 1：打開”。

備考：1. 學習者回應之 SPM 績效是正確回應績效的 2 倍(參照第 6.1.9.5 節)，以便記錄額外的步驟，如同上面的例子。

2. 配對之句法在本標準中未指定。

(h) sequencing：一個有零或多個短識別符之陣列，學習者回應順序由陣列中的次序表示。每一個短識別符識別代表一個可排順序之元件。

(i) numeric：實數。

(j) other：由定義中的其它(other)互動類型(參照第 6.1.9.2 節)所定義的字串。此字串的內容在本標準中未被定義。

第 6.2.5 節和第 6.2.9 節分別定義了 localized_string_type 和 short_identifier_type。

備考：1. 學習者回應之資料元件是一個結構性的機制，用來識別與第 6.1.9.2 節所定義的互動類型相關的學習者回應，正確性的決定，是實作者定義的教材物件時的一個特性。

2. 如同第 6.1.9.2 所定義的互動類型，已眾所周知的挑選了合適的變數。

The values of this data element consist of data generated when a learner responds to an interaction. This data element shall have one of the ten possible variants that shall match the conditions described below. The content developer may create extended types using other.

— true_false: A state that contains the values true and false. The state true means true or an equivalence of true in a particular context (e.g., agree, yes, richtig). The state false means false or an equivalence of false in a particular context (e.g., disagree, no, falsch).

— multiple_choice: A set of short identifiers. The values of the identifiers in the set represent the choices made by the learner. The set may contain zero

or more short identifiers. Examples: If a single choice was allowed, the set would contain a single identifier, e.g., “alpha.” If a combination of choices was allowed, the set would contain multiple identifiers, e.g., “alpha,” “bravo,” and “delta,” the order of which is insignificant.

— fill_in: An array of localized strings.

— long_fill_in: A localized string.

— likert: A short identifier. The value of the identifier represents the choice made by the learner.

— matching: A bag that contains zero or more records. Each record contains a source and a target that are represented by short identifiers. Each record represents a match made by the learner.

— performance: An array of responses in the order in which they were provided by the learner in response to the interaction. Each response consists of a step name (a short identifier) and either a single literal value (a character string) or a number. The step names and types of the responses shall match those provided in the correct_responses for the interaction (see 6.1.9.5), but the responses in the learner_response may be in a different order. Because a learner may perform the same step more than once, the step names of the responses may not be unique (i.e., a step name may appear more than once with the same value or with a different value). Example: If the performance involves setting several valves to specific positions, the learner may adjust the position of the same valve more than once in the course of the performance. The name-value pairs for the response might be “valve 1:open, valve 2:closed, valve 1:closed.” Notes: (1) The SPM for performance for learner_response is twice the size of the SPM for performance for correct_responses (see 6.1.9.5) to allow the recording

of extra steps, as in the example above. (2) The syntax of the name-value pairs is not specified by this Standard.

— sequencing: An array of zero or more short identifiers. The sequence determined by the learner is represented by the order of the elements in the array. Each short identifier identifies one element that was available to be sequenced.

— numeric: A real number.

— other: A string defined by the specific “other” interaction type (see 6.1.9.2). The content of this string is not defined by this Standard.

Subclauses 6.2.5 and 6.2.9 define localized_string_type and short_identifier_type, respectively.

NOTES

1—The learner_response data element is a structured mechanism for identifying the exact learner response relating to each of the types of interactions described in 6.1.9.2. The determination of correctness is an implementation-defined feature of the content object.

2—The type of the interaction, as defined in 6.1.9.2, has to be known to select the appropriate variant.

6.1.9.8 成果(Result)

(1) 概要(Synopsis)

result :

choice

(

state(result_state, numeric),

)

of

(

result_state :

state(correct, incorrect, unanticipated, neutral),

numeric :

real(10,7),

),

(2) 描述

此資料元件的值是一個出自學習者答覆之正確性的判斷，資料元件中應有一個下列可允許的值：

(a) correct：正確回應。

(b) incorrect：錯誤回應。

(c) unanticipated：未預期回應。

(d) neutral：中性回應。

(e) numeric：數值。

備考：1. 本標準未指定如何或在何處決定成果值。

2. 實數值 real(10,7) 用來提供描述學習者回應之正確性的能力的預估值，本標準沒有指定如何以數值描繪正確性。

The value of this data element is a judgment of the correctness of the learner response.

This data element shall have one of the following permissible values:

— correct: The learner response was correct.

— incorrect: The learner response was incorrect.

— unanticipated: The learner response was not expected.

— neutral: The learner response was neither correct nor incorrect.

— numeric: A real number.

NOTES

1—This Standard does not specify where or how the value of result is determined.

2—The numeric value real(10,7) is included to provide the capability of reporting a numeric estimate of the correctness of the learner response. This Standard does not specify how correctness is represented in the numeric value.

6.1.9.9 潛時(Latency)

(1) 概要(Synopsis)

latency :

timeinterval(second,10,2),

(2) 描述

此資料元件的值，是學習者從可以回應開始，到第一次回應的期間。

一個字串繫結符合 ISO 8601:2000 可被用來當作區間時間值(參照附錄C)。

備考：如果學習者沒有做回應，則潛時之資訊無法獲得。潛時，實際上是指可回應及第一次回應的時戳(參照第 6.1.9.4 節)之間的差異。如果多個互動因為在同一時間可以開始回應，而致有多個相同的時戳時，則每一個互動的時戳紀錄可用來決定學習者對互動的回應順序。

The value of this data element is the time elapsed between the time the interaction was made available to the learner for response and the time of the first response.

A string binding conforming to ISO 8601:2000 may be used to communicate time interval values (see Annex C).

NOTE—The latency information is not available for an interaction if the learner did not respond. The latency is, in effect, the time difference between the time_stamp (see 6.1.9.4) of the interaction and the time of the first response. If several interactions have the same time_stamp because they became available for response at the same time, the latency recorded for each interaction can be used to determine the order in which the learner responded to these interactions.

6.1.9.10 描述(Description)

(1) 概要(Synopsis)

description :

localized_string_type(250),

// the parameter value is the

SPM

(2) 描述

此資料元件之值是對於互動的簡短參考性描述，第 6.2.5 節中定義了 localized_string_type。

The value of this data element is a brief informative description of the interaction. Subclause 6.2.5 defines localized_string_type.

6.1.10 啟動資料(Launch data)

(1) 概要(Synopsis)

launch_data :

characterstring(iso-106

46-1),

// SPM: 4000 characters

(2) 描述

此資料元件之值用於某特定教材物件之資料，此教材物件可用於初始化階段，此資料元件的值未被指定。

備考：此資料元件可被允許的值由教材物件的實作者自行定義。一般說來，教材物件之文件應指定該資料元之值可以或必須包含的值。

The value of this data element provides data specific to a content object that the content object can use for initialization. The value of this data element is not specified.

NOTE—The allowable values for this data element are defined by the implementer of the content object. Typically, the documentation for the content object would specify what data can or has to be provided.

6.1.11 學習者ID (Learner ID)

(1) 概要(Synopsis)

learner_id :

long_identifier_type,

(2) 描述

此資料元件之值用來識別此教材物件實例啟動時所代表之學習者, 此標記值至少在此教材物件之範圍內是唯一值。

第 6.2.6 節定義了長識別符類型(long_identifier_type)。

備考：本標準沒有指定學習者ID如何被創建、分派或解析。

The value of this data element identifies the learner on behalf of whom this content object instance was launched. The label shall be unique at least within the scope of the content object.

Subclause 6.2.6 defines long_identifier_type.

NOTE—This Standard does not specify how learner IDs are created, assigned, or resolved.

6.1.12 學習者名稱(Learner name)

(1) 概要(Synopsis)

learner_name :

localized_string_type(250),

// the parameter value is the

SPM

(2) 描述

此資料元件之值是學習者名稱，第 6.2.5 節定義了定位字串類型(localized_string_type)。

備考：本標準沒有指定學習者名稱如何被創建、分派或解析。

The value of this data element is the name of the learner.

Subclause 6.2.5 defines localized_string_type.

NOTE—This Standard does not specify how learner names are created, assigned, or resolved.

6.1.13 學習者偏好資料(Learner preference data)

(1) 概要(Synopsis)

```
learner_preference_data :
    learner_preference_type,

type learner_preference_type =
  record
    (
      audio_level :
        real(10,7) range(0..*),
      language :
        language_type,
      delivery_speed :
        real(10,7) range(0..*),
```

audio_captioning :

state(off, no_change, on),

),

(2) 描述

此資料元件之值指定了學習者對於使用該教材物件的偏好，學習者偏好資料的組件定義於第 6.1.13.1 節至第 6.1.13.4 節。

備考：本標準沒有指定教材物件、RTS亦或兩者具有決定或解釋學習者偏好的能力。

The values of this data element specify learner preferences associated with the learner's use of the content object.

The components of learner_preference_data are defined in 6.1.13.1 – 6.1.13.4.

NOTE—This Standard does not specify whether the content object, the RTS, or both have the ability to set or interpret learner preferences.

6.1.13.1 音訊位階(Audio level)

(1) 概要(Synopsis)

audio_level :

real(10,7) range(0..*),

(2) 描述

此資料元件之值是一個倍數值，代表相對於實作時所決定之參考音量水準，其數值 1代表“不作改變”。例如，0代表了無限降低音量，0.5表示降低10分貝，2 則代表擴大 10分貝。

備考：此倍數值不被用來代表經由此資料元件溝通後所呈現的改變效果，而是用於相同實作時的參考水準。

The value of this data element is a multiplier value that specifies an intended change

in perceived audio level relative to an implementation-specific reference level with the value 1 meaning “no change.” For example, the value 0 specifies infinite attenuation, the value 0.5 specifies an attenuation of 10 decibels, and the value 2 specifies an amplification of 10 decibels.

NOTE—The multiplier value is not intended to be applied to the effect of previous changes communicated through this data element, but rather to the same implementation-specific reference level.

6.1.13.2 語言(Language)

(1) 概要(Synopsis)

language :

language_type,

(2) 描述

此資料元件之值是對一個多國語的教材物件中學習者偏好的語言，第 6.2.4 節定義了語言類型(language_type)。

The value of this data element is the learner’s preferred language for a content object with multilingual capability.

Subclause 6.2.4 defines language_type.

6.1.13.3 傳遞速度(Delivery speed)

(1) 概要(Synopsis)

delivery_speed :

real(10,7) range(0..*),

(2) 描述

此資料元件值是一個倍數，其代表學習者偏好的內容傳遞速度，表示成相對於

實作時之參考速度的變化值。舉例來說，2 是參照速度的兩倍快而0.5則是參照速度的1/2倍快。

備考：1. 數值0表示停止傳遞。

2. 此倍數值不是被用來代表經由此資料元件溝通後所呈現的改變效果，而是用於相同實作時的參考水準。

The value of this data element is a multiplier that specifies the learner's preferred relative speed of content delivery expressed as a change in speed relative to an implementation-specific reference speed. For example, the value 2 is twice as fast as the reference speed and the value 0.5 is one half the reference speed.

NOTES

1—A value of 0 indicates that delivery is stopped.

2—The multiplier value is not intended to be applied to the effect of previous changes communicated through this data element, but rather to the same implementation-specific reference speed.

6.1.13.4 音訊字幕(Audio captioning)

(1) 概要(Synopsis)

audio_captioning :

state(off, no_change, on),

(2) 描述

此資料元件之值指定是否於音訊中呈現對應之標題, 此資料元件應有下列其中一個可允許的值：

(a) off：關閉標題，與音訊對應之標題不呈現。

(b) no_change：目前的標題設定。

(c) on：標題開啟，呈現與音訊對應之標題。

The value of this data element specifies whether captioning text corresponding to audio is displayed. This data element shall have one of the following permissible values:

— off: Captioning is off, and text corresponding to audio is not displayed.

— no_change: The current captioning setting.

— on: Captioning is on, and text corresponding to audio is displayed.

6.1.14 課程狀態(Lesson status)

(1) 概要(Synopsis)

lesson_status :

state(passed, failed, completed, incomplete, browsed,

not_attempted),

(2) 描述

此資料元件用於向前相容於舊有的實作，此資料元件完成狀態(completion_status)及成功狀態(success_status)應該被使用(分別參照第 6.1.3 節及第 6.1.24 節)。

此資料元件之值指出學習者是否有嘗試，完成，通過，失敗，或瀏覽相關的教材物件。此資料元件應有下列其中一個被允許的值：

(a) passed：學習者有滿足通過教材物件之必要條件。

(b) failed：學習者沒有滿足通過教材物件之必要條件。

(c) completed：學習者有滿足完成教材物件之必要條件。

(d) incomplete：學習者沒有滿足完成教材物件之必要條件。

(e) browsed：學習者於教材物件啟動後以瀏覽的模式進入該教材物件，或是在教材物件中選擇瀏覽。

(f) not_attempted：學習者沒有進入教材物件，或學習者存取教材物件的期間太短而被認為沒有進入。

備考：1. 本標準沒有指定如何決定課程狀態，他可能由教材物件所記述、經由RTS

與mastery分數比較而決定、由外部代理人(如教師)設定的學習目標為基礎來決定或是經由一些其它的方法來決定。

2. 完成狀態及成功狀態資料元件應被使用, 因為課程狀態資料元件可能在舊有實作中存在。

This data element is included for backward compatibility with legacy implementations. The data elements completion_status and success_status should be used (see 6.1.3 and 6.1.24, respectively).

The value of this data element indicates whether the learner has attempted, completed, passed, failed, or browsed the associated content object. This data element shall have one of the following permissible values:

— passed: The learner has satisfied the requirements to pass the content object.

— failed: The learner has not satisfied the requirements to pass the content object.

— completed: The learner has satisfied the requirements to complete the content object.

— incomplete: The learner has not satisfied the requirements to complete the content object.

— browsed: The learner has accessed the content object with a mode of browse or elected to browse while in the content object after a normal launch.

— not_attempted: The learner has not accessed the content object, or the learner previously has accessed the content object but has experienced so little of it that it is considered to be not attempted.

NOTES

1—This Standard does not specify how to determine lesson_status. It may be reported by a content object, determined by an RTS by comparing scores to mastery scores, determined on the basis of objectives set by an outside agent (e.g., an instructor), or by

some other means.

2—The completion_status and success_status data elements should be used because the lesson_status data element may exist only in legacy implementations.

6.1.15 位置(Location)

(1) 概要(Synopsis)

location :

characterstring(iso-10646-1),

// SPM: 1000 characters

(2) 描述

此資料元件之值是在教材物件中的位置，此值和它的定義由教材物件本身決定，未於本標準中指定。本標準沒有指定實作時，如該資料元件沒有值的時候，實作時應如何呈現。

備考：1. 隨實作而定，教材位置若不存在，可以用空字串、零的元件表示或是完全不顯示該資料元件。

2. 如果一個教材物件溝通確認教材位置存在，則此資料元件提供支援之機制，允許學習者回到先前所離開的教材物件中的同一位置。此資料元件可以用一個值，識別學習者的退出點，此值只對該教材元件有意義，而該位置資訊可以用來當作學習者下次回到該教材元件時的進入點。教材物件也可用此資料元件與 RTS 在持續性的基礎上，溝通此位置資訊。例如：一個 RTS 可能用這些資訊來創建書籤、或是用教材所提供的位置資訊，同步參照資料或註解。

The value of this data element is a location in the content object. The value and its meaning are defined by the content object and are not specified by this Standard. This Standard does not specify how an implementation shall represent that there is no value for location.

NOTES

1—Depending on the implementation, the absence of a value for location could be represented as an empty string, a null element, or the absence of the data element.

2—If a content object communicates a location on exit, this data element provides support for a mechanism that lets the learner return to the content object at the same place he or she left it. This data element can identify the learner's exit point with a value that is meaningful to the content object only, and that location information can be used by the content object as an entry point the next time the learner enters the content object. This data element also can be used by the content object to communicate its location to the RTS on an ongoing basis. Example: An RTS may be able to use this information to create bookmarks or to synchronize reference materials or annotations with the location reported by the content.

6.1.16 最大允許時間(Max time allowed)

(1) 概要(Synopsis)

max_time_allowed :

timeinterval(second,10,2),

(2) 描述

此資料元件之值是學習者被允許參與課程的累積時數，(參照第 6.1.26 節對教材物件超過限制的預期反應)一個符合字串 ISO 8601:2000 可以被用來溝通區間時間值(參照附錄C)。

備考：學習者嘗試始於最初交談時間之起始，並持續到該活動終止。

The value of this data element is the amount of accumulated time the learner is allowed to use a content object in the learner attempt. (See 6.1.26 for the content object's expected response to exceeding the limit.)

A string binding conforming to ISO 8601:2000 may be used to communicate time

interval values (see Annex C).

NOTE—The learner attempt begins with the beginning of the first learner session and continues until the activity terminates.

6.1.17 模式(Mode)

(1) 概要(Synopsis)

mode :

state(browse, normal, review),

(2) 描述

此資料元件之識別值，為教材可以呈現給學習者的三個可能模式之一，此資料元件應有下列可允許的值中的其中一個：

(a) browse：此教材物件以不記錄任何關於當前學習者交談時間資訊的方式呈現。

(b) normal：此教材物件以記錄任何關於當前學習者交談時間資訊的方式呈現。

(c) review：此教材物件先前已記錄關於學習者嘗試的資訊，不以更新當前使用者交談時間資訊的方式呈現。

備考：學習者嘗試始於最初交談時間之起始，並持續到該活動終止。

The value of this data element identifies one of three possible modes in which a content object may be presented to a learner. This data element shall have one of the following permissible values:

— browse: The content object is presented without the intent of recording any i nformation about the current learner session.

— normal: The content object is presented with the intent of recording information about the current learner session.

— review: The content object has previously recorded information about the learner

attempt and is presented without the intent of updating this information with data from the current learner session. Note: The learner attempt begins with the beginning of the first learner session and continues until the activity terminates.

6.1.18 目標(Objectives)

(1) 概要(Synopsis)

```
objectives :
    set of objective_type,
    // SPM: 100 objective_type records in
    the bag


type objective_type =
  record
  (
    id :
        long_identifier_type,
    score :
        score_type,
    status :
        state( passed, completed, failed, incomplete,
        browsed,
          not_attempted ),
    progress_measure :
        progress_measure_type,
    completion_status :
        completion_status_type,
```

success_status :

success_status_type,

description :

localized_string_type(250),

// the parameter value is the SPM

),

(2) 描述

此資料元件之值指定教材物件的學習或績效目標，一個目標類型(objective_type)紀錄的實例應包括一個目標識別符(參照第 6.1.18.1 節)；所有其它的組件都是選擇性的。

目標類型的組件定義於第 6.1.18.1 節至第 6.1.18.7 節。

備考：1. 目標資訊可來自於一個教材物件、來自於一個RTS或來自於一些其它的來源。

2. 本標準未定義目標與教材物件的完成狀態、課程狀態、分數以及成功狀態之間的關係(分別參照第 6.1.3 節、第 6.1.14 節、第 6.1.22 節及第 6.1.24 節)。

The values of this data element specify learning or performance objectives associated with a content object. An instance of an objective_type record shall include an objective identifier (see 6.1.18.1); all other components are optional.

The components of objective_type are defined in 6.1.18.1 – 6.1.18.7.

NOTES

1—Information about objectives may come from a content object, from an RTS, or from some

other source.

2—This Standard does not define any relationship between objectives and the content object's completion_status, lesson_status, score, or success_status (see 6.1.3, 6.1.14, 6.1.22, and 6.1.24, respectively).

6.1.18.1 識別符(ID)

(1) 概要(Synopsis)

id :

long_identifier_type,

(2) 描述

此資料元件之值是對目標之標記, 此標記至少在此教材物件範圍中是唯一值, 第 6.2.6 節定義了長識別符類型(long_identifier_type)。

備考：本標準未指定ID如何被創建、 分派或解析。

The value of this data element is a label for the objective. This label shall be unique at least within the scope of the content object.

Subclause 6.2.6 defines long_identifier_type.

NOTE—This Standard does not specify how IDs are created, assigned, or resolved.

6.1.18.2 分數(Score)

(1) 概要(Synopsis)

score :

score_type,

(2) 描述

此資料元件之值是學習者對於該目標達成的分數, 第 6.2.8 節定義了分數類型(score_type)。

備考：本標準未指定分數的值如何被創建或指派。

The value of this data element is the score achieved by the learner for the objective. Subclause 6.2.8 defines score_type.

NOTE—This Standard does not specify how the value of score is created or assigned.

6.1.18.3 狀態(Status)

(1) 概要(Synopsis)

status :

state(passed, completed, failed, incomplete,

browsed,

not_attempted),

(2) 描述

此資料元件用於向前相容於舊有實作(legacy implementation)，此資料元件之完成狀態及成功狀態應該可供使用(分別參照第 6.1.18.5 節及第 6.1.18.6 節)。此資料元件之值指出學習者是否已經參與了相關目標的教材元件，如果已參與，則指出學習者是否展現其精通於該目標。此資料元件應有下列其中一個可允許的值：

(a) passed：通過目標。

(b) completed：所有與目標相關之教材物件的部分都存取過。此目標可能通過或尚未通過。

(c) failed：未通過目標。

(d) incomplete：並非所有與目標相關之教材物件的部分都存取過。

(e) not_attempted：與目標相關之教材物件的部分未被存取過。

(f) browsed：與目標相關之教材物件是以瀏覽的模式開啟(參照第 6.1.17

節)，因此沒有與目標相關之特定狀態資訊可供使用。

備考：1. 本標準未指定如何決定狀態。狀態可能是由教材物件、RTS或其它方法所提供。

2. 完成狀態和成功狀態資料元件應可供使用，因為該狀態資料元件可能只存在於舊有之實作中。

This data element is included for backward compatibility with legacy implementations. The data elements completion_status and success_status should be used (see 6.1.18.5 and 6.1.18.6, respectively).

The value of this data element indicates whether the learner has engaged with that portion of the content object related to the objective and, if so, whether the learner has demonstrated mastery of the objective. This data element shall have one of the following permissible values:

— passed: The objective was passed.

— completed: All parts of the content object related to the objective were accessed. The objective may or may not have been passed.

— failed: The objective was failed.

— incomplete: Not all parts of the content object related to the objective were accessed.

— not_attempted: No part of the content object related to the objective was accessed.

— browsed: No specific status information for the objective is available because the content object related to the objective was launched with a mode of browse (see 6.1.17).

NOTES

1—This Standard does not specify how to determine status. Status may be provided by

the content object, by an RTS, or by some other means.

2—The completion_status and success_status data elements should be used because the status data element may exist only in legacy implementations.

6.1.18.4 進展測量(Progress measure)

(1) 概要(Synopsis)

progress_measure :

progress_measure_type,

(2) 描述

此資料元件之值是學習者對於完成目標之進展測量，第 6.2.7 節定義了進展測量類型(progress_measure_type)。
備考：本標準未指定如何決定進展測量之值。

The value of this data element is a measure of the progress the learner has made toward completing the objective.

Subclause 6.2.7 defines progress_measure_type.

NOTE—This Standard does not specify how to determine the value of progress_measure.

6.1.18.5 完成狀態(Completion status)

(1) 概要(Synopsis)

completion_status :

completion_status_type,

(2) 描述

此資料元件之值指出學習者是否完成目標，第 6.2.2 節定義了完成狀態類型(completion_status_type)。
備考：本標準未指定如何決定完成狀態，它可能經由教材物件所記述、由 RTS 決定、以外在代理人(例如，教師)所設定的目標為基礎決定或經由其它的方法決定。

The value of this data element indicates whether the learner has completed the objective.

Subclause 6.2.2 defines completion_status_type.

NOTE—This Standard does not specify how to determine completion_status. It may be reported by a content object, determined by an RTS, determined on the basis of objectives set by an outside agent (e.g., an instructor), or by some other means.

6.1.18.6 成功狀態(Success status)

(1) 概要(Synopsis)

success_status :

success_status_type,

(2) 描述

資料元件之值指出學習者是否已經精通目標，第6.2.10節定義了成功狀態類型(success_status_type)。

備考：本標準未指定如何決定成功狀態，它可能經由一個教材物件所記述、經由 RTS 決定、經由外在代理人(例如，教師)所設定之目標決定，或經由其它方法決定。

The value of this data element indicates whether the learner has mastered the objective.

Subclause 6.2.10 defines success_status_type.

NOTE—This Standard does not specify how to determine success_status. It may be reported by a content object, determined by an RTS, determined on the basis of objectives set by an outside agent (e.g., an instructor), or by some other means.

6.1.18.7 描述(Description)

(1) 概要(Synopsis)

description :

localized_string_type(250),

// the parameter value is the SPM

(2) 描述

此資料元件之值是對目標的簡短描述資訊，第6.2.5節定義了定位字串類型(localized_string_type)。

The value of this data element is a brief informative description of the objective. Subclause 6.2.5 defines localized_string_type.

6.1.19進展測量(Progress measure)

(1) 概要(Synopsis)

progress_measure :

progress_measure_type,

(2) 描述

此資料元件之值是學習者關於完成目標的進展測量，第 6.2.7 節定義了進展測量類型(progress_measure_type)。

備考：1. 本標準未指定完成狀態(completion_status) (參照第 6.1.3 節)與進展測量(progress_measure)之間，除了 0 或 1 以外之值的精確關係。任何在 0 和 1 之間的值都對應到一個未完成之狀態，除非此值相等於或是高於定義中之完成門檻(completion_threshold) (參照第 6.1.4 節)；在該例中，此值對應到完成狀態(completion_status)之完成值。

2. 本標準未指定如何決定進展測量之值。

The value of this data element is a measure of the progress the learner has made toward completing the content object.

Subclause 6.2.7 defines progress_measure_type.

NOTES

1—This Standard does not specify an exact relationship between completion_status (see 6.1.3) and values for progress_measure other than 0 or 1. Any value between 0 and 1 typically corresponds to a completion_status value of incomplete, unless the value is equal to or above a defined completion_threshold (see 6.1.4); in which case, the value typically corresponds to a completion_status value of completed.

2—This Standard does not specify how to determine the value of progress_measure.

6.1.20 原始及格分數(Raw passing score)

(1) 概要(Synopsis)

raw_passing_score :

real(10,7),

(2) 描述

此資料元件之值是教材物件之原始及格分數，此大小未被定義，此資料元件用於向前相容於舊有實作(legacy implementation)，此資料元件標度及格分數(scaled_passing_score)應被用到(參照第 6.1.21 節)。

備考：此標度及格分數(scaled_passing_score)資料元件應可供使用，因為原始及格分數(raw_passing_score)資料元件可能只存在於舊有實作中。

The value of this data element is the raw passing score for a content object. The scale is not defined. This data element is included for backward compatibility with legacy implementations. The data element scaled_passing_score should be used (see 6.1.21).

NOTE—The scaled_passing_score data element should be used because the raw_passing_score data element may exist only in legacy implementations.

6.1.21 標度及格分數(Scaled passing score)

(1) 概要(Synopsis)

scaled_passing_score :

real(10,7) range(-1..1),

(2) 描述

此資料元件之值是教材物件的標度及格分數，此資料元件之大小為包含 –1 到 1 之間的範圍。

備考：1. 如果標度及格分數定義為用於教材物件，則表示一段描述，此描述為使用該教材物件以獲取大於或等於標度及格分數所需達到之必備條件(參照第 6.1.22 節)相關聯之一種陳述。舉例來說，如果對教材物件之標度及格分數是 0.85，而學習者達成 0.9 之標度分數，則該學習者可獲得該教材物件之通過的成功狀態(參照第 6.1.24 節)。然而，本標準未指定或要求 RTS、教材物件或任何其他系統之組件對標度及格分數作解釋或回應。

2. 被標度後的分數範圍在 –1 到 1 之間，讓內容開發者易於對不正確的選擇進 行扣分。

The value of this data element is the scaled passing score for a content object. The value of this data element is scaled to fit the range –1 to 1 inclusive.

NOTES

1—If a scaled_passing_score is defined for the use of a content object, this is a statement that the requirements associated with the use of that content object are achieved by obtaining a score (see 6.1.22) greater than or equal to the scaled_passing_score. For example, if the scaled_passing_score for a content object is 0.85 and a learner achieves a scaled score of 0.90, a success_status of passed may be assigned to that content object for that learner (see 6.1.24). However, this Standard does not specify or require that an RTS, content object, or any other system component interpret or take action in response to a scaled_passing_score.

2—A scaled score range of –1 to +1 is used to allow a content developer to more easily assign a penalty for an incorrect choice.

6.1.22 分數(Score)

(1) 概要(Synopsis)

score :

score_type,

(2) 描述

此資料元件之值是學習者在教材物件中的分數，第 6.2.8 節定義了分數類型(score_type)。

The value of this data element is the learner's score for the content object.

Subclause 6.2.8 defines score_type.

6.1.23 交談時間(Session time)

(1) 概要(Synopsis)

session_time :

timeinterval(second,10,2),

(2) 描述

此資料元件之值是學習者在教材物件中所花費學習者交談時間之時間總數。如果沒有學習者交談時間在進行，則此交談時間是學習者在上一個教材物件的學習者交談時間的花費。

符合 ISO 8601:2000 標準的字串可用於溝通時間間隔值(參照附錄C)。

備考：1. 本標準未指定如何決定交談時間或其精確度。

2. 交談時間之值在學習者交談時間期可多次評定。總交談時間(參照第6.1.27 節)之值直到學習者交談時間結束之後才會被更新。

3. 如果學習者交談時間在進行中, 學習者嘗試之實際期間為總交談時間(參照第6.1.27 節) 加上當前交談時間。

The value of this data element is the amount of time that the learner has spent in the current learner session for this content object. If no learner session is in progress, the session time is the time the learner spent in the last learner session for this content object. A string binding conforming to ISO 8601:2000 may be used to communicate time interval values (see Annex C).

NOTES

1—This Standard does not specify how to determine the value of session_time or its accuracy.

2—The value for session_time may be evaluated one or more times during a learner session. The value of total_time (see 6.1.27) is not updated until after the learner session has ended.

3—If a learner session is in progress, the actual duration of the learner attempt is the total_time (see 6.1.27) plus the current session_time.

6.1.24 成功狀態(Success status)

(1) 概要(Synopsis)

success_status :

success_status_type,

(2) 描述

此資料元件之值指出學習者與否精通於教材物件; 第 6.2.10 節定義了成功狀態類型。

備考：此標準未指定如何決定成功狀態(success_status)。它可能由教材物件記述、由 RTS 藉由比較精熟分數來決定、由外部代理人設定的目標基礎決定(例如，教師)，或是經由其它方法決定。

The value of this data element indicates whether the learner has mastered the content object. Subclause 6.2.10 defines

success_status_type.

NOTE—This Standard does not specify how to determine success_status. It may be reported by a content object, determined by an RTS by comparing scores to mastery scores, determined on the basis of objectives set by an outside agent (e.g., an instructor), or by some other means.

6.1.25 懸置資料(Suspend data)

(1) 概要(Synopsis)

suspend_data :

characterstring(iso-10646-1),

// SPM: 4000 characters

(2) 描述

此資料元件之值提供一個資訊，此資訊可由教材物件產生，且該資訊是由於學習者存取或對教材物件的回應所產生。此資料元件內容之格式是未被指定的。

備考：目的是用來儲存當前學習者交談時間之資料，該資料可於稍後同一學習者交談時間中使用或是在教材元件與相同的學習者間的後續之學習者交談時間中使用。

The value of this data element provides information that may be created by a content object as a result of a learner accessing or interacting with that content object. The format of the content of this data element is unspecified.

NOTE—The intent is for the content object to store data for later use in the current learner session or a subsequent learner session between the content object and the same learner.

6.1.26 時間限制動作(Time limit action)

(1) 概要(Synopsis)

time_limit_action :

state(exit_message, continue_message, exit_no_message,

continue_no_message),

(2) 描述

此資料元件的值指出內容元件應如何反應當超過最大允許時間(max_time_allowed)（參照第 6.1.16 節）。此資料元件應有以下其中之一的可允許值：

(a) 退出訊息(exit_message)：學習者應強制退出教材物件，教材物件應提供給學習者一個訊息，指出學習者超過學習者嘗試中的最大允許時間。

(b) 繼續訊息(continue_message)：學習者應可繼續進行教材物件，教材物件應提供給學習者一個訊息，指出學習者超過學習者嘗試中的最大允許時間。

(c) 不提供訊息便退出(exit_no_message)：學習者應強制退出教材物件並不會獲得任何訊息。

(d) 不提供訊息便繼續(continue_no_message)：雖然學習者超過最大允許時間，學習者不會獲得任何訊息也不會強制退出教材物件。

備考：1. 當訊息顯示給學習者，由教材物件定義該訊息之內容與格式。

2. 本標準並未指定教材物件該如何強制學習者退出教材物件。

The value of this data element indicates what the content object should do when max_time_allowed is exceeded (see 6.1.16). This data element shall have one of the following permissible values:

— exit_message: The learner should be forced to exit the content object. The content object should provide a message to the learner that indicates that the maximum time allowed for the learner attempt was exceeded.

— continue_message: The learner should be allowed to continue in the content object. The content object should provide a message to the learner that indicates that the

maximum time allowed for the learner attempt was exceeded.

— exit_no_message: The learner should be forced to exit the content object with no message.

— continue_no_message: Although the learner has exceeded the maximum time allowed for the learner attempt, the learner should not be given a message and should not be forced to exit the content object.

NOTES

1—When a message is presented to the learner, the content object defines the content and form of the message.

2—This Standard does not specify how the content object forces the learner to exit the content object.

6.1.27 全部時間(Total time)

(1) 概要(Synopsis)

total_time :
timeinterval(second,10,2),

(2) 描述

此資料元件之值是所有學習者交談時間之總和(參照第 6.1.23 節)，是由在當前學習者交談時間之前的當前學習者嘗試所累積的。當一個學習者交談時間還在處理時總交談時間(total_time)之值不應被更新。

一個符合 ISO 8601:2000 字串繫結可能被用在溝通時間間隔值(參照附錄C)。

備考：學習者嘗試始於最初交談時間之起始，並持續到該活動終止。

The value of this data element is the sum of all of the learner's learner session times (see 6.1.23) accumulated in the current learner attempt before the current learner session. The value of total_time shall not be updated while a learner session is in progress.

A string binding conforming to ISO 8601:2000 may be used to communicate time

interval values (see Annex C).

NOTE—The learner attempt begins with the beginning of the first learner session and continues until the activity terminates.

6.2 輔助的資料類型(Auxiliary data types)

接下來的資料類型應被用來連接在第 6.1 節中描述的資料元件。

The following data types are used in conjunction with the data elements described in 6.1.

6.2.1 評論類型(Comment type)

(1) 概要(Synopsis)

```
type comment_type =
    record
    (
       comment :
          localized_string_type(4000),
             // the parameter value is the SPM
       location :
          characterstring(iso-10646-1),
             // SPM: 1000 characters
       time_stamp :
    date_time_type,
    ),
```

(2) 描述

此資料類型描述了本文中的輸入，資料類型的實例應包含一個評論(參照第 6.2.1.1 節)，此評論類型(comment_type)之組件被定義在第 6.2.1.1 節至第 6.2.1.3 節。

This data type describes textual input. Instances of this data type shall include a comment (see 6.2.1.1). The components of the comment_type are defined in 6.2.1.1 – 6.2.1.3.

6.2.1.1 評論(Comment)

(1) 概要(Synopsis)

comment :

localized_string_type(4000),

// the parameter value is the SPM

(2) 描述

此資料元件應描述一教材物件中相關的評論或註解, 第 6.2.5 節定義了定位字串類型(localized_string_type)。

備考：本標準並未定義一個定位字串(localized_string_type)內容的架構或格式。

This data element shall describe comments or annotations associated with a content object.

Subclause 6.2.5 defines.

NOTE—This Standard does not define a structure or format for the content of the localized string.

6.2.1.2 位置(Location)

(1) 概要(Synopsis)

location :

characterstring(iso-106

46-1),

// SPM: 1000

characters

(2) 描述

此資料元件是教材物件在評論發生時的時間點，如果沒有對位置指定一個值，評論可適用於全部的教材物件。本標準沒有指定當沒有值存在於位置時該如何實作。

備考：1. 根據實作狀態，可以使用一個空的字串來代表位置之缺值，一個空的元件，或缺乏的資料元件。

2. 本標準並未指定在實作中教材物件中如何定義一個位置。

This data element is the point in the content object at which the comment applies. If no value is specified for location, the comment is applicable to the entire content object. This Standard does not specify how an implementation shall represent that no value exists for location.

NOTES

1—Depending on the implementation, the absence of a value for location could be represented as an empty string, a null element, or the absence of the data element.

2—This Standard does not specify how an implementation defines a location in a content object.

6.2.1.3 時戳(Time stamp)

(1) 概要(Synopsis)

time_stamp :

date_time_type,

(2) 描述

此資料元件為評論被創建時或最新改變時之時間點，第 6.2.3 節定義了日期時間類型(date_time_type)。

This data element is the point in time at which the comment was created or most recently changed. Subclause 6.2.3 defines date_time_type.

6.2.2 完成狀態類型(Completion status type)

(1) 概要(Synopsis)

type completion_status_type =

state(completed, incomplete, not_attempted, unknown),

(2) 描述

此資料類型指出學習者已完成教材物件或目標，此資料類型應有下列所允許的其中一個值：

(a) 已完成(completed)：學習者已體驗足夠的教材物件或目標來認定為已完成。

(b) 未完成(incomplete)：學習者並未體驗足夠的教材物件或目標來認定為已完成。

(c) 未嘗試(not_attempted)：學習者不被認為曾有效使用過教材物件或目標。

備考：學習者未曾存取教材物件或目標，或是學習者在之前曾經存取但體驗過少以致於被認為未嘗試。

(d) 未知(unknown)：判定未產生。

This data type indicates whether the learner has completed a content object or an objective. This data type shall have one of the following permissible values:

— completed: The learner has experienced enough of the content object or objective to consider it completed.

— incomplete: The learner has not experienced enough of the content object or objective to consider it completed.

— not_attempted: The learner is considered not to have used the content object or objective in any significant way. Note: The learner has not accessed the

content object or objective, or the learner previously has accessed it but has experienced so little of it that it is considered to be not attempted.

— unknown: No assertion is made.

6.2.3 資料時間類型(Data time type)

(1) 概要(Synopsis)

type date_time_type =

time(second,10,0),

(2) 描述

此資料類型表示時間上的點。此資料類型應被需求至少有1秒的準確度及另外可選擇性的0.01秒的準確度。

此資料類型的實作應包含清楚的時間點表示，從 197001-01 00:00:00 到 2037-12-31 23:59:59，有著1秒的需求準確度及可選擇性的0.01秒的準確度但不包含閏秒。實作應可以明確地指出其已超出所要求的日期與時間範圍。

一個字串繫結符合 ISO 8601:2000 可被用來溝通日期與時間值（參照附件C）。

備考：1. 此標準未指定如何轉譯時間，以百分之一秒準確度或1秒的準確度表現可能是由四捨五入、捨去法或其他方法所完成。

2. 為了支援閏秒的表現，符合標準的實作是許可的但並非強制要求的。

This data type represents a point in time. This data type shall have a required precision of 1 second and an optional precision of 0.01 seconds.

Implementations of this data type shall include distinct representations for points in time in the range 197001-01 00:00:00 through 2037-12-31 23:59:59, not including leap seconds, with a required precision of 1 second and an optional precision of 0.01 seconds. Implementations may include distinct representations for values beyond the required date and time range.

A string binding conforming to ISO 8601:2000 may be used to communicate date and time values (see Annex C).

NOTES

1—This Standard does not specify how to translate times expressed with precisions of hundredths of a second to times expressed with precisions of seconds, which may be done by rounding, truncation, or another method.

2—Conforming implementations are permitted, but not required, to support the representation of leap seconds.

6.2.4 語言類型(Language type)

(1) 概要(Synopsis)

```
type language_type =
    characterstring(iso-646),
    // SPM: 250 characters
```

(2) 描述

此資料類型是一個字元串包含了所要求的語言碼(language code)包括複合的、可選擇性的、連字元前置的子碼(subcode)(參照以下範例)。

接下來的規則適用於字元串的語言碼部分：

(a)2個字母的字碼依照ISO 639-1所規定。

(b)3個字母的字碼依照ISO 639-2所規定。

(c)依照網際網路位址分配機構(IANA)所規定，1個字母的字碼「i」被保留並且當成註冊碼前置的字首。

(d)1個字母的字碼「x」被保留並且被當成私人使用之前置字首。

接下來的規則適用於字元串的第一個子碼部分：

(a)2個字母的子碼為 ISO 3166-1 alpha-2 國家代碼。

(b)3到8個字母的子碼為IANA所註冊。

其他的子碼並未被特殊指定

ISO 639-2 指定了2個碼集，一個為書目的應用(ISO 639-2/B)另一個為術語的應用(ISO 639-2/T)，2者中的任一個都可能被使用。

備考：語言碼通常用小寫字體而子碼用大寫字體，但其字體對值是沒有差別的。

範例

“en-GB”

“de”

“fr-CA”

“it”

“grc” (古希臘，1453之前)

“en-US-philadelphia”

“eng-GB-cockney”

“map-PG-buin”(Austronesian -新幾內亞島)

“gem-US-pennsylvania”

“i-bnn” (IANA Bunun)

The format of this data type is a character string consisting of a required language code followed by multiple, optional, hyphen-prefixed subcodes (see examples below).

The following rules apply to the language code part of the character string:

— Two-letter codes are defined by ISO 639-1.

— Three-letter codes are defined by ISO 639-2.

— The one-letter code “i” is reserved and used as a prefix for registrations defined by the Internet Assigned Numbers Authority (IANA).

— The one-letter code “x” is reserved and used as a prefix for private use. The following rules apply to the first subcode part of the character string:

— Two-letter subcodes are ISO 3166-1 alpha-2 country codes.

— Subcodes from three to eight letters are registered with IANA.

Rules for additional subcodes are unspecified.

ISO 639-2 specifies two code sets, one for bibliographic applications (ISO 639-2/B) and one for terminology applications (ISO 639-2/T). Either code set may be used.

NOTE—The language code is normally given in lower case and the subcodes (if any) in upper case. However, the values are case insensitive.

Examples

“en-GB”

“de”

“fr-CA”

“it”

“grc” (Ancient Greek, until 1453)

“en-US-philadelphia”

“eng-GB-cockney”

“map-PG-buin”(Austronesian - Papua New Guinea Buin)

“gem-US-pennsylvania”

“i-bnn” (IANA Bunun)

6.2.5 定位字串類型(Localized string type)

(1) 概要(Synopsis)

type localized_string_type(length) =

record

(

language :

```
        language_type,
    string :
        characterstring(iso-10646-1),
          // SPM: the length parameter
),
```

(2) 描述

此資料類型包含了字串與字串本身的語言規格，定位字串類型的元件應定義在第 6.2.5.1節和第 6.2.5.2 節。

範例

以下是3個定位字串的例子：以法文表示的“ 資訊科技 ”(參照例1)、用英式英文表示的“ 局部化 ”(參照例2)及用日語平假名表示的“ xxx ”(參照例3)。

例1.(“fr ”， “Technologies de l’information”)

例2.(“en-GB ”， “localisation”)

例3.(“jp-JP-jisx208”， “xxx”)

This data type consists of a language specification for a string and the string itself. The components of the localized_string_type are defined in 6.2.5.1 and 6.2.5.2.

Examples

The following are three examples of localized strings: “Information Technology” in French, “localization” in British English, and “xxx” in Japanese hiragana.

(“fr”, “Technologies de l’information”)

(“en-GB”, “localisation”)

(“jp-JP-jisx208”, “xxx”)

6.2.5.1 語言(Language)

(1) 概要(Synopsis)

language :

language_type,

(2) 描述

此資料元件指定了定位字串的語言，第 6.2.4 節定義了語言類型(language_type)。

This data element specifies the language of the localized string. Subclause 6.2.4 defines language_type.

6.2.5.2 字串(String)

(1) 概要(Synopsis)

string :

characterstring(iso-10646-1),

// SPM: the length parameter

(2) 描述

此資料元件包含了定位字串的文字。

This data element contains the text of the localized string.

6.2.6 長識別符類型(Long identifier type)

(1) 概要(Synopsis)

type long_identifier_type

=

characterstring(iso-106

46-1),

// SPM: 4000

characters

(2) 描述

此資料類型為一與物件相關的識別符(標記), 運用物件的上下文使成為唯一。字元串應符合 RFC 2396 所定義的 Uniform Resource Identifier (URI)語法。

備考：此標準推薦URI以Uniform Resource Name (URN)之格式(參照RFC 2141 [B4])成為唯一的識別符。

This data type is an identifier (a label) associated with an object that is intended to be unique within the context of usage of the object. The character string shall conform to the syntax for Uniform Resource Identifiers (URIs) as defined by RFC 2396.

NOTE—This Standard recommends that the URI be a globally unique identifier in the form of a Uniform Resource Name (URN) (see RFC 2141 [B4]).

6.2.7 進展測量類型(Progress measure type)

(1) 概要(Synopsis)

type progress_measure_type :

real(10,7) range(0..1),

(2) 描述

此資料類型為一量度用以測量學習者所完成教材物件或目標之成效,「0」值對應為未嘗試(參照第 6.2.2 節)之完成狀態類型。「1」值對應為已完成之完成狀態類型。

This data type is a measure of the progress the learner has made toward completing a content object or an objective. A value of 0 corresponds to a completion_status_type value of not_attempted (see 6.2.2). A value of 1 corresponds to a completion_status_type value of completed.

6.2.8 分數類型(Score type)

(1) 概要(Synopsis)

```
type score_type =
    record
    (
        raw :
            real(10,7),
        min :
            real(10,7),
        max :
            real(10,7),
        scaled :
            real(10,7) range(-1..1),
    ),
```

(2) 描述

此資料類型描述評分之資訊，評分類型之組件應定義於第 6.2.8.1 節至第 6.2.8.4 節。

This data type describes scoring information.

The components of the score_typeare defined in 6.2.8.1 – 6.2.8.4.

6.2.8.1 原始(Raw)

(1) 概要(Synopsis)

```
raw :
    real(10,7),
```

(2) 描述

此資料元件為一反映學習者成效的數字，而其範圍相介於最大值與最小值之間。

備考：原始分數並非必須為未處理之分數，舉例：一個未處理的分數可能被轉換成十進位的百分率分數，也就是說，學習者可能獲得分數「3/4」，應轉換成原始值「0.75」，介於最小「0」(參照第6.2.8.2節)與最大「1」(參照第 6.2.8.3 節)之間。

This data element is a number that reflects the performance of the learner relative to the range bounded by the values of min and max.

NOTE—A raw score is not necessarily an unprocessed score. *Example:* An unprocessed score might be converted to a percentage score as a decimal value. That is, the learner achieved a score of 3 out of 4 possible, which is converted to a raw value of 0.75 with min (see 6.2.8.2) equal to 0 and max(see 6.2.8.3) equal to 1.

6.2.8.2 最小值(Min)

(1) 概要(Synopsis)

min :

real(10,7),

(2) 描述

此資料元件對原始分數(參照第 6.2.8.1 節)的範圍來說為最小值。

This data element is the minimum value in the range for the raw score (see 6.2.8.1).

6.2.8.3 最大值(Max)

(1) 概要(Synopsis)

max :

real(10,7),

(2) 描述

此資料元件對原始分數(參照第 6.2.8.1 節)的範圍來說為最大值。

This data element is the maximum value in the range for the raw score (see 6.2.8.1).

6.2.8.4 標度(Scaled)

(1) 概要(Synopsis)

scaled :

real(10,7) range(-1..1),

(2) 描述

此資料元件為一反映出學習者表現的數字，資料元件的值符合標度範圍包含 –1 到 1。

備考：被標度的分數範圍在 –1 到 1 之間，用來允許內容開發者更加容易對錯誤的選擇來指定懲罰，像是飛行模擬系統中學習者的選擇而造成飛機及機上人員的折損。

This data element is a number that reflects the performance of the learner. The value of the data element is scaled to fit the range –1 to 1, inclusive.

NOTE—A scaled score range of –1 to +1 is used to allow a content developer to more easily assign a penalty for an incorrect choice, such as in a flight simulation system where the learner's choice would have resulted in the loss of the aircraft and all aboard.

6.2.9 短識別符類型(Short identifier type)

(1) 概要(Synopsis)

type short_identifier_type =

characterstring(iso-10646-1),

// SPM: 250 characters

(2) 描述

此資料類型為一識別符(標記)，字元串須符合RFC 2396定義之URI的語法。

This data type is an identifier (a label). The character string shall conform to the syntax for URIs as defined by RFC 2396.

6.2.10 成功狀態類型(Success status type)

(1) 概要(Synopsis)

type success_status_type =

state(passed, failed, unknown),

(2) 描述

此資料類型指出學習者掌控教材物件或是目標與否，此資料類型應有以下允許值之一：

(a) 通過(passed)：學習者通過教材物件或目標。

(b) 失敗(failed)：學習者未能通過教材物件或目標。

(c) 未知(unknown)：判定未產生。

This data type indicates whether the learner has mastered a content object or an objective.

This data type shall have one of the following permissible values:

— passed: The learner has passed the content object or objective.

— failed: The learner has failed the content object or objective.

— unknown: No assertion is made.

(參考)

參考文獻

[B1] AICC CMI001, CMI Guidelines for Interoperability, Version 3.5, April 2001.

[B2] IEEE 100, The Authoritative Dictionary of IEEE Standards Terms, Seventh Edition.

[B3] IEEE Std 1484.11.2-2003, Standard for Learning Technology—ECMAScript Application Programming Interface for Content to Runtime Services Communication.

[B4] IETF RFC 2141, URN Syntax.

Annex A

(informative)

Bibliography

附錄 B

(參考)

了解本標準中 ISO/IEC 11404:1996 所定義之實數及時間間隔資料類型。

此標準中的實數資料類型及時間間隔資料類型在 B.1 及 B.2 中探討。

B.1 實數資料類型(Real data type)

宣告實數(10,7)表示一個擁有到10^{-7} (i.e., 0.0000001)的準確性之帶值的實數資料類型。

舉例來說，根據此類型定義：

(1) 5550.000001 和 5550.000002是不同的值。

(2) 5550.000000001 和 5550.0求得相同的數值，因為0.000000001的差異對說明類型定義的準確性需 求來說真的太小了。

(3) 5550.0 和 5550.000000是相同的值。

(4) 5550.0 和 5550會求得相同的值。

Annex B

(informative)

Understanding the ISO/IEC 11404:1996 real and time interval data type definitions used in this Standard

The real and time interval data types used in this Standard are discussed in B.1 and B.2.

B.1 Real data type

The declaration real(10,7) denotes a real data type with values that have precision to 10–7 (i.e., 0.0000001).

For example, according to this type definition

— 5550.000001 and 5550.000002 are different values

— 5550.000000001 and 5550.0 may evaluate to the same value, because the difference of 0.000000001 is too small to be accounted for according to the precision requirement of the type definition

— 5550.0 and 5550.000000 are the same value

— 5550.0 and 5550 evaluate to the same value

B.2 時間間隔資料類型(Time interval data type)

宣告時間間隔(second,10,2)表示時間間隔資料元件的值代表用0.01秒準確性而消逝的時間。

此標準不需要實作以辨別，舉例來說，2.000 秒和 2.001秒的時間間隔，因為0.001秒的差異小於對此資料類型的準確性要求。此標準介紹繫結(bindings)使用一字串來代表符合 ISO 8601:2000 對時間間隔值的溝通。然而，此標準並沒有指定一個繫結(bindings)，及不同繫結對此資料類型

值的可能性。

舉例來說，如果一個繫結(binding)用實數來表示秒：

(1) 一小時的時間持續期間可以精確的用實數值3600.0來表示。

(2) 2.5秒的時間持續期間可以精確的用實數值2.5來表示。

(3) 一小時30秒的時間持續期間可以精確的用實數值5800.0來表示。

如果是使用 ISO 8601:2000 的繫結(binding)：

(1) 一小時的時長可以用字串“PT1H”來表示。

(2) 2.5秒的時時長可以用字串“PT2.5S”來表示。

(3) 一小時30秒的時長可以用“PT1H30M”來表示。

上述字串表示的格式以下列的類型來定義：

P[yY] [mM] [dD] [T[hH] [nM] [s[.s]S]]

其中

y是年數(整數，>0，不限制)

m是月數(整數，>0，不限制，例如：允許其值>12)

d是天數(整數，>0，不限制，例如：允許其值>31)

h是時數(整數，>0，不限制，例如：允許其值>23)

n是分數(整數，>0，不限制，例如：允許其值>59)

s是秒數或秒的再劃分(整數，>0，不限制，例如：允許其值>59)

當對應非0值時，字元標示"P", "Y", "M", "D", "T", "H", "M", "S"一定要出現。

B.2 Time interval data type

The declaration timeinterval(second,10,2) denotes that the value for the data element timeinterval represents elapsed time with a precision of 0.01 seconds.

This Standard does not require implementations to distinguish between, for example, time intervals of 2.000 seconds and 2.001 seconds, because the difference of 0.001 seconds is less than the precision requirement for this data type.

This Standard recommends that bindings use a string representation conforming to ISO 8601:2000 to communicate the time interval value. However, this Standard does not specify a binding, and different bindings are possible for a value of this data type. For example, if a binding uses real numbers to represent seconds

— A duration of exactly 1 hour can be expressed with the real value 3600.0

— A duration of 2.5 seconds can be expressed with the real value 2.5

A duration of 1 hour and 30 minutes can be expressed with the real value 5800.0

If a binding uses ISO 8601:2000

— A duration of exactly 1 hour can be expressed with the string “PT1H”

— A duration of 2.5 seconds can be expressed with the string “PT2.5S”

— A duration of 1 hour and 30 minutes can be expressed with the string “PT1H30M”

The format for the string representations above is defined by the following pattern:

P[yY][mM][dD][T[hH][nM][s[.s]S]]

where

y is the number of years (integer, ≥ 0, not restricted)

m is the number of months (integer, ≥ 0, not restricted, e.g., > 12 is acceptable)

d is the number of days (integer, ≥ 0, not restricted, e.g., > 31 is acceptable)

h is the number of hours (integer, ≥ 0, not restricted, e.g., > 23 is acceptable)

n is the number of minutes (integer, ≥ 0, not restricted, e.g., > 59 is acceptable)

s is the number of seconds or fraction of seconds (real or integer, ≥ 0, not restricted, e.g., > 59 is acceptable)

The character literal designators “P”, “Y”, “M”, “D”, “T”, “H”, “M”, and “S” have to appear if the corresponding nonzero value is present.

附 錄 C

(參考)

ISO 8601：2000 資料時間類型之表示。

一個符合 ISO 8601:2000 的字串表示可能在與資料時間類型(date_time_type)值的溝通上被用到(參照第6.2.3 節)。本標準沒有指定一個繫結(binding)，及不同繫結對此資料類型值的可能性。

舉例來說，使用一個符合 ISO 8601:2000 的字串表示，時間點1997年7月16日下午7點20分過30秒，與格林威治時間相差8小時，可以被字串表示成：

“1997-07-16T19:20:30.17+01:00”

格式用下列的類型定義：

YYYY[-MM[-DD[Thh[:mm[:ss[.s[TZD]]]]]]]

其中

YYYY = 四位數年份(>=0001)

MM = 二位數月份(01到12；01是指一月)

DD = 二位數日期(01到31；須視年、月的值而定)

hh = 二位數小時(00到23) (不用am/pm)

mm = 二位數分鐘(00到59)

ss = 二位數秒數(00到59)

s = 以一或多個數字表示一秒的小數劃分

TZD = 時區標示("Z"表示UTC或+hh:mm或-hh:mm)

至少要表示四位數的年份，如果還要表示日期時間的其他部分，則要加上“- ”、“T”和“.”等字元。

如果只出現時間部分，而沒有時區部分，則直接理解時區為格林威治時間(UTC)。

Annex C

(informative)

ISO 8601:2000 representation of the date time type

A string representation conforming to ISO 8601:2000 may be used to communicate the values of the date_time_type (see 6.2.3). This Standard does not specify a binding, and other bindings are possible.

For example, using a string representation conforming to ISO 8601:2000, the point in time July 16, 1997, 30.17 seconds past 7:20 PM with a time offset of 1 hour with respect to UTC, can be expressed with the string

“1997-07-16T19:20:30.17+01:00”

where the format is defined by the following pattern:

YYYY[-MM[-DD[Thh[:mm[:ss[.s[TZD]]]]]]]

where

YYYY is the four-digit year (≥ 0001)

MM is the two-digit month (01 through 12 where 01 = January, etc.)

DD is the two-digit day of month (01 through 31, depending on value of month and year)

hh is the two digits of hour (00 through 23) (AM/PM NOT allowed)

mm is the two digits of minute (00 through 59)

ss is the two digits of second (00 through 59)

s is the one or more digits representing a decimal fraction of a second

TZD is the time zone designator (“Z” for UTC or +hh:mm or -hh:mm)

At least the four-digit year must be present. If additional parts of the value of the date_time_type are included, the character literals “-”, “T”, “:”, and “.” are parts of the character lexical representation for the value.

If the time portion is present, but the time zone designator is not present, the time zone is unspecified, and the time is interpreted as “local time.”

英中名詞對照表

-A-

array	陣列
audio captioning	音訊字幕

-B-

bag	紀錄袋
binding	繫結

-C-

category	類目
character	字元
character string	字元串
credit	學分

-D-

data model	資料模型

-E-

element	元件
entry	進入
exit	退出

-F-

flag	旗標

-G-

-H-

-I-

identifier	識別符
instance	實例

-J-

-K-

-L-

label	標記
latency	潛時

learning management system (LMS)	學習管理系統(LMS)
-M-	
max time allowed	最大允許時間
-N-	
-O-	
-P-	
profile	規範
-Q-	
-R-	
raw passing score	原始及格分數
runtime service (RTS)	執行時期服務(RTS)
response	回應
-S-	
scale	標度
scaled passing score	標度及格分數
sentinel value	標兵值
session time	交談時間
smallest permitted maximum(SPM)	最小允許上限
-T-	
threshold	*門檻*
time stamp	時戳
-U-	
Universal Multiple-Octet Coded Character Set (UCS)	*通用多八位元編碼字元集(UCS)*
Uniform Resource Identifier (URI)	*通用資源識別符(URI)*
-V-	
-W-	
-X-	
weight	權重
-Y-	

-Z-

Data Model for Content to Learning Management System Communication

Contents

1. Overview

The scope and purpose of this Standard are discussed in 1.1 and 1.2.

1.1 Scope

This Standard describes a data model to support the interchange of agreed upon data elements and their values between a learning-related content object and a runtime service (RTS) used to support learning management. This Standard does not specify the means of communication between a content object and an RTS nor how any component of a learning environment shall behave in response to receiving data in the form specified. This Standard is based on a related data model defined in “Computer Managed Instruction (CMI) Guidelines For Interoperability,” version 3.5 [B1], by the Aviation Industry CBT Committee (AICC).To balance the need to support existing implementations with the need to make technical corrections and support emerging practice, this Standard selectively includes those data elements from the CMI specification that are commonly implemented, renames some data elements taken from the CMI specification to clarify their intended meaning, modifies the data types of data elements taken from the CMI specification to reflect ISO standard data types and internationalization requirements, removes some organizational structures used in the CMI specification to group data elements that are specific to the AICC community of practice and not generally applicable, and introduces some data elements not present in the CMI specification to correct known technical deficiencies in data elements taken from that specification.

1.2 Purpose

There is widespread acknowledgement that the data model for content object communication defined in the AICC “Computer Managed Instruction (CMI) Guidelines for Interoperability,” version 3.5 [B1], has broad applicability to systems used for learning management. The purpose

of this Standard is to build consensus around, resolve ambiguities in, and correct defects in the AICC data model for the data exchanged between learning-related content objects and an RTS used to support learning management.

2. Terms and definitions

2.1 Definitions

For purposes of this Standard, the following terms and definitions apply. The Authoritative Dictionary of IEEE Standards Terms [B2] should be referenced for terms not defined in this Clause.

2.1.1 content object: A collection of digital content that is intended for presentation to a learner by a learning technology system. It may include learning material and processing code. Example: A content object might be an HTML page with an embedded video clip and an ECMAScript component written in accordance with IEEE Std 1484.11.2TM-2003.

NOTE：For more information on IEEE Std 1484.11.2-2003, see [B3].

2.1.2 implementation defined (adj.): An indication that the implementation provider shall define and document the requirements for correct program constructs and correct data of a value or behavior. When the value or behavior in the implementation is designed to be variable or customizable on each instantiation of the system, the implementation provider shall document the nature and permissible ranges of this variation.

2.1.3 interaction: A recognized and recordable input or group of inputs from a learner to a content object.

2.1.4 launch (v.): To cause a content object to be delivered to a learner.

2.1.5 learner: An individual engaged with a learning technology system to acquire knowledge or skills.

2.1.6 learner attempt: A tracked effort by a learner to satisfy the requirements of a learning activity that uses a content object. It may span one or more learner sessions and be suspended between learner sessions.

See also: learner session.

NOTE：The learner attempt begins with the beginning of the first learner session and continues until the learning activity terminates.

2.1.7 learner session: An uninterrupted period of time during which a learner is accessing a content object.

See also: learner attempt.

2.1.8 learning management system (LMS): A computer system that may include the capabilities to register learners, schedule learning resources, control and guide the learning process, analyze and report learner performance, and schedule and track learners. See also: runtime service.

NOTE：Some implementations of learning management systems also have the ability to launch and deliver content. For this Standard, these capabilities are known as a runtime service.

2.1.9 runtime service (RTS): Software that controls the execution and delivery of learning content and that may provide services such as resource allocation, scheduling, input–output control, and data management.

See also: learning management system.

2.1.10 score: A numerical value or a point on a descriptive scale. A score may be the result of a learner assessment.

2.2 Acroynms and abbreviations

AICC	Aviation Industry CBT Committee
CMI	computer managed instruction
IANA	Internet Assigned Numbers Authority
LMS	learning management system
RTS	runtime service
SPM	smallest permitted maximum
URI	Uniform Resource Identifier
URN	Uniform Resource Name

3. Normative references

The following referenced documents are indispensable for the application of this Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.
IETF RFC 2396, Uniform Resource Identifiers (URI): Generic Syntax.
ISO 639-1, Code for the representation of names of languages—Part 1: Alpha-2 code.
ISO 639-2, Codes for the representation of names of languages—Part 2: Alpha-3 code.
ISO 3166-1, Codes for the representation of names of countries and their subdivisions—Part 1: Country codes.
ISO 8601:2000, Data elements and interchange formats—Information interchange—Representation of dates and times.
ISO/IEC 646:1991, Information technology—ISO 7-bit coded character set for information interchange.
ISO/IEC 10646-1, Information technology—Universal Multiple-Octet Coded Character Set (UCS)—Part 1: Architecture and Basic Multilingual Plane.
ISO/IEC 11404:1996, Information technology—Programming languages, their environments and system software interfaces—Language-independent datatypes.

4. Conformance

Conformance to this Standard is discussed in 4.1 – 4.6.
In this Standard, “shall” is to be interpreted as a requirement on an implementation; “shall not” is to be interpreted as a prohibition.

4.1 Data instances:

A conforming data instance shall be an instance of the data model as defined in 6.1.

4.2 Sending implementations:

A conforming sending implementation shall send data instances that conform to this Standard.

4.3 Receiving implementations:

A conforming receiving implementation shall accept data instances that conform to this Standard.

4.4 Repository implementations:

A conforming repository implementation shall accept, store, and provide data

that conform to this Standard upon request.

4.5 Implementation-defined values:

The processing and meanings of values that are not specified by this Standard (e.g., sentinel, missing, and empty values) are implementation-defined.

NOTE：For example, bindings, application profiles, or implementations may specify the processing or meanings of default values or sentinel values for specific data elements. An application profile might specify that in the absence of another value, the default value for mode is normal.

4.6 Smallest permitted maximum values:

This Standard defines SPM values for data elements with data types that include bag, array, set, and characterstring. For these data elements, a receiving implementation or a repository implementation that conforms to this Standard shall accept and process at least that number of entries or characters specified by the SPM for the element and may accept and process a larger number.

NOTES

1. The intent is for the SPM values to cover most cases.
2. In this subclause, the meaning of "processing" is dependent on the nature of the application.
3. This Standard defines no provisions for how and whether a sending system can determine whether a receiving system can process more than the SPM for a particular data element.

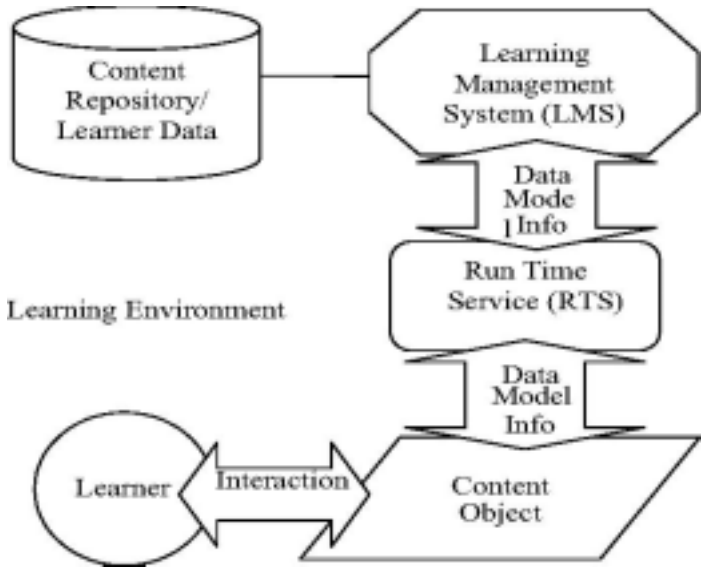
5. Conceptual model (informative)

In one conceptual model for the use of this Standard, shown in Figure 1, the learner interacts with a content object in the learning environment. The content object may require information about the learner. It acquires this information through an RTS, which, in turn, gets the information from an LMS.

As the learner interacts with the content object, the content object may gather information on the learner's performance. This information is passed to the RTS, which passes it on to the LMS.

Other conceptual models exist that may use the data model. Although this conceptual model includes an RTS and an LMS, they are not required for the use of the data model. This conceptual model is designed to describe only one possible use of the data model.

Figure 1—Conceptual model diagram



6. Data model

This Clause defines a data model that a content object can use for obtaining information from an RTS to enable the content object to perform its expected functions and that an RTS can use for obtaining information from a content object to enable the RTS to manage the content object properly. The data model provides a description of the information that may pass to and from the content object.

This Standard does not specify how, when, or in which direction the information may flow. In addition, this Standard does not specify persistence of the data, how often it may be written or rewritten, or by whom it may be created or destroyed.

Unless noted otherwise, all components of “records” are optional in a data instance.

NOTES

1. The use of ISO/IEC 11404 notation in the synopses in 6.1 and 6.2 is for descriptive purposes only. A complete implementation of the operations defined in ISO/IEC 11404 is not required for conformance.
2. The ISO/IEC 11404 notation describes the semantics of the language-independent data types across all bindings(e.g., implementation of

a data type as itself, its subtypes, its subclasses, and its specializations). For example, an ISO/IEC 11404 “array” may be implemented as an SQL table (because SQL tables support indexing, a requirement for arrays); an ISO/IEC 11404 “state” may be implemented as a C programming language bit field; an ISO/IEC 11404 “characterstring” may be implemented in any encoding (e.g., ISO 646, ASCII, ISO 8859-1, UTF-8, UTF-16, UTF-32, etc.) that supports the repertoire specified in the parameter for the characterstring data type.

3. All examples in 6.1 and 6.2 are informative and do not endorse any particular binding.
4. The following language-independent data types are defined in ISO/IEC 11404: array, bag, characterstring, choice, real, record, set, state, time, and timeinterval.
5. The data element and data type labels used in the synopses in 6.1 and 6.2 are for reference only. Implementations are not required to use the exact same labels, as long as the data elements and data types are semantically equivalent. It is recommended that implementations use spellings for labels similar to the spellings specified in this Standard.
6. This Standard does not define an extension mechanism for the data model. Implementers may create additional data models for content object communications. Such additional data models may be used to augment this data model to support different communities of practice.

6.1 Content object communication

(1) Synopsis

content_object_communication :

```
record
(
        comments_from_learner :
            array(0..249) of
            comment_type,
            // the SPM for the array is
            250
            comments_from_lms :
            array(0..99) of
            comment_type,
            // the SPM for the array is
            100
            completion_status :
            completion_status_type,
            completion_threshold :
            real(10,7) range(0..1),
            credit :
            state( credit, no_credit ),
            data_model_version :
            characterstring(iso-10646-
            1),
            // SPM: 250 characters
            entry :
            state( ab_initio, resume,
            _nil_ ),
```

exit :

state(timeout, suspend,

logout, normal, _nil_),

interactions :

bag of interaction_type,

// SPM: 250

interaction_type records

in the bag

launch_data :

characterstring(iso-10646-

1),

// SPM: 4000 characters

learner_id :

long_identifier_type,

learner_name :

localized_string_type(250

),

// the parameter value is

the SPM

learner_preference_data :

learner_preference_type,

lesson_status :

state(passed, completed,

failed, incomplete,

browsed,

not_attempted),

location :

characterstring(iso-1064

6-1),

// SPM: 1000 characters

max_time_allowed :

timeinterval(second,10,

2),

mode :

state(browse, normal,

review),

objectives :

set of objective_type,

// SPM: 100

objective_type records

in the bag

progress_measure :

progress_measure_type,

raw_passing_score :

real(10,7),

scaled_passing_score :

real(10,7) range(-1..1),

score :

score_type,

session_time :

timeinterval(second,10,

```
2),
success_status :
success_status_type,
suspend_data :
characterstring(iso-1064
6-1),
// SPM: 4000 characters
time_limit_action :
state( exit_message,
continue_message,
exit_no_message,

continue_no_message ),
total_time :
timeinterval(second,10,
2),

),
```

(2) Description

The components of content_object_communication are defined in 6.1.1 – 6.1.27. Depending on the direction, destination, and purpose of the communication, an instance of content_object_communication shall include zero or more of the defined components.

6.1.1 Comments from learner

(1) Synopsis

```
comments_from_learner :
    array(0..249) of comment_type,
    // the SPM for the array is 250
```

(2) Description

The values of this data element are comments from the learner.

Subclause 6.2.1 defines comment_type.

NOTES

1. The values of this data element are intended to provide feedback about the content object or the learning experience with the content object from a specific learner. Using this data element for other purposes may adversely affect interoperability.
2. This Standard does not specify the mechanism for collecting comments.

6.1.2 Comments from LMS

(1) Synopsis

```
comments_from_lms :

    array(0..99) of

    comment_type,

    // the SPM for the array is

    100
```

(2) Description

The values of this data element are comments and annotations intended to be made available to the learner.

Subclause 6.2.1 defines comment_type.

NOTES

1. The values of this data element are intended to provide information about the content object or the learning experience with the content object. Using this data element for other purposes may adversely affect interoperability.
2. This Standard does not specify the mechanism for collecting comments.

6.1.3 Completion status

(1) Synopsis

completion_status :

completion_status_type,

(2) Description

The value of this data element indicates whether the learner has completed the content object. Subclause 6.2.2 defines completion_status_type.

NOTE：This Standard does not specify how to determine completion_status. It may be reported by a content object, determined by an RTS by comparing a progress measure with a threshold, determined on the basis of objectives set by an outside agent (e.g., an instructor), or determined by some other means.

6.1.4 Completion threshold

(1) Synopsis

completion_threshold :

real(10,7) range(0..1),

(2) Description

The value of this data element is a value against which the measure of the progress the learner has made toward completing the content object can be compared to determine whether the content object should be considered completed.

NOTE：The completion_threshold is designed to be used in conjunction with the progress_measure (see 6.1.19). For example, if the completion_threshold for a content object is 0.85 and a learner achieves a progress_measure of 0.90, a completion_status of completed(see 6.1.3) may be assigned to that content object for that learner. However, this Standard does not specify or require that an RTS, content object, or any other system component, interpret or take action in response to a completion_threshold.

6.1.5 Credit

(1) Synopsis

credit :

state(credit, no_credit),

(2) Description

The value of this data element indicates whether the learner will be credited for performance in this content object. This data element shall have one of the following permissible values:

(a) credit: The learner is taking the content object for credit.

(b) no_credit: The learner is taking the content object for no credit.

NOTE：This Standard does not specify how to determine the value of credit or what it means to give credit for performance.

6.1.6 Data model version

(1) Synopsis

```
data_model_version :
    characterstring(iso-1064
    6-1),
    // SPM: 250 characters
```

(2) Description

The value of this data element indicates the version of the data model defined in this Standard. The value shall consist of a period-delimited string containing major and minor release values as whole numbers, for example, “1.0”. Any characters appearing after the minor release value shall be separated from the minor release value by a period (“.”). The syntax and semantics of any characters following the minor release value are not specified by this Standard.

For this edition of this Standard, the major version number shall be “1” and the minor version number shall be “0”. Therefore, the first three characters of the value shall be “1.0”.

An implementation may append additional characters to the value of this data element, in which case, the first four characters shall be “1.0.”.

6.1.7 Entry

(1)Synopsis

```
entry :
  state( ab_initio, resume, _nil_ ),
```

(2)Description

The value of this data element is information that asserts whether the learner has previously accessed the content object. This data element shall have one of the following permissible values:

(a) ab_initio: Indicates that the learner has not accessed the content object during the current learner attempt.

(b) resume: Indicates that (1) the learner has previously accessed the content object during the current learner attempt, and (2) upon exiting, the exit data element had the value suspend (see 6.1.8).

(c) _nil_: Indicates all other conditions. There is no knowledge of previous access, or no specific entry condition is indicated.

NOTE：If the value for entry is resume, it indicates that either location or suspend_data may contain data stored in a previous learner session that is relevant to resuming the learner session (see 6.1.15 and 6.1.25, respectively).

6.1.8 Exit

(1) Synopsis

exit :

state(timeout, suspend, logout, normal, _nil_),

(2) Description

The value of this data element indicates how or why the learner left the content object. This data element shall have one of the following permissible values:

(a) timeout: The content object terminated because the time limit specified by max_time_allowedhad been exceeded (see 6.1.16).

(b) suspend: The learner exited the content object with the intent of returning to it.

(c) logout: The content object signaled a desire to terminate the entire learning activity of which the content object is a part.

(d) normal: The content object exited normally.

(e) _nil_: The exit conditions are undetermined.

6.1.9 Interactions

(1) Synopsis

```
interactions :
    bag of interaction_type,
    // SPM: 250 interaction records in the
    bag


type interaction_type =
record
(


    id :
        long_ide
        ntifier_ty
        pe,
        type :


      state( true_false, multiple_choice, fill_in,
                    long_fill_in, likert, matching, performance,
                    sequencing, numeric, other ),


    objectives_id :
        array(0..9) of
        long_identifier_type,
        // the SPM for the array
```

is 10

time_stamp :

date_time_type,

correct_responses :

correct_responses_type,

weighting :

real(10,7),

learner_response :

learner_response_type,

result :

choice

(

state(result_state, numeric),

)

of

(

result_state :

state(correct, incorrect,

unanticipated,

neutral),

numeric :

real(10,7),

),

latency :

timeinterval(second,10,2),

description :

localized_string_type(250),

// the parameter value is the SPM

),

(2) Description

The values of this data element define information pertaining to an interaction for the purpose of measurement or assessment. An instance of an interaction_type record shall include an interaction identifier (see 6.1.9.1). If an instance includes either correct_responses or learner_response, then the instance shall include type (see 6.1.9.2). All other components are optional.
The components of interaction_type are defined in 6.1.9.1 – 6.1.9.10.

NOTES

1. Interactions are intended to be responses to individual questions or tasks that the content developer wants to record. This Standard does not specify how interaction data are to be recorded, used, or interpreted.
2. The interactions data model includes data elements that correspond to a limited set of interaction types, but it does not support logging of discrete learner events.
3. This Standard does not specify how interactions are presented or rendered.
4. This Standard does not specify how interactions are grouped in a question (i.e., one or multiple interactions per question).
5. The primary intent of interaction data is to communicate information about the status of an interaction object, such as a test item, a simulation, or another interactive feature of the content object. Interaction data also may be used to communicate interaction events as they occur, but in that case, only the data elements that carry information specific to the event should be communicated.

6.1.9.1 ID

(1) Synopsis

id :

long_identifier_type,

(2) Description

The value of this data element is a label for the interaction. This label shall be unique at least within the scope of the content object.

Subclause 6.2.6 defines long_identifier_type.

NOTE：This Standard does not specify how IDs are created, assigned, or resolved.

6.1.9.2 Type

(1) Synopsis

type :

state(true_false, multiple_choice, fill_in, long_fill_in,

likert, matching, performance, sequencing, numeric,

other),

(2) Description

The value of this data element indicates which category of interaction is recorded in an instance of an interaction. It is also used to determine how the interaction response should be interpreted. This data element shall have one of the following permissible values. The content developer may create extended types using other.

(a) true_false: The interaction has two possible responses. Examples: “True or False,” “Yes or No,” and “Agree or Disagree.”

(b) multiple_choice: The interaction has a set of two or more possible responses. This interaction type can be used for interactions in which the learner selects just one choice and for interactions in which the learner can select more than one choice.

(c) fill_in: The interaction requires the learner to supply a short response in the form of one or more strings of characters. Note: Typically, the correct response consists of part

of a word, one word, or a few words.

(d) long_fill_in: The interaction requires the learner to supply a response in the form of a long string of characters. Notes: (1) Typically, the correct response is a sentence, paragraph, or short composition, but long composition forms are also possible. (2) Typically, the interaction is presented as an examination statement the learner must analyze and respond to by creating a written answer of a specified length, such as a short or long essay.

(e) likert: The interaction asks the learner to select from a discrete set of choices on a scale. Note: This Standard does not specify the number of choices, the scale, or the meaning of the scale. Example: A typical response scale has five choices ranging from “strongly disagree” to “strongly agree.”

(f) matching: The interaction consists of two sets of items. Members of the first set are related to zero or more members of the second set. Responding to the interaction requires the learner to indicate matches between members of the first set and members of the second set.

(g) performance: The interaction requires the learner to perform a task that requires multiple steps. Example: The task is a simulation for the changing of a spark plug on an automobile engine involving six steps: (1) pull off the rubber boot from the plug, (2) unscrew the spark plug, (3) gap the replacement plug to a specific dimension, (4) screw in the replacement, (5)
torque the plug using a torque wrench set to 12 foot-pounds, and (6) push the boot back on.

(h) sequencing: The interaction requires the learner to identify a logical order for the members of a list. Example: The learner may be asked to place a series of events in chronological order or to rank a group of items by the order of their importance.

(i) numeric: The interaction requires a numeric response from the learner.

(j) other: Any other type of interaction not defined by this Standard. The semantics and

structure of the correct_responses and learner_response data element values are not defined by this Standard when the interaction type is other (see 6.1.9.5 and 6.1.9.7, respectively). Note: When the interaction type is other, information identifying this extended type should be embedded in the correct_responses and learner_response data element values. For example, this may take the form of a prefix in the string used to communicate those values.

6.1.9.3 Objectives ID

(1) Synopsis

objectives_id :

array(0..9) of long_identifier_type,

// the SPM for the array is 10

(2) Description

The values of this data element are labels for objectives (see 6.1.18) associated with the interaction. The labels shall be unique at least within the scope of the content object.
Subclause 6.2.6 defines long_identifier_type.

NOTE：This Standard does not specify how objective IDs are created, assigned, or resolved.

6.1.9.4 Time stamp

(1) Synopsis

time_stamp :

date_time_type,

(2) Description

The value of this data element is the point in time at which the interaction was first made available to the learner for learner interaction and response.
Subclause 6.2.3 defines date_time_type.

NOTES

1.This Standard does not specify how the time_stamp value is obtained.

2.If several interactions are presented at the same time, they have the same time_stamp value. If an interaction was never available for response, such as an interaction that is not used in an adaptive test, no time_stamp value is available for that interaction.

3.If a time_stamp value is available for an interaction but no learner response data are available, it should be assumed that the interaction was made available to the learner but the learner did not respond.

6.1.9.5 Correct responses

(1) Synopsis

```
correct_responses :
correct_responses_type,

type correct_responses_type =
    choice
    (

        state( true_false, multiple_choice, fill_in, long_fill_in,
                likert, matching, performance, sequencing, numeric,
                other ),
    )
    of
    (

        true_false :
            state( true,
            false ),
            multiple_choic
            e :
```

set of set of short_identifier_type,

// set of set SPM: 10 sets

// set of short_identifier_type SPM: 36

// short identifiers

fill_in :

ba

g

of

rec

ord

//

SP

M:

5

rec

ord

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(

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e_

ma

tter

s :

```
        boolean,
    order_matte
    rs :
    boolean,

match_text :

      array(0..9) of localized_string_type(250),
          // the SPM for the array is 10
          // the parameter value is the SPM for the
          // localized string

      ),
long_fill_in :
bag of record
// SPM: 5
records
(
case_matters :
boolean,
match_text :
localized_string
_type(4000),
// the parameter
value is the
SPM
```

```
                    ),

likert :
    short_identifier_type,
    matching :

  bag of bag of record
      // outer bag SPM: 5 inner bags
      // each inner bag SPM: 36 records

        (
            source :
            short_identifier_type,
            target :
            short_identifier_type,
            ),
            performance :
            bag of record
            // SPM: 5 records
            (
            order_matters :
            boolean,
            answers :
            array(0..124) of record
            // the SPM for the array is 125
            (
```

```
step_name :
short_identifier_type,

   step_answer :
        choice
        (

             state( literal, numeric ),
        )
        of
        (

                  literal :
                       characterstring(iso-10646-1),
                       // SPM: 250 characters

             numeric :
                  record
                  (

           min :
                  real(10,7),
                  max :
                  real(10,7),
                  ),
                  ),
```

```
                    ),
                    ),
                    sequencing :

    bag of array(0..35) of short_identifier_type,
        // bag SPM: 5 arrays
        // the SPM for the array is 36

numeric :
    record
    (
        min :
            real(10,7),
            max :
            real(10,7),
            ),

                other :
                    characterstring(iso-104
                    6-1),
                    // SPM: 4000
                    characters

        ),
```

(2) Description

The values of this data element indicate the correct response(s) to the interaction. This data element shall have one of ten possible variants that shall match the conditions described below. The content developer may create extended types using other.
Several response types support more than one correct response. For these types, a list (bag) of correct response(s) is provided. A correct response may require multiple inputs. For these responses, a collection of input(s) is provided.

(a) true_false: A state that contains the values true and false. The state true means true or an equivalence of true in a particular context (e.g., agree, yes, richtig). The state false means false or an equivalence of false in a particular context (e.g., disagree, no, falsch).

(b) multiple_choice: A set that contains one or more sets of short identifiers. Any of the sets of short identifiers satisfies the requirement for a correct response. Multiple sets may be defined if more than one correct response exists. A set of short identifiers may contain zero or more short identifiers, all of which are required for a correct response. Each of the short identifiers represents an expected choice. If a set of short identifiers is empty, it represents that the correct response is no choice. Examples: (1) A single choice may be allowed: “alpha.” (2) Multiple sets of choices may be allowed: “alpha,” “bravo,” “charlie,” and “alpha,” “bravo,” “delta.”

(c) fill_in: A bag of records. The bag contains one or more records, any of which satisfies the requirement for a correct response. Each record consists of an array of localized strings and two flags. The localized strings represent a correct response. The case_matters flag indicates whether the case of the string is used to evaluate the correctness of the response. If the value of the flag is true, the case of the learner response shall match the correct response. If the value of the flag is false, the case of the learner response is not used in evaluating the response. If case_matters is not specified, it is assumed to be false. The order_matters flag indicates whether the order of the inputs for a correct response matters. If the value of the flag is true, then order matters, and the order of the learner’s responses should be used to evaluate

correctness of the response. If the value of the flag is false, then order does not matter, and the order of the learner's responses should not be used to evaluate correctness of the response. If order_matters is not specified, it is assumed to be true.

(d) long_fill_in: A bag of records. The bag contains one or more records, any of which satisfies the requirement for a correct response. Each record consists of a localized string and a flag. The localized string represents a correct response. The flag indicates whether the case of the string is used to evaluate the correctness of the learner response. If the value of the flag is true, the case of the learner response shall match the correct response. If the value of the flag is false, the case of the learner response is not used in evaluating the response. If case_matters is not specified, it is assumed to be false. Note: Although a correct response for long_fill_in can be specified, the evaluation of a long_fill_in response typically involves an interpretative process that is outside of the scope of this Standard.

(e) likert: A short identifier that matches a choice on a scale. Note: Although a correct response for likert can be specified, likert interactions typically do not include correct responses.

(f) matching: A bag of bags of records. The single outer bag contains one or more inner bags. Each inner bag contains one or more records. If more than one inner bag exists, any of the inner bags satisfies the requirement for a correct response. If more than one record is contained by an inner bag, all records are required for the correct response specified by that inner bag. Each of the records is a pair of short identifiers representing an expected matching input. Each correct response pair consists of a source and a target. Each source and each target shall be represented by a short identifier. The scope for the short identifiers used for sources and targets shall be the interaction. The same short identifier may appear in more than one source-target pair.

(g) performance: A bag of records. The bag contains one or more records, any of which

satisfies the requirement for a correct response. Each record consists of a flag and an array. The array represents a set of correct responses. The order_matters flag indicates whether the order of the inputs matters for a correct response. If the value of the flag is true, the order of the learner's responses should be used to evaluate correctness of the response. If the value of the flag is false, the order of the learner's responses should not be used to evaluate correctness of the response. If order_matters is not specified, it is assumed to be true. Each correct response consists of a name and either a single literal value or a numeric range. If the correct response is expressed as a literal value, this Standard does not specify how to use the value to evaluate the corresponding response. If the correct response is expressed as a numeric range, the learner's response should be within the specified range to be judged correct.

(h) sequencing: A bag of arrays of short identifiers. The bag contains one or more arrays, any of which satisfies the requirement for a correct response. Each array represents a sequence of zero or more short identifiers for a correct response. Each short identifier identifies one element available to be sequenced when the interaction is presented to the learner. Each array shall contain a different sequence of short identifiers. Different arrays may contain different short identifiers.

(i) numeric: Two real numbers. The numbers may be used to express an inclusive range for the correct response. If a min value is specified with no max value, the upper limit of the range is unbounded. If a max value is specified with no min value, the lower limit of the range is unbounded. If both the min and max values are unspecified, both the upper and lower limits of the range are unbounded. If the min and max values are equal, the range is a single value. Note: This Standard does not specify the number of significant digits that should be considered in evaluating results against the specified range.

(j) other: A string defined by the specific "other" interaction type (see 6.1.9.2).

The content of this string is not defined by this Standard.

Subclauses 6.2.5 and 6.2.9 define localized_string_type and short_identifier_type, respectively.

NOTE：The correct_responses data element is a structured mechanism for identifying the correct learner response or responses relating to each of the types of interactions described in 6.1.9.2. The determination of correctness is an implementation-defined feature (see 6.1.9.8).

6.1.9.6 Weighting

(1) Synopsis

weighting :

real(10,7),

(2) Description

The value of this data element is a weight given to the interaction that may be used by the content object to compute a value for a score.

NOTE：Interaction weights typically are used to explain the effect of an interaction on the value of the score data element for an objective or for the content object (see 6.1.18.2 and 6.1.22, respectively), but they are not intended to be used by systems other than the content object to compute a score.

6.1.9.7 Learner response

(1) Synopsis

learner_response :

learner_response_type,

type learner_response_type =

choice

(

state(true_false, multiple_choice, fill_in, long_fill_in,

```
                likert, matching, performance, sequencing, numeric,
                other ),

)
of
(

        true_false :
            state( true, false ),
            multiple_choice :
            set of
            short_identifier_type,
            // SPM: 36 short
            identifiers
            fill_in :

         array(0..9) of localized_string_type(250),
             // the SPM for the array is 10
             // the parameter value is the SPM for the localized
             // string

           long_fill_in :
               localized_string_type(40
               00),
               // the parameter value is
               the SPM
```

likert :

short_identifier_type,

matching :

bag of record

// SPM: 36 records

(

source :

short_identifier_type,

target :

short_identifier_type,

),

performance :

array(0..249) of record

// the SPM for the array

is 250

(

step_name :

short_identifier_type,

step_answer :

choice

(

state(literal, numeric),

)

of

(

literal :

characterstring(iso-10646-1),

// SPM: 250 characters

numeric :

real(10,7),

),

),

sequencing :

array(0..35) of

short_identifier_type,

// the SPM for the array is

36

numeric :

real(10,7),

other :

characterstring(iso-1046-1),

// SPM: 4000 characters

),

(2) Description

The values of this data element consist of data generated when a learner responds to an interaction. This data element shall have one of the ten possible variants that shall match the conditions described below. The content developer may create extended types using other.

(a) true_false: A state that contains the values true and false. The state true means true or

an equivalence of true in a particular context (e.g., agree, yes). The state false means false or an equivalence of false in a particular context (e.g., disagree, no).

(b) multiple_choice: A set of short identifiers. The values of the identifiers in the set represent the choices made by the learner. The set may contain zero or more short identifiers. Examples: If a single choice was allowed, the set would contain a single identifier, e.g., “alpha.” If a combination of choices was allowed, the set would contain multiple identifiers, e.g., “alpha,” “bravo,” and “delta,” the order of which is insignificant.

(c) fill_in: An array of localized strings.

(d) long_fill_in: A localized string.

(e) likert: A short identifier. The value of the identifier represents the choice made by the learner.

(f) matching: A bag that contains zero or more records. Each record contains a source and a target that are represented by short identifiers. Each record represents a match made by the learner.

(g) performance: An array of responses in the order in which they were provided by the learner in response to the interaction. Each response consists of a step name (a short identifier) and either a single literal value (a character string) or a number. The step names and types of the responses shall match those provided in the correct_responses for the interaction (see 6.1.9.5), but the responses in the learner_response may be in a different order. Because a learner may perform the same step more than once, the step names of the responses may not be unique (i.e., a step name may appear more than once with the same value or with a different value).

Example: If the performance involves setting several valves to specific positions, the learner may adjust the position of the same valve more than once in the course of the performance. The name-value pairs for the response might be “valve 1:open, valve 2:closed, valve 1:closed.” Notes: (1)The SPM for performance for learner_response is

twice the size of the SPM for performance for correct_responses (see 6.1.9.5) to allow the recording of extra steps, as in the example above. (2) The syntax of the name-value pairs is not specified by this Standard.

(h) sequencing: An array of zero or more short identifiers. The sequence determined by the learner is represented by the order of the elements in the array. Each short identifier identifies one element that was available to be sequenced.

(i) numeric: A real number.

(j) other: A string defined by the specific “other” interaction type (see 6.1.9.2). The content of this string is not defined by this Standard.

Subclauses 6.2.5 and 6.2.9 define localized_string_type and short_identifier_type, respectively.

NOTES

1. The learner_response data element is a structured mechanism for identifying the exact learner response relating to each of the types of interactions described in 6.1.9.2. The determination of correctness is an implementation-defined feature of the content object.
2. The type of the interaction, as defined in 6.1.9.2, has to be known to select the appropriate variant.

6.1.9.8 Result

(1) Synopsis

result :

choice

(

state(result_state, numeric),

)

of

(

result_state :

state(correct, incorrect,

unanticipated, neutral),

numeric :

real(10,7),

),

(2) Description

The value of this data element is a judgment of the correctness of the learner response. This data element shall have one of the following permissible values:

(a) correct: The learner response was correct.

(b) incorrect: The learner response was incorrect.

(c) unanticipated: The learner response was not expected.

(d) neutral: The learner response was neither correct nor incorrect.

(e) numeric: A real number.

NOTES

1.This Standard does not specify where or how the value of result is determined.

2.The numeric value real(10,7) is included to provide the capability of reporting a numeric estimate of the correctness of the learner response. This Standard does not specify how correctness is represented in the numeric value.

6.1.9.9 Latency

(1) Synopsis

latency :

timeinterval(second,10,2),

(2) Description

The value of this data element is the time elapsed between the time the interaction was made available to the learner for response and the time of the first response.

A string binding conforming to ISO 8601:2000 may be used to communicate time interval values (see Annex C).

NOTE：The latency information is not available for an interaction if the learner did not respond. The latency is, in effect, the time difference between the time_stamp (see 6.1.9.4) of the interaction and the time of the first response. If several interactions have the same time_stamp because they became available for response at the same time, the latency recorded for each interaction can be used to determine the order in which the learner responded to these interactions.

6.1.9.10 Description

(1) Synopsis

description :

localized_string_type(250),

// the parameter value is the

SPM

(2) Description

The value of this data element is a brief informative description of the interaction. Subclause 6.2.5 defines localized_string_type.

6.1.10 Launch data

(1)Synopsis

launch_data :

characterstring(iso-1064

6-1),

// SPM: 4000 characters

(2)Description

The value of this data element provides data specific to a content object that the content object can use for initialization. The value of this data element is not specified.

NOTE：The allowable values for this data element are defined by the implementer of

the content object. Typically, the documentation for the content object would specify what data can or has to be provided.

6.1.11 Learner ID

(1) Synopsis

learner_id :

long_identifier_type,

(2) Description

The value of this data element identifies the learner on behalf of whom this content object instance was launched. The label shall be unique at least within the scope of the content object.
Subclause 6.2.6 defines long_identifier_type.

NOTE：This Standard does not specify how learner IDs are created, assigned, or resolved.

6.1.12 Learner name

(1) Synopsis

learner_name :

localized_string_type(250),

// the parameter value is the

SPM

(2) Description

The value of this data element is the name of the learner.
Subclause 6.2.5 defines localized_string_type.

NOTE：This Standard does not specify how learner names are created, assigned, or resolved.

6.1.13 Learner preference data

(1) Synopsis

learner_preference_data :

```
    learner_preference_type,

type learner_preference_type =

    record

    (

        audio_level :

            real(10,7) range(0..*),

        language :

            language_type,

        delivery_speed :

            real(10,7) range(0..*),

        audio_captioning :

            state( off, no_change, on ),

    ),
```

(2) Description

The values of this data element specify learner preferences associated with the learner's use of the content object.

The components of learner_preference_data are defined in 6.1.13.1 – 6.1.13.4.

NOTE：This Standard does not specify whether the content object, the RTS, or both have the ability to set or interpret learner preferences.

6.1.13.1 Audio level

(1) Synopsis

audio_level :

real(10,7) range(0..*),

(2) Description

The value of this data element is a multiplier value that specifies an intended change in perceived audio level relative to an implementation-specific reference level with the value 1 meaning "no change." For example, the value 0 specifies infinite attenuation, the value 0.5 specifies an attenuation of 10 decibels, and the value 2 specifies an amplification of 10 decibels.

NOTE：The multiplier value is not intended to be applied to the effect of previous changes communicated through this data element, but rather to the same implementation-specific reference level.

6.1.13.2 Language

(1) Synopsis

language :

language_type,

(2) Description

The value of this data element is the learner's preferred language for a content object with multilingual capability.

Subclause 6.2.4 defines language_type.

6.1.13.3 Delivery speed

(1) Synopsis

delivery_speed :

real(10,7) range(0..*),

(2) Description

The value of this data element is a multiplier that specifies the learner's preferred relative speed of content delivery expressed as a change in speed relative to an implementation-specific reference speed. For example, the value 2 is twice as fast as the reference speed and the value 0.5 is one half the reference speed.

NOTES

1. A value of 0 indicates that delivery is stopped.
2. The multiplier value is not intended to be applied to the effect of previous changes communicated through this data element, but rather to the same implementation-specific reference speed.

6.1.13.4 Audio captioning

(1) Synopsis

audio_captioning :

state(off, no_change, on),

(2) Description

The value of this data element specifies whether captioning text corresponding to audio is displayed. This data element shall have one of the following permissible values:

(a) off: Captioning is off, and text corresponding to audio is not displayed.

(b) no_change: The current captioning setting.

(c) on: Captioning is on, and text corresponding to audio is displayed.

6.1.14 Lesson status

(1) Synopsis

lesson_status :

state(passed, failed, completed, incomplete,

browsed,

not_attempted),

(2) Description

This data element is included for backward compatibility with legacy implementations. The data elements completion_status and success_status should be used (see 6.1.3 and 6.1.24, respectively). The value of this data element indicates whether the learner has attempted, completed, passed, failed, or browsed the associated content object. This data element shall have one of the following permissible values:

(a) passed: The learner has satisfied the requirements to pass the content object.

(b) failed: The learner has not satisfied the requirements to pass the content object.

(c) completed: The learner has satisfied the requirements to complete the content object.

(d) incomplete: The learner has not satisfied the requirements to complete the content object.

(e) browsed: The learner has accessed the content object with a mode of browse or elected to browse while in the content object after a normal launch.

(f) not_attempted: The learner has not accessed the content object, or the learner previously has accessed the content object but has experienced so little of it that it is considered to be not attempted.

NOTES

1. This Standard does not specify how to determine lesson_status. It may be reported by a content object, determined by an RTS by comparing scores to mastery scores, determined on the basis of objectives set by an outside agent (e.g., an instructor), or by some other means.
2. The completion_status and success_status data elements should be used because the lesson_status data element may exist only in legacy implementations.

6.1.15 Location

(1) Synopsis

location :

characterstring(iso-10646-1),

// SPM: 1000 characters

(2) Description

The value of this data element is a location in the content object. The value and its meaning are defined by the content object and are not specified by this Standard. This Standard does not specify how an implementation shall represent that there is no value for location.

NOTES

1. Depending on the implementation, the absence of a value for location could be represented as an empty string, a null element, or the absence of the data element.
2. If a content object communicates a location on exit, this data element provides support for a mechanism that lets the learner return to the content object at the same place he or she left it. This data element can identify the learner's exit point with a value that is meaningful to the content object only, and that location information can be used by the content object as an entry point the next time the learner enters the content object. This data element also can be used by the content object to communicate its location to the RTS on an ongoing basis. Example: An RTS may be able to use this information to create bookmarks or to synchronize reference materials or annotations with the location reported by the content.

6.1.16 Max time allowed

(1) Synopsis

max_time_allowed :

timeinterval(second,10,2),

(2) Description

The value of this data element is the amount of accumulated time the learner is allowed to use a content object in the learner attempt. (See 6.1.26 for the content object's expected response to exceeding the limit.)

A string binding conforming to ISO 8601:2000 may be used to communicate time interval values (see Annex C).

NOTE：The learner attempt begins with the beginning of the first learner session and continues until the activity terminates.

6.1.17 Mode

(1)Synopsis

mode :

state(browse, normal, review),

(2)Description

The value of this data element identifies one of three possible modes in which a content object may be presented to a learner. This data element shall have one of the following permissible values:

(a) browse: The content object is presented without the intent of recording any information about the current learner session.

(b) normal: The content object is presented with the intent of recording information about the current learner session.

(c) review: The content object has previously recorded information about the learner attempt and is presented without the intent of updating this information with data from the current learner session. Note: The learner attempt begins with the beginning of the first learner session and continues until the activity terminates.

6.1.18 Objectives

(1) Synopsis

objectives :

set of objective_type,

// SPM: 100 objective_type records in the

bag

type objective_type =

record

(

id :

long_identifier_type,

score :

score_type,

status :

state(passed, completed, failed, incomplete, browsed,

not_attempted),

progress_measure :

progress_measure_type,

completion_status :

completion_status_type,

success_status :

success_status_type,

description :

localized_string_type(250),

// the parameter value is the SPM

),

(2) Description

The values of this data element specify learning or performance objectives associated with a content object. An instance of an objective_type record shall include an objective identifier (see 6.1.18.1); all other components are optional.

The components of objective_type are defined in 6.1.18.1 – 6.1.18.7.

NOTES

1. Information about objectives may come from a content object, from an RTS, or from some other source.
2. This Standard does not define any relationship between objectives and the content object's completion_status, lesson_status, score, or success_status (see 6.1.3, 6.1.14, 6.1.22, and 6.1.24,

respectively).

6.1.18.1 ID

(1) Synopsis

id :

long_identifier_type,

(2) Description

The value of this data element is a label for the objective. This label shall be unique at least within the scope of the content object.
Subclause 6.2.6 defines long_identifier_type.

NOTE：This Standard does not specify how IDs are created, assigned, or resolved.

6.1.18.2 Score

(1) Synopsis

score :

score_type,

(2) Description

The value of this data element is the score achieved by the learner for the objective.
Subclause 6.2.8 defines score_type.

NOTE：This Standard does not specify how the value of score is created or assigned.

6.1.18.3 Status

(1) Synopsis

status :

state(passed, completed,

failed, incomplete,

browsed,

not_attempted),

(2) Description

This data element is included for backward compatibility with legacy implementations. The data elements completion_status and success_status should be used (see 6.1.18.5 and 6.1.18.6, respectively).

The value of this data element indicates whether the learner has engaged with that portion of the content object related to the objective and, if so, whether the learner has demonstrated mastery of the objective. This data element shall have one of the following permissible values:

(a) passed: The objective was passed.

(b) completed: All parts of the content object related to the objective were accessed. The objective may or may not have been passed.

(c) failed: The objective was failed.

(d) incomplete: Not all parts of the content object related to the objective were accessed.

(e) not_attempted: No part of the content object related to the objective was accessed.

(f) browsed: No specific status information for the objective is available because the content object related to the objective was launched with a mode of browse (see 6.1.17).

NOTES

1. This Standard does not specify how to determine status. Status may be provided by the content object, by an RTS, or by some other means.
2. The completion_status and success_status data elements should be used because the status data element may exist only in legacy implementations.

6.1.18.4 Progress measure

(1) Synopsis

progress_measure :

progress_measure_type,

(2) Description

The value of this data element is a measure of the progress the learner has made toward completing the objective.
Subclause 6.2.7 defines progress_measure_type.

NOTE：This Standard does not specify how to determine the value of progress_measure.

6.1.18.5 Completion status

(1) Synopsis

completion_status :

completion_status_type,

(2) Description

The value of this data element indicates whether the learner has completed the objective.
Subclause 6.2.2 defines completion_status_type.

NOTE：This Standard does not specify how to determine completion_status. It may be reported by a content object, determined by an RTS, determined on the basis of objectives set by an outside agent (e.g., an instructor), or by some other means.

6.1.18.6 Success status

(1) Synopsis

success_status :

success_status_type,

(2) Description

The value of this data element indicates whether the learner has mastered the objective.
Subclause 6.2.10 defines success_status_type.

NOTE：This Standard does not specify how to determine success_status. It may be reported by a content object, determined by an RTS, determined on the basis of objectives set by an outside agent (e.g., an instructor), or by some other means.

6.1.18.7 Description

(1) Synopsis

description :

localized_string_type(250),

// the parameter value is the

SPM

(2) Description

The value of this data element is a brief informative description of the objective. Subclause 6.2.5 defines localized_string_type.

6.1.19 Progress measure

(1) Synopsis

progress_measure :

progress_measure_type,

(2) Description

The value of this data element is a measure of the progress the learner has made toward completing the content object.
Subclause 6.2.7 defines progress_measure_type.

NOTES

1. This Standard does not specify an exact relationship between completion_status (see 6.1.3) and values for progress_measure other than 0 or 1. Any value between 0 and 1 typically corresponds to a completion_status value of incomplete, unless the value is equal to or above a defined completion_threshold (see 6.1.4); in which case, the value typically corresponds to a completion_status value of completed.
2. This Standard does not specify how to determine the value of progress_measure.

6.1.20 Raw passing score

(1) Synopsis

raw_passing_score :

real(10,7),

(2) Description

The value of this data element is the raw passing score for a content object. The scale is not defined. This data element is included for backward compatibility with legacy implementations. The data element scaled_passing_score should be used (see 6.1.21).

NOTE：The scaled_passing_score data element should be used because the raw_passing_score data element may exist only in legacy implementations.

6.1.21 Scaled passing score

(1) Synopsis

scaled_passing_score :

real(10,7) range(-1..1),

(2) Description

The value of this data element is the scaled passing score for a content object. The value of this data element is scaled to fit the range –1 to 1 inclusive.

NOTES

1. If a scaled_passing_score is defined for the use of a content object, this is a statement that the requirements associated with the use of that content object are achieved by obtaining a score (see 6.1.22) greater than or equal to the scaled_passing_score. For example, if the scaled_passing_score for a content object is 0.85 and a learner achieves a scaled score of 0.90, a success_status of passed may be assigned to that content object for that learner (see 6.1.24). However, this Standard does not specify or require that an RTS, content object, or any other system component interpret or take action in response to a scaled_passing_score.
2. A scaled score range of –1 to +1 is used to allow a content developer to more easily assign a penalty for an incorrect choice.

6.1.22 Score

(1) Synopsis

score :

score_type,

(2) Description

The value of this data element is the learner's score for the content object.

Subclause 6.2.8 defines score_type.

6.1.23 Session time

(1) Synopsis

session_time :

timeinterval(second,10,2),

(2) Description

The value of this data element is the amount of time that the learner has spent in the current learner session for this content object. If no learner session is in progress, the session time is the time the learner spent in the last learner session for this content object.

A string binding conforming to ISO 8601:2000 may be used to communicate time interval values (see Annex C).

NOTES

1. This Standard does not specify how to determine the value of session_time or its accuracy.
2. The value for session_time may be evaluated one or more times during a learner session. The value of total_time (see 6.1.27) is not updated until after the learner session has ended.
3. If a learner session is in progress, the actual duration of the learner attempt is the total_time (see 6.1.27) plus the current session_time.

6.1.24 Success status

(1) Synopsis

success_status :

success_status_type,

(2) Description

The value of this data element indicates whether the learner has mastered the content object. Subclause 6.2.10 defines success_status_type.

NOTE：This Standard does not specify how to determine success_status. It may be reported by a content object, determined by an RTS by comparing scores to mastery scores, determined on the basis of objectives set by an outside agent (e.g., an instructor), or by some other means.

6.1.25 Suspend data

(1)Synopsis

suspend_data :

characterstring(iso-10646-1),

// SPM: 4000 characters

(2)Description

The value of this data element provides information that may be created by a content object as a result of a learner accessing or interacting with that content object. The format of the content of this data element is unspecified.

NOTE：The intent is for the content object to store data for later use in the current learner session or a subsequent learner session between the content object and the same learner.

6.1.26 Time limit action

(1)Synopsis

time_limit_action :

state(exit_message, continue_message, exit_no_message,

continue_no_message),

(2)Description

The value of this data element indicates what the content object should do when max_time_allowed is exceeded (see 6.1.16). This data element shall have one of the following permissible values:

(a) exit_message: The learner should be forced to exit the content object. The content object should provide a message to the learner that indicates that the maximum time allowed for the learner attempt was exceeded.

(b) continue_message: The learner should be allowed to continue in the content object.

The content object should provide a message to the learner that indicates that the maximum time allowed for the learner attempt was exceeded.

(c) exit_no_message: The learner should be forced to exit the content object with no message.

(d) continue_no_message: Although the learner has exceeded the maximum time allowed for the learner attempt, the learner should not be given a message and should not be forced to exit the content object.

NOTES

1. When a message is presented to the learner, the content object defines the content and form of the message.
2. This Standard does not specify how the content object forces the learner to exit the content object.

6.1.27 Total time

(1)Synopsis

total_time :
timeinterval(second,10,2),

(2)Description

The value of this data element is the sum of all of the learner's learner session times (see 6.1.23) accumulated in the current learner attempt before the current learner session. The value of total_time shall not be updated while a learner session is in progress.

A string binding conforming to ISO 8601:2000 may be used to communicate time interval values (see Annex C).

NOTE：The learner attempt begins with the beginning of the first learner session and continues until the activity terminates.

6.2 Auxiliary data types

The following data types are used in conjunction with the data elements described in 6.1.

6.2.1 Comment type

(1) Synopsis

```
type comment_type =
    record
    (
        comment :
            localized_string_type(4000),
            // the parameter value is the SPM
            location :
            characterstring(iso-10646-1),
            // SPM: 1000 characters
            time_stamp :
            date_time_type,
            ),
```

(2) Description

This data type describes textual input. Instances of this data type shall include a comment (see 6.2.1.1). The components of the comment_type are defined in 6.2.1.1 – 6.2.1.3.

6.2.1.1 Comment

(1) Synopsis

```
comment :
    localized_string_type(4000),
    // the parameter value is the SPM
```

(2) Description

This data element shall describe comments or annotations associated with a content object.
Subclause 6.2.5 defines.

NOTE：This Standard does not define a structure or format for the content of the localized string.

6.2.1.2 Location

(1) Synopsis

location :

characterstring(iso-106

46-1),

// SPM: 1000

characters

(2) Description

This data element is the point in the content object at which the comment applies. If no value is specified for location, the comment is applicable to the entire content object. This Standard does not specify how an implementation shall represent that no value exists for location.

NOTES

1. Depending on the implementation, the absence of a value for location could be represented as an empty string, a null element, or the absence of the data element.
2. This Standard does not specify how an implementation defines a location in a content object.

6.2.1.3 Time stamp

(1) Synopsis

time_stamp :

date_time_type,

(2) Description

This data element is the point in time at which the comment was created or most recently changed. Subclause 6.2.3 defines date_time_type.

6.2.2 Completion status type

(1) Synopsis

type completion_status_type =

state(completed, incomplete, not_attempted, unknown),

(2) Description

This data type indicates whether the learner has completed a content object or an objective. This data type shall have one of the following permissible values:

(a) completed: The learner has experienced enough of the content object or objective to consider it completed.

(b) incomplete: The learner has not experienced enough of the content object or objective to consider it completed.

(c) not_attempted: The learner is considered not to have used the content object or objective in any significant way. Note: The learner has not accessed the content object or objective, or the learner previously has accessed it but has experienced so little of it that it is considered to be not attempted.

(d) unknown: No assertion is made.

6.2.3 Data time type

(1) Synopsis

type date_time_type =

time(second,10,0),

(2) Description

This data type represents a point in time. This data type shall have a required precision of 1 second and an optional precision of 0.01 seconds.

Implementations of this data type shall include distinct representations for points in time in the range 197001-01 00:00:00 through 2037-12-31 23:59:59, not including leap seconds, with a required precision of 1 second and an optional precision of 0.01 seconds. Implementations may include distinct representations for values beyond the required date and time range.

A string binding conforming to ISO 8601:2000 may be used to communicate date and time values (see Annex C).

NOTES

1.This Standard does not specify how to translate times expressed with precisions of hundredths of

a second to times expressed with precisions of seconds, which may be done by rounding, truncation, or another method.

2.Conforming implementations are permitted, but not required, to support the representation of leap seconds.

6.2.4 Language type

(1) Synopsis

```
type language_type =

    characterstring(iso-646),

    // SPM: 250 characters
```

(2) Description

The format of this data type is a character string consisting of a required language code followed by multiple, optional, hyphen-prefixed subcodes (see examples below).

The following rules apply to the language code part of the character string:

(a) Two-letter codes are defined by ISO 639-1.

(b) Three-letter codes are defined by ISO 639-2.

(c) The one-letter code “i” is reserved and used as a prefix for registrations defined by the Internet Assigned Numbers Authority (IANA).

(d) The one-letter code “x” is reserved and used as a prefix for private use.

The following rules apply to the first subcode part of the character string:

(a) Two-letter subcodes are ISO 3166-1 alpha-2 country codes.

(b) Subcodes from three to eight letters are registered with IANA.

Rules for additional subcodes are unspecified.

ISO 639-2 specifies two code sets, one for bibliographic applications (ISO 639-2/B) and one for terminology applications (ISO 639-2/T). Either code set may be used.

NOTE：The language code is normally given in lower case and the subcodes (if any) in upper case. However, the values are case insensitive.

Examples

“en-GB”

“de”

“fr-CA”

“it”

“grc” (Ancient Greek, until 1453)

“en-US-philadelphia”

“eng-GB-cockney”

“map-PG-buin”(Austronesian - Papua New Guinea Buin)

“gem-US-pennsylvania”

“i-bnn” (IANA Bunun)

6.2.5 Localized string type

(1) Synopsis

```
type localized_string_type(length) =

    record

    (


        language :

            language_type,

            string :

            characterstring(iso-10646-1),

            // SPM: the length parameter

            ),
```

(2) Description

This data type consists of a language specification for a string and the string itself.

The components of the localized_string_type are defined in 6.2.5.1 and 6.2.5.2.

Examples

The following are three examples of localized strings: “Information Technology” in French, “localization” in British English, and “xxx” in Japanese hiragana.

(“fr”, “Technologies de l’information”)

(“en-GB”, “localisation”)

(“jp-JP-jisx208”, “xxx”)

6.2.5.1 Language

(1) Synopsis

```
language :

    language_type,
```

(2) Description

This data element specifies the language of the localized string. Subclause 6.2.4 defines language_type.

6.2.5.2 String

(1) Synopsis

```
string :

    characterstring(iso-10646-1),

    // SPM: the length parameter
```

(2) Description

This data element contains the text of the localized string.

6.2.6 Long identifier type

(1) Synopsis

```
type long_identifier_type =

    characterstring(iso-106

    46-1),

    // SPM: 4000

    characters
```

(2) Description

This data type is an identifier (a label) associated with an object that is intended to be unique within the context of usage of the object. The character string shall conform to the syntax for Uniform

Resource Identifiers (URIs) as defined by RFC 2396.

NOTE：This Standard recommends that the URI be a globally unique identifier in the form of a Uniform Resource Name (URN) (see RFC 2141 [B4]).

6.2.7 Progress measure type

(1) Synopsis

```
type progress_measure_type :
    real(10,7) range(0..1),
```

(2) Description

This data type is a measure of the progress the learner has made toward completing a content object or an objective. A value of 0 corresponds to a completion_status_type value of not_attempted (see 6.2.2). A value of 1 corresponds to a completion_status_type value of completed.

6.2.8 Score type

(1) Synopsis

```
type score_type =
    record
    (
        raw :
            real(10,7),
            min :
            real(10,7),
            max :
            real(10,7),
            scaled :
            real(10,7) range(-1..1),
    ),
```

(2) Description

This data type describes scoring information.

The components of the score_typeare defined in 6.2.8.1 – 6.2.8.4.

6.2.8.1 Raw

(1) Synopsis

raw :

real(10,7),

(2) Description

This data element is a number that reflects the performance of the learner relative to the range bounded by the values of min and max.

NOTE：A raw score is not necessarily an unprocessed score. Example: An unprocessed score might be converted to a percentage score as a decimal value. That is, the learner achieved a score of 3 out of 4 possible, which is converted to a raw value of 0.75 with min (see 6.2.8.2) equal to 0 and max(see 6.2.8.3) equal to 1.

6.2.8.2 Min

(1) Synopsis

min :

real(10,7),

(2) Description

This data element is the minimum value in the range for the raw score (see 6.2.8.1).

6.2.8.3 Max

(1) Synopsis

max :

real(10,7),

(2) Description

This data element is the maximum value in the range for the raw score (see 6.2.8.1).

6.2.8.4 Scaled

(1) Synopsis

```
scaled :

    real(10,7) range(-1..1),
```

(2) Description

This data element is a number that reflects the performance of the learner. The value of the data element is scaled to fit the range –1 to 1, inclusive.

NOTE：A scaled score range of –1 to +1 is used to allow a content developer to more easily assign a penalty for an incorrect choice, such as in a flight simulation system where the learner's choice would have resulted in the loss of the aircraft and all aboard.

6.2.9 Short identifier type

(1) Synopsis

```
type short_identifier_type =

    characterstring(iso-10646-1),

    // SPM: 250 characters
```

(2) Description

This data type is an identifier (a label). The character string shall conform to the syntax for URIs as defined by RFC 2396.

6.2.10 Success status type

(1) Synopsis

```
type success_status_type =

    state( passed, failed, unknown ),
```

(2) Description

This data type indicates whether the learner has mastered a content object or an objective. This data type shall have one of the following permissible values:

(a) passed: The learner has passed the content object or objective.

(b) failed: The learner has failed the content object or objective.

(c) unknown: No assertion is made.

Annex A

Bibliography
(informative)

[B1] AICC CMI001, CMI Guidelines for Interoperability, Version 3.5, April 2001.

[B2] IEEE 100, The Authoritative Dictionary of IEEE Standards Terms, Seventh Edition.

[B3] IEEE Std 1484.11.2-2003, Standard for Learning Technology—ECMAScript Application Programming Interface for Content to Runtime Services Communication.

[B4] IETF RFC 2141, URN Syntax.

Annex B

Understanding the ISO/IEC 11404:1996 real and time interval data type definitions used in this Standard

(informative)

The real and time interval data types used in this Standard are discussed in B.1 and B.2.

B.1 Real data type

The declaration real(10,7) denotes a real data type with values that have precision to 10^{-7} (i.e., 0.0000001).

For example, according to this type definition

- 5550.000001 and 5550.000002 are different values
- 5550.000000001 and 5550.0 may evaluate to the same value, because the difference of 0.000000001 is too small to be accounted for according to the precision requirement of the type definition
- 5550.0 and 5550.000000 are the same value
- 5550.0 and 5550 evaluate to the same value

B.2 Time interval data type

The declaration timeinterval(second,10,2) denotes that the value for the data element timeinterval represents elapsed time with a precision of 0.01 seconds.

This Standard does not require implementations to distinguish between, for example, time intervals of 2.000 seconds and 2.001 seconds, because the difference of 0.001 seconds is less than the precision requirement for this data type.

This Standard recommends that bindings use a string representation conforming to ISO 8601:2000 to communicate the time interval value. However, this Standard does not specify a binding, and different bindings are possible for a value of this data type.

For example, if a binding uses real numbers to represent seconds

- A duration of exactly 1 hour can be expressed with the real value 3600.0
- A duration of 2.5 seconds can be expressed with the real value 2.5
- A duration of 1 hour and 30 minutes can be expressed with the real value 5800.0

If a binding uses ISO 8601:2000

- A duration of exactly 1 hour can be expressed with the string “PT1H”

— A duration of 2.5 seconds can be expressed with the string “PT2.5S”

— A duration of 1 hour and 30 minutes can be expressed with the string “PT1H30M”

The format for the string representations above is defined by the following pattern:

P[yY][mM][dD][T[hH][nM][s[.s]S]]

where

y is the number of years (integer, ≥ 0, not restricted)

m is the number of months (integer, ≥ 0, not restricted, e.g., > 12 is acceptable)

d is the number of days (integer, ≥ 0, not restricted, e.g., > 31 is acceptable)

h is the number of hours (integer, ≥ 0, not restricted, e.g., > 23 is acceptable)

n is the number of minutes (integer, ≥ 0, not restricted, e.g., > 59 is acceptable)

s is the number of seconds or fraction of seconds (real or integer, ≥ 0, not restricted, e.g., > 59 is acceptable)

The character literal designators “P”, “Y”, “M”, “D”, “T”, “H”, “M”, and “S” have to appear if the corresponding nonzero value is present.

Annex C

ISO 8601:2000 representation of the date time type (informative)

A string representation conforming to ISO 8601:2000 may be used to communicate the values of the date_time_type (see 6.2.3). This Standard does not specify a binding, and other bindings are possible.

For example, using a string representation conforming to ISO 8601:2000, the point in time July 16, 1997,
30.17 seconds past 7:20 PM with a time offset of 1 hour with respect to UTC, can be expressed with the string

"1997-07-16T19:20:30.17+01:00"

where the format is defined by the following pattern:

YYYY[-MM[-DD[Thh[:mm[:ss[.s[TZD]]]]]]]

where

YYYY is the four-digit year (≥ 0001)
MM is the two-digit month (01 through 12 where 01 = January, etc.)
DD is the two-digit day of month (01 through 31, depending on value of month and year)
hh is the two digits of hour (00 through 23) (AM/PM NOT allowed)
mm is the two digits of minute (00 through 59)
ss is the two digits of second (00 through 59)
s is the one or more digits representing a decimal fraction of a second
TZD is the time zone designator ("Z" for UTC or +hh:mm or -hh:mm)

At least the four-digit year must be present. If additional parts of the value of the date_time_type are included, the character literals "-", "T", ":", and "." are parts of the character lexical representation for the value.
If the time portion is present, but the time zone designator is not present, the time zone is unspecified, and the time is interpreted as "local time."

1. 參考資料

AICC CMI001, CMI Guidelines for Interoperability, Version 3.5, April 2001.

IEEE 100, The Authoritative Dictionary of IEEE Standards Terms, Seventh Edition.

IEEE Std 1484.11.2-2003, Standard for Learning Technology—ECMAScript Application Program¬ming Interface for Content to Runtime Services Communication.

IETF RFC 2141, URN Syntax.

2. 爭議事項

在研譯的過程中，發現原始規格書(IEEE 1484.11.1)之內容中，有部份爭議之處，整理如下：

(1) 原始規格書的 p .30 ：6.1.20 Raw passing curse 建議修改成 Raw passing score，因為 curse 置於此難以解釋，而且在規格的內文，其實也都是用 score 在做解釋。

(2) 原始規格書的 p .37 ：6.2.7 Progess measure type 之"Progess"拚字有誤，應改成"progress"。

(3) 本中文草案的內容，有對各資料模型的名稱及定義進行中文翻譯，但由於部份資料模型的對應值無法以中文翻譯表示(如第 16 頁資料模型"Entry"所對應的 ab_initio、_nil_ 等值)，同時考量於後續資料模型繫結的實作上也需保持英文示之故，為保持文件內容表示的統一性，本中文草案的資料模型對應值仍統一以英文表示。

(4) 6.1.9.7(學習者回覆)之描述(b)，在原文中有"agree,yes,richtig"及"disagree,no,falsch"等內容，由於"richtig"及"falsch"並非英文單字，又在判別前後文後發現去除此兩字並不會造成內文意義上的誤解，因此特別去除之而未特別翻譯。

以上問題，已在中文及英文草案中修正。

3. 英中名詞對照表

-A-

array	陣列
audio captioning	音訊字幕

-B-

bag	紀錄袋
binding	繫結

-C-

category	類目
character	字元
character string	字元串
credit	學分

-D-

data model	資料模型

-E-

element	元件
entry	進入
exit	退出

-F-

flag	旗標

-G-

-H-

-I-

identifier	識別符
instance	實例

-J-

-K-

-L-

label	標記
latency	潛時
learning management system (LMS)	學習管理系統(LMS)

-M-

max time allowed	最大允許時間

-N-

-O-

-P-

profile	規範

-Q-

-R-

raw passing score	原始及格分數
runtime service (RTS)	執行時期服務(RTS)
response	回應

-S-

scale	標度
scaled passing score	標度及格分數
sentinel value	標兵值
session time	交談時間
smallest permitted maximum(SPM)	最小允許上限

-T-

threshold	*門檻*
time stamp	時戳

-U-

Universal Multiple-Octet Coded Character Set (UCS)	*通用多八位元編碼字元集(UCS)*
Uniform Resource Identifier (URI)	*通用資源識別符(URI)*

-V-

-W-

-X-

weight	權重

-Y-

-Z-

4. 中英名詞對照表

陣列	array
音訊字幕	audio captioning
紀錄袋	bag
繫結	binding
類目	category
字元	character
字元串	character string
學分	credit
資料模型	data model
元件	element
進入	entry

退出	exit
旗標	flag
識別符	identifier
實例	instance
標記	label
潛時	latency
學習管理系統(LMS)	learning management system (LMS)
最大允許時間	max time allowed
規範	profile
原始及格分數	raw passing score
執行時期服務(RTS)	runtime service (RTS)
回應	response
標度	scale
標度及格分數	scaled passing score
標兵值	sentinel value
交談時間	session time
最小允許上限	smallest permitted maximum(SPM)
門檻	*threshold*
時戳	time stamp
通用多八位元編碼字元集(UCS)	*Universal Multiple-Octet Coded Character Set (UCS)*
通用資源識別符(URI)	*Uniform Resource Identifier (URI)*
權重	weight