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Internationalisation of SIF and harmonisation with other specs/standards

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Foreword

This work is directly related to the European Commission's Mandate M/280 'Standardisation mandate to CEN, CENELEC and ETSI in the domain of 'Learning and Training Technologies & Educational Multimedia Software', covering the development of a workplan for standards related activities in relation to Learning Technologies. The first agreed workplan was published as CWA 14040 in the year 2000. In a second step, the original workplan has been expanded. The development of Interoperability frameworks for exchange of information between diverse management systems in cooperation with OASIS [1], Open Architecture and Schools in Society, was one of the recommendations for further work.

This report was prepared by an appointed Project Team within the CEN/ISSS Learning Technologies Workshop. The CEN/ISSS Learning Technologies Workshop (WS-LT) [2] agreed at its meeting in Madrid on April 04/05 2002 to provide interoperability specifications for a range of information exchange, initially aimed at school systems, but also applicable in a wider lifelong learning context. This work item will support the output of the OASIS (Open Architecture and Schools in Society) project which enables different applications and systems to share information.

OASIS is an ambitious project to promote virtual communities in the school system, partly by harmonizing information exchange standards. It has been proposed in the framework of the User-friendly information society (the IST Programme) under the Fifth Framework Programme, which defines the European Commission activities in the field of RTD (Research Technological development and Demonstration). The work of OASIS will initially be based upon the SIF project (Schools Interoperability Framework) [3] but will be adapted by the partners to meet European needs. Some of the original specifications will be discarded and some additional ones will be created.

The work item will focus on collaborating with the OASIS partners in ensuring that the specifications they produce do not duplicate international standards activity, are appropriate for a broader audience and are suitable for e-Europe standardisation.

This CEN Workshop Agreement identifies those elements within the SIF Data Model that should be further studied in order to properly cope with the multi-cultural and multi-lingual environment in Europe. In addition, this document also identifies those parts of the SIF specification that overlap with other existing standards for e-learning and other domains whose adoption may be considered by SIF-based initiatives.

The document has been developed through the collaboration of a number of contributing partners, representing a wide mix of interests, from universities to commercial companies representatives. The names of the individuals and their affiliations that have expressed support for this CWA is available from the CEN/ISSS Secretariat

The final review/endorsement round for this CWA was started on the 2004-01-12 and closed 2004-01-25.

The final text of this CWA was submitted to CEN for approval and publication in 2004-02-04.

1 Scope

The purpose of this CWA is twofold:

1. Identify those elements within the SIF Data Model that should be extended in order to be used in a worldwide environment. For this, special attention was paid to the identification of issues related to multi-cultural and multi-lingual environments.
2. Harmonise the SIF Data Model with other existing specifications/standards in the e-learning domain. Also, for those aspects not directly related to e-learning (e.g. bus routes, cafeteria tickets, etc.) this CWA presents whether standards in those areas exist or not.

Although the purpose of this CWA is to internationalise SIF in a worldwide context, special emphasis was put on those issues that may affect the multicultural and multilingual Europe.

The use of the SIF data model in a multicultural and multilingual environment raises some issues about localisation and/or correct interpretation of attributes used in different contexts. For this reason it is mandatory to identify those SIF data elements that are culturally dependent, need to be further detailed or are not clearly explained.

The purpose is to support the global applicability and understanding of the SIF Data Model, investigating both general cultural topics (different calendars, languages, etc) and more specific technical issues (character sets, standards for dates, etc.).

This work will support the outputs of the OASIS project that enable different applications and systems to share information. This CWA is intended to be used by OASIS and other initiatives worldwide which would like to localise the SIF specification in their particular contexts, and to develop their own data models taking into account existing standards/specifications that may be reused and internationalisation issues that may have been left out of the SIF specification. At the same time the SIF specification developers may consider this CWA for future updates of the specification.

Other people and organizations that may be affected by the recommendations made in this report are schools, teachers, software enterprises developing SIF-compliant software and software managers in schools.

2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

<i>CEDEFOP</i>	<i>European Centre for the Development of Vocational Training (Centre Européen pour le Développement de la Formation Professionnelle)</i>
<i>CEN</i>	<i>European Committee for Standardization (Comité Européen de Normalisation)</i>
<i>CENELEC</i>	<i>European Committee for Electrotechnical Standardization</i>
<i>CWA</i>	<i>CEN Workshop Agreement</i>
<i>ETB</i>	<i>European Treasury Browser</i>
<i>ETSI</i>	<i>European Telecommunications Standards Institute</i>
<i>EUN</i>	<i>European SchoolNet</i>
<i>IEC</i>	<i>International Electrotechnical Commission</i>
<i>IEEE</i>	<i>Institute of Electrical and Electronics Engineers</i>
<i>ISO</i>	<i>International Organization for Standardization</i>
<i>ISSS</i>	<i>Information Society Standardization System</i>
<i>LIP</i>	<i>IMS Learner Information Package</i>
<i>NCES</i>	<i>National Center for Educational Statistics</i>
<i>OASIS</i>	<i>Open Architecture and Schools in Society</i>
<i>PAPI</i>	<i>Public And Private Information</i>
<i>RTD</i>	<i>Research Technological development and Demonstration</i>
<i>SIF</i>	<i>Schools Interoperability Framework</i>
<i>SIG</i>	<i>Special Interest Group</i>
<i>SPEEDE</i>	<i>Standardization of Postsecondary Education Electronic Data Exchange</i>
<i>STUDENTHB</i>	<i>Student Data Handbook</i>
<i>W3C</i>	<i>World Wide Web Consortium</i>
<i>WS/LT</i>	<i>CEN/ISSS Workshop on Learning Technologies</i>
<i>XML</i>	<i>eXtensible Markup Language</i>
<i>ZIS</i>	<i>Zone Integration Server</i>

3 References

[1] OASIS, <i>Open Architecture and Schools in Society</i> http://oasis.cnice.mecd.es/index.htm
[2] CEN ISSS WS-LT, <i>CEN Information Society Standardization System Learning Technologies Workshop</i> http://cenorm.be/iss/Workshop/LT/Default.htm
[3] SIF, <i>Schools Interoperability Framework</i> http://www.sifinfo.org
[4] CEN/ISSS, <i>CEN Information Society Standardization System</i> http://www.cenorm.be/iss
[5] ISO, <i>International Organization for Standardization</i> http://www.iso.org
[6] IEC, <i>International Electrotechnical Commission</i> http://www.iec.ch
[7] W3C, <i>World Wide Web Consortium</i> http://www.w3.org
[8] ARIADNE http://www.ariadne-eu.org/
[9] eEurope http://europa.eu.int/information_society/eeurope/
[10] EUN, <i>European Schoolnet</i> http://www.eun.org
[11] PROMETEUS PROMoting Multimedia access to Education and Training in EUropean Society http://prometeus.org
[12] IMS Project http://www.imsproject.org
[13] ADL, <i>The Department of Defense's (DoD) Advanced Distributed Learning</i> http://www.adlnet.org
[14] IEEE LTSC, <i>IEEE Learning Technology Standards Committee</i> http://ltsc.ieee.org/
[15] Schools Interoperability Framework (SIF) specification version 1.1 http://www.sifinfo.org/spec.html
[16] ISO/IEC 10646-1: 2000. <i>Information technology -- Universal Multiple-Octet Coded Character Set (UCS) - Part 1: Architecture and Basic Multilingual Planet</i> http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=29819&ICS1=35&ICS2=40&ICS3
[17] Unicode http://www.unicode.org/
[18] ISO 15924 <i>Code for the representation of names of scripts</i> http://www.evertype.com/standards/iso15924/index.html
[19] ANSI/NISO Z39.53-2001: <i>Codes for the Representation of Languages for Information Interchange</i> http://www.niso.org/Z3953.html
[20] ISO 639-1: 2002. <i>Code for the representation of names of languages -- Part 1: Alpha-2 code</i> http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=22109&ICS1=1&ICS2=140&ICS3=20
[21] ISO 639-2: 1998. <i>Codes for the representation of names of languages -- Part 2: Alpha-3 code</i> http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=4767&ICS1=1&ICS2=140&ICS3=20
[22] ISO 639 Joint Advisory Committee, http://lcweb.loc.gov/standards/iso639-2/iso639jac.html

[23] ISO 3166-1:1997 <i>Codes for the representation of names of countries and their subdivisions -- Part 1: Country codes</i> http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=24591&ICS1=1&ICS2=140&ICS3=30
[24] ISO 3166-3:1999 <i>Codes for the representation of names of countries and their subdivisions -- Part 3: Code for formerly used names of countries</i> http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=2130&ICS1=1&ICS2=140&ICS3=30
[25] ISO 3166-2:1998 <i>Codes for the representation of names of countries and their subdivisions -- Part 2: Country subdivision code</i> http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=8349&ICS1=1&ICS2=140&ICS3=30
[26] RFC 3066-2001: <i>Tags for Identification of Languages</i> http://www.ietf.org/rfc/rfc3066
[27] CEN CWA14643, <i>Internationalisation of the IEEE Learning Object Metadata</i> http://www.cenorm.be/cenorm/businessdomains/businessdomains/informationstandardizationsystem/published+cwas/cwa14643.pdf
[28] ISO 8601: 2000. <i>Data elements and interchange formats -- Information interchange -- Representation of dates and times</i> http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=26780&ICS1=1&ICS2=140&ICS3=30
[29] ISO 4217:2001. <i>Codes for the representation of currencies and funds</i> http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=34749&ICS1=3&ICS2=60&ICS3
[30] ISO 31:1992. <i>Quantities and Units. Part 0: General Principles, Units and Symbols</i> http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=3621&ICS1=1&ICS2=60&ICS3
[31] ISO 31:1992. <i>Quantities and Units. Part 1: Space and time</i> http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=3623&ICS1=1&ICS2=60&ICS3
[32] SPEEDE, <i>Standardization of Postsecondary Education Electronic Data Exchange</i> http://nces.ed.gov/edi/speedeExp.asp
[33] NCES STUDENTHB, <i>National Center for Educational Statistics Student Data Handbook</i> http://nces.ed.gov/pubs2000/studenthb/
[34] LIP, <i>Learner Information Package</i> http://www.imsproject.org/accessibility/acclipv1p0pd/imsacclip_infov1p0pd.html
[35] PAPI, <i>Public And Private Information</i> http://edutool.com/papi
[36] vCard, <i>virtual Card</i> http://www.imc.org/pdi/vcard-21.txt
[37] ETB, <i>European Treasury Browser</i> http://www.en.eun.org/eun.org2/eun/en/etb/content.cfm?lang=en&ov=7208
[38] CEDEFOP, <i>European Centre for the Development of Vocational Training</i> http://www.cedefop.eu.int/
[39] vCalendar, <i>virtual Calendar</i> http://www.imc.org/pdi/vcal-10.txt
[40] iCalendar, http://www.ietf.org/rfc/rfc2445.txt

4 Standards Organizations and Activities

A number of organizations working on standardisation are, or may become, particularly interested in this report. These include:

- CEN/ISSS [4] which has several workshops involved with standards related to learning technologies, such as Metadata for Multimedia Information, E-commerce, and the Workshop in Learning Technologies (WS-LT). The Cultural Diversity Steering Group (CDSG) is also of special relevance.
- ISO [5] and IEC [6] which have produced many globally accepted standards for a wide range of domains; the subcommittee ISO/IEC JTC1 SC36, Information Technology for Learning, Education, and Training, has several working groups and ad hoc committees. CEN/ISSS/LT-WS has a Category A liaison relationship with SC36. Other relevant committees are ISO/TC 37 (*Terminology and other language resources*) and ISO/TC 46 (*Information and documentation*).
- W3C [7] which produces many generic and domain specific standards and specifications for the World Wide Web and the Internet.

There are several significant European activities connected with learning technologies, including:

- ARIADNE [8], a European foundation developing concepts and tools for computer-based and telematics-supported remote authoring, teaching and learning, with a strong emphasis on the sharing and reuse of electronic learning material. The foundation partners contribute to international standardisation activities, notably for metadata, and have developed an operational infrastructure.
- OASIS, Open Architecture and Schools Interoperability project which aims to maintain public educational systems as leaders in Internet-based education by developing the concept of the small school virtual community. Its main objectives are to prepare a blueprint for interoperability that allows schools to share information in a virtual community and to develop a cost-effective school Zone Server.
- eEurope [9], an initiative intended to accelerate positive change in the Union. It aims at ensuring that this change towards the Information Society is cohesive, not divisive. eEurope also aims at bringing the benefits of the Information Society to the reach of all Europeans.
- EUN [10], European Schoolnet which has several work plans as part of a European network of national networks for school level ICT. Activities include examining issues around metadata and IPR.
- PROMETEUS [11] – PROMoting Multimedia access to Education and Training in European Society, co-founded with the WS/LT with a membership of over 500 European corporate and academic organizations. There are several active Special Interest Groups (SIGs) that are producing recommendations and guidelines. Having built consensus, PROMETEUS may feed recommendations for standards into WS/LT. This is part of a two-way process, as WS/LT may identify topics that are not mature enough for standardisation but are appropriate for research and consensus building within PROMETEUS.

There are also significant global activities connected with learning technologies, such as:

- The IMS Global Learning Consortium [12] with centres in several countries and has produced a wide range of specifications for learning technologies.
- The Advanced Distributed Learning (ADL) Initiative [13], sponsored by the Office of the Secretary of Defence (OSD), a collaborative effort between US government, industry and academia to establish a new distributed learning environment that permits the interoperability of learning tools and course content on a global scale.

- The Learning Technology Standards Committee (LTSC) [14] is chartered by the IEEE Computer Society Standards Activity Board to develop accredited technical standards, recommended practices and guides for learning technology. The LTSC coordinates formally and informally with other organizations that produce specifications and standards for similar purposes. Standards development is done in working groups via a combination of face-to-face meetings, teleconferences, and exchanges in discussion groups.

5 Introduction to SIF

The Schools Interoperability Framework (SIF) [3] is an industry initiative to develop an open specification for ensuring that K-12 instructional and administrative software applications work together more effectively. SIF is not a product, but rather an industry-supported technical blueprint for K-12 software that will enable diverse applications to interact and share data seamlessly; now and in the future.

Much of today's educational software is proprietary, meaning that data cannot be easily shared and transferred, if at all.

The lack of interoperability to users means:

- Applications and their data are isolated from one another
- Redundant data entry is common
- Disconnected applications have higher support costs
- Data reporting is costly and inefficient
- Data is inaccessible for decision makers

The lack of interoperability also forces administrators to spend large amounts of time and money to keep all of their institutions' various software programs up to date. With multiple sets of data, there is also an increased possibility that information being dispersed by a school to parents or others may not be entirely correct or current.

The goal of SIF is to eliminate redundant data entry and improve schools' ability to gather and report data. This will allow schools to reduce support and maintenance costs because administrators can purchase software that enables data sharing without requiring costly add-ons to be built. This initiative will also make the process of purchasing software easier for administrators, because they will know that as long as new software is SIF certified, it will be able to interact with other SIF certified applications.

A standard set of specifications used by all education software companies would:

- Ensure that data is entered only once in one application, and automatically propagates to other applications
- Allow applications to exchange data more effectively
- Enable schools to create powerful reports by accessing data from different applications
- Allow educators to deliver reports securely via the Internet to various organisations

6 SIF Data Model

The SIF Data Model [15] describes the data objects and elements that may be transferred between agents via the ZIS. It is clearly divided into 2 parts: the first one presents the common elements that will be used by other more complex objects and the second one where the objects which belong to each working group are described. Among the SIF working groups, some of them have not defined any data object because it is not their aim (e.g. Customer Involvement, Requirements, Communications & Accords (CIRCA))

Common Elements

- **Address:** an address which will occur within objects and elements such as *StaffPersonal* and *StudentPersonal/StudentAddress*, etc.
- **Demographics:** this describes ethnicity, gender, country of birth, language etc.
- **Email:** email addresses of people within the system.
- **GridLocation:** a latitude and longitude used within other elements such as *BusStopInfo* and *Address*.
- **MeetingTime:** the meeting times and periods for a course.
- **OtherID:** lists other IDs associated with objects such as barcodes and identifiers of schools.
- **PhoneNumber:** of people within the system.

Data objects from specific working groups

Food Services objects

- **Student meal:** communicates the current meal status of a pupil.

Human Resources and Financials objects

- **Billing:** specifies an amount to be billed.
- **Payment:** contains information about the payment of a billing object.

Library Automation objects

- **LibraryPatronStatus:** this is a complex object detailing library books held, fines due etc.

Student Information objects

- **AttendanceCodeInfo:** used for attendance records i.e. absences, reasons for absences etc.
- **RoomInfo:** information about rooms in a school – their size, capacity etc.
- **RoomType:** the type of room e.g. cafeteria, classroom etc.
- **SchoolCourseInfo:** information about courses.
- **SchoolInfo:** information about the school such as contact details and name of principal.
- **SectionInfo:** a section appears to be a part of a course.

- **StaffPersonal:** personal information relating to a staff member. Most of these elements are defined already in *Name, Email, Address*, etc.
- **StudentContact:** similar to *StaffPersonal* this contains contact details for a pupil's "contacts" (e.g. a parent).
- **StudentDailyAttendance:** time in and time out for a pupil on a particular day together with notes if necessary.
- **StudentPersonal:** all personal information related to a pupil. Most of this is contact details.
- **StudentPicture:** contains a picture or the URL of a picture of the pupil.
- **StudentSchoolEnrollment:** when a pupil enrolled at the school, their current academic level etc.
- **StudentSectionEnrollment:** similar to the above but relating to a student's enrolment in a section of a course.
- **TermInfo:** information about a term, its start and end date etc.

Transportation and Geographic Information objects

- **BusEquipment:** may refer to a wheelchair for instance.
- **BusInfo:** details about a bus, its capacity and any special equipment on it.
- **BusRouteDetail:** the schedule for a bus route, its stops and times.
- **BusRouteInfo:** all information about a bus route including the name of the driver, the distance and duration of the route.
- **BusStopInfo:** information about a bus stop – a description and location.
- **StudentTransportInfo:** transportation information about a student – their eligibility and a reference to a *BusRouteDetail* for instance.

7 Internationalisation of the SIF Data Model

This section analyses the Data Model presented in the SIF specification version 1.1 [15]. Concrete actions are presented in section 10. These recommendations should be considered when adopting SIF in other settings different from the US, for example, Europe.

7.1 Objects that should be further studied

There are 3 data objects that show the need of adaptation of the SIF Data Model when used in a different cultural/educational setting: *StudentSectionEnrollment*, *SectionInfo* and *TermInfo*. Different educational settings use different durations for these periods.

There are also some data objects that should be adapted to each particular educational/cultural/political environment (e.g. Address, Name, SchoolInfo). A detailed analysis of these internationalisation needs as far as each particular object is concerned is presented in section 9.

The corresponding recommendation is **10.1**

The rest of this section focuses on those issues that can be applied in general to the SIF Data Model, i.e. two or more objects would be affected by these recommendations.

7.2 Repertoires for data coding

The SIF specification does not identify the character set repertoire that should be used to represent textual information. Nevertheless, this is an important issue when dealing with multi-lingual environments. There are several recommendations that could be made at this point.

1. The SIF specification may be updated to define a repertoire character set wide enough to cope with as many languages as possible. ISO/IEC 10646 [16] and Unicode [17] should be used for this purpose. Also, when the script is relevant, the ISO 15924 [18] needs to be used. There are some languages where the writing style (left to right or vice versa and top to bottom or vice versa) is different from the western style. Writing style is a function of script. Most languages have one script only, which would be the default (from which it is possible to deviate some special cases). Other languages are rendered in different scripts. For Europe that is particularly the case for Serbian and Bosnian; to some extent also for Moldavian, Croatian and Yiddish.
2. Those SIF-based specifications that adapt the American specification to their particular cultural and linguistic environment should take into account what the appropriate repertoire character set is. In this case, special attention should be paid to those cases where it is possible to have SIF zones or federation of SIF zones that cover different cultural areas with different needs as far as character set repertoires is concerned.

The corresponding recommendation is **10.2**

7.3 Actions on *Language* elements

The value space for *Language* (Demographics object) and *LanguageOfInstruction* (SectionInfo object) is the ANSI/NISO Z39.53-2001: *Codes for the Representation of Languages for Information Interchange* [19]. This standard defines a set of three-letter codes for language identification. However, this language representation has several disadvantages for its use in a worldwide environment:

1. The format does not allow the use of dialects or variations. For example, a variation/dialect of Spanish, Asturian, is not included in Z39.53.

2. Variations of the same language depending on the country where it is spoken cannot be managed using this standard. For example, there should be a mechanism to distinguish between Mexican Spanish or Spaniard Spanish, or US English and UK English.
3. Variations of the same language depending on the region where it is spoken cannot be managed using this standard. For example, the following French variants: Norman, Picard, Wallon, Angevin, Berrichon, Bourbonnais, Bourguignon, Franc-Comtois, Gallo, Lorraine, Poitevin, Santogonais from http://www.ethnologue.com/show_language.asp?code=FRN do not have a code.

To solve these problems, the ISO 639 (*codes for the representation of the names of languages*) series have to be applied. The US standard ANSI/NISO Z39.53 is maintained by Library of Congress, which is also involved in the maintenance process of the ISO 639 series. In many respects Z39.53 is a national US application of the International Standard.

Currently two parts of ISO 639 exist, Part 1 (2002) being the alpha-2 code table, and Part 2 (1998) being the alpha-3 code table. ISO 639-1 [20] is a subset of ISO 639-2 [21] as far as language inclusion is concerned. Items like “en” and “eng” are synonyms. The two parts are being maintained by one joint committee, the ISO 639 Registration Authorities’ Joint Advisory Committee (JAC) [22].

ISO 639-2 provides in principle one alpha-3 code table for, at this moment, 468 languages. For historical and backwards compatibility reasons there are 21 “synonyms” in the code table. This causes the existence of two code sets: the bibliographic and the terminology. The terminology version contains 21 codes based on the native name of the language and the other ones based on the English name of the language and the bibliographic version contains all the codes based on the English name of the language, so all the codes are identical apart from those 21. No new synonyms will be accepted in the future. For coherence reasons, this CWA recommends the use of the bibliographic version.

The ISO 639 standard series will be developed further. Part 3 is being voted on as a CD at the time of this writing. That part includes some 6000 alpha-3 identifiers for the majority of living languages of the world. Parts 4, 5 and 6 are also in the pipeline. Part 6 will provide mechanisms for identifying virtually any language variant.

ISO 639 code covers the first and second issues outlined above. Country identifiers (ISO 3166-1 [23] and ISO 3166-3 [24]) may be used in combination with language identifiers. Country subdivision identifiers (ISO 3166-2 [25]) may also be used. This way English in the state of New York could be identified as “en-US-NY”. At present not all the subdivisions of all the countries are covered by this standard, so there will be cases where it will not be applicable.

The concern expressed in item 3 will in the future be covered by ISO 639-6. However, some of the “variants” may be recognized as “individual languages” (the distinction between language, dialect and language variant is not absolutely clear).

Language identifiers from ISO 639 may also be combined with script identifiers from ISO 15924 (*Information and Documentation – Code for the representation of names of scripts*). This way, “es-US-FL-Cyrl” would be Spanish as used in Florida in Cyrillic script, if it existed.

Therefore, the use of ISO 639 standard series will be able to cope with all the problems stated at the beginning of this section. Currently, there are some options that try to represent as many language variations as possible:

The RFC 3066 (Tags for the Identification of Languages) [26] proposes a language tag of one or more parts: A primary language subtag and a (possibly empty) series of subsequent subtags. Its syntax is as follows:

Language-Tag = Primary-subtag * (“-“ Subtag)

Primary-subtag = 1*8ALPHA

Subtag = 1*8(ALPHA / DIGIT)

The productions ALPHA and DIGIT denote respectively the characters A to Z in upper or lower case and the digits from 0 to 9. The character “-” is HYPHEN-MINUS.

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The primary subtag may be either a 2-letter code from ISO 639-1:2002 standard, "Code for the representation of names of languages" or a 3-letter code from ISO 639-2 standard, "Codes for the representation of names of languages – Part 2: Alpha-3 code"

The second subtag may be a 2-letter code from ISO 3166 standard, "Codes for the representation of names of countries and their subdivisions – Part 1: Country codes", a dialect, a language not listed in ISO 639-1 that is not variant of any listed language and can be registered with IANA (Internet Assigned Numbers Authority), region identification, etc.

There are no further rules for the third and subsequent subtags. This RFC also proposes several best practice guidelines related with the tags that should be followed to face interoperability issues.

Another alternative that is based on the CEN Workshop Agreement on the Internationalisation of the IEEE Learning Object Metadata (CWA 14643 [27]) defines the following format:

Langcode("-"Subcode("-"Variant))

where

Langcode: Three letter code according to the standard ISO 639-2:1998

Subcode: Two letter code for identification of countries according to the standard ISO 3166-1:1997.

Variant: Code for the variation of the language identified by the previous two codes.

Some examples are shown below:

eng-US-philadelphia

eng-GB-newcastle

spa-ES-andalucia

spa-MX-monterrey

fre-FR-paris

This CWA recommends to use the following variation of the previous format while the ISO 639 series is not completely developed:

Langcode("-"Subcode("-"Variant))

where

Langcode: Three letter code according to the standard ISO 639-2:1998

Subcode-Variant: Identification of the region where the language is spoken according to ISO 3166-2. This standard should be used whenever it contains a suitable identification for the language variant. When this is not the case the following meaning for these two fields needs to be used:

Subcode: Two letter code for identification of countries according to the standard ISO 3166-1:1997 and ISO 3166-3:1999.

Variant: Code for the variation of the language identified by the *Langcode* and *Subcode* fields.

The corresponding recommendations are **10.3** and **10.4**.

7.4 Actions on *Date*-value elements and attributes

SIF Data Model does not specify how dates should be represented. The only reference in the specification to date format is in the section where encapsulation of SIF messages over HTTP is presented. In this case the format is, obviously, the format defined in the HTTP RFC (RFC 2616): CCYYMMDD. This format is followed by the SIF Data Model.

Nevertheless, this CWA recommends to explicitly define the date format in the conceptual data model description section within the SIF specification. For this, an initial proposal may be a widely used standard like ISO 8601:2000 [28]. The proposed format by this CWA is in the form YYYY-MM-DD, as ISO 8601:2000 recommends. The date portion only represents dates in the Common Era (CE). The date portion follows the Gregorian calendar for dates after October 15, 1582, and the Julian calendar for dates prior to October 15, 1582, independent of locale. Other cases should be represented using the "Description" data item.

In addition, if SIF is to be used in multicultural environments an extended solution should be found. This is particularly important if a SIF zone may cover a multicultural geographical area or if a SIF federation may lead to an exchange of data among heterogeneous cultural regions.

Although the format proposed above assures interoperability, other national formats for dates or Eras (reference points) are not taken into account. The suggestion is to include an additional local Date that corresponds to the DateTime in ISO 8601:2000 format whenever possible (e.g. year 100 in the Buddhist era corresponds to a BCE year). Provided there exists a unique format/era reference, localisation would be identified using the country code (using ISO 3166-1:1997 and ISO 3166-3:1999). This also supports different formats to represent dates (e.g. DD-MM-YYYY). Nevertheless, since there may be some cases where the country identifier is not enough, an additional reference to the standard document where the format is specified could be needed.

In order to ensure interoperability in a multicultural environment the ISO 8601:2000 standard could be used as the canonical form to represent dates. The alternative representation proposed here should be used whenever providing a localised reference point in time is especially relevant (e.g. the first day of the Chinese year is not obvious when stated in the Gregorian calendar format).

Proposal for DateTime:

This CWA proposes to add a new aggregate data element that can be used to allow DateTime localisation. In this way, the new definition for the DateTime item would be as:

Nr	Name	Explanation	Value Space
1	DateTime	A point in time with accuracy at least as small as a second	ISO 8601
2	Description	Description of the date	
3	DateTimeLocale		
3.1	Locale	Identifier for the country where the LocalisedDateTime applies.	Country code from the code sets ISO 3166-1:1997 and ISO 3166-3:1999
3.2	Source	Identifier of the source (standard or recommendation) that defines the specific date format for the country	Repertoire of the ISO/IEC 10646 Note: A typical Source could be the URL of the document

			where the standard is specified
3.3	LocalisedDateTime	The same point in time as in the DateTime element but formatted according to the specific localisation	Repertoire of the ISO/IEC 10646

Below is shown an example of an XML instance using this approach:

```

<DATETIME>2003-12-25</DATETIME>
<DATETIMELOCALE>
  <LOCALE>US</LOCALE>
  <SOURCE>http://standards.org/us/calendarSpecs.pdf</SOURCE>
  <LOCALIZEDDATETIME>12/25/03</LOCALIZEDDATETIME>
</DATETIMELOCALE>
<DATETIMELOCALE>
  <LOCALE>UK</LOCALE>
  <LOCALIZEDDATETIME>25/12/03</LOCALIZEDDATETIME>
</DATETIMELOCALE>
<DATETIMELOCALE>
  <LOCALE>AE</LOCALE>
  <SOURCE>http://standards.org/ae/calendarNumSpecs.pdf</SOURCE>
  <LOCALIZEDDATETIME>1/11/1424</LOCALIZEDDATETIME>
</DATETIMELOCALE>
<DATETIMELOCALE>
  <LOCALE>AE</LOCALE>
  <SOURCE>http://standards.org/ae/calendarTextSpecs.pdf</SOURCE>
  <LOCALIZEDDATETIME>1 Dhu'l-Qa'dah 1424</LOCALIZEDDATETIME>
</DATETIMELOCALE>

```

An alternative approach of the XML binding for the conceptual model would be to use, whenever possible, attributes instead of sub-elements:

```

<DATETIME>2003-12-25</DATETIME>
<DATETIMELOCALE LOCALE="US" SOURCE=" http://standards.org/us/calendarSpecs.pdf">

```

12/25/03

</DATETIMELOCALE>

<DATETIMELOCALE LOCALE="UK">25/12/03</DATETIMELOCALE>

<DATETIMELOCALE LOCALE="AE" SOURCE=" http://standards.org/ae/calendarNumSpecs.pdf">

1/11/1424

</DATETIMELOCALE>

<DATETIMELOCALE LOCALE="AE" SOURCE=" http://standards.org/ae/calendarTextSpecs.pdf">

1 Dhu'l-Qa'dah 1424

</DATETIMELOCALE>

The corresponding recommendation is **10.5**

7.5 Actions on *currency-based* values

There are several elements in the SIF Data Model that are defined to encapsulate numbers representing a monetary amount. In particular:

- BilledAmount in the object Billing
- ReceivedAmount in the object Payment
- CircTx/FineInfo/Amount, FineAmount, RefundAmount in the object LibraryPatronStatus

In order to cope with multi-currency environments, the following recommendations are proposed:

1. The previously presented objects should be extended to allow the specification of the particular currency being used to indicate each amount (e.g. US dollars, European euros, Mexican pesos, etc.). A straightforward solution, which may be considered as an initial approach, is to create an aggregate data element (e.g. MonetaryAmount) with three sub-elements (e.g. Currency, NumberFormatID and Amount). *Currency* represents the identifier for the actual currency being used, see next point below. *NumberFormatID* lets us take into account different representations for numeric amounts (e.g. for the amount one thousand and fifty six cents the representation may be 1.000,56 or 1,000.56). The use of the country code, according to the ISO 3166-1 and 3166-3 standards, is proposed to identify each particular format.
2. The identifier for the currency must follow a widely used standard. An initial approach may be to use ISO 4217:2001. *Codes for the representation of currencies and funds* [29], which includes a three letter code for each currency.

A proposal for a conceptual model for currency-type values could be:

Name	Explanation	Value Space
Currency	Identifier of the currency	ISO 4217:2001

	unit	
NumberFormatID	Identifier of the country where the value applies	Country code from the code sets ISO 3166-1:1997 and ISO 3166-3:1999
Amount	Number indicating the amount of money	

Two possible XML bindings of this conceptual model are shown below.

The first two examples are shown using an aggregate-data element approach.

<!-- Example 1: Currency element with Euro currency type in the UK-->

```
<MONETARYAMOUNT>
  <CURRENCY>EUR</CURRENCY>
  <NUMBERFORMATID>UK</NUMBERFORMATID>
  <AMOUNT>1,045.96</AMOUNT>
</MONETARYAMOUNT>
```

<!-- Example 2: Currency element with Euro currency type in Germany -- >

```
<MONETARYAMOUNT>
  <CURRENCY>EUR</CURRENCY>
  <NUMBERFORMATID>DE</NUMBERFORMATID>
  <AMOUNT>1.045,96</AMOUNT>
</MONETARYAMOUNT>
```

<!-- Example 3: Currency element with US Dollar currency type in the USA-->

```
<MONETARYAMOUNT>
  <CURRENCY>USD</CURRENCY>
  <NUMBERFORMATID>US</NUMBERFORMATID>
  <AMOUNT>1,045.96</AMOUNT>
</MONETARYAMOUNT>
```

The same result can be achieved with a different approach using attributes instead of sub-elements, as it is done in SIF specification (cf. OtherId element):

<!-- Example 1: Currency element with Euro currency type in the UK (attribute approach)-->

```
<MONETARYAMOUNT CURRENCY="EUR" NUMBERFORMATID="UK">1,045.96</MONETARYAMOUNT>
```

<!-- Example 2: Currency element with Euro currency type in Germany (attribute approach)-->

```
<MONETARYAMOUNT CURRENCY="EUR" NUMBERFORMATID="DE">1.045,96</MONETARYAMOUNT>
```

<!-- Example 3: Currency element with US Dollar currency type in the USA (attribute approach)-->

```
<MONETARYAMOUNT CURRENCY="USD" NUMBERFORMATID="US">1,045.96</MONETARYAMOUNT>
```

The corresponding recommendation is **10.6**

7.6 Actions on *measurement-type* values

There are several objects with elements whose values represent measurements (e.g. RouteDistance in object BusRouteInfo or Size in object RoomInfo). The SIF Data Model makes no reference to the possibility of using these objects in an environment where several measurement formats are used. Two recommendations are made:

1. The previously presented object should be extended to allow the specification of the particular measurement type being used (e.g. miles, feet, pounds, kilometres, kilograms). A straightforward solution, which may be considered as an initial approach, is to create an aggregate data element (e.g. Measurement) with three sub-elements (e.g. Unit, NumberFormatID and Amount). *Unit* represents the identifier for the actual measurement type being used, see next point below. *NumberFormatID* lets us take into account different representations for numeric amounts (e.g. for the amount one thousand and fifty six pounds the representation may be 1.000,56 or 1,000.56). The use of the country code, according to the ISO standard, is proposed to identify each particular format.
2. The identifier for the measurement must follow a widely used standard. An initial approach may be to use ISO 31:1992, *Quantities and Units. Part 0* [30]: *General Principles, Units and Symbols. Part 1: Space and time.* [31]

A proposal for a conceptual model for measurement-type values could be:

Name	Explanation	Value Space
Unit	Identifier of the measurement unit	ISO 31:1992
NumberFormatID	Identifier of the country where the value applies	Country code from the code sets ISO 3166-1:1997 and ISO 3166-3:1999
Amount	Number indicating the measure	

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Two possible XML bindings of this conceptual model are shown below.

The first two examples are shown using an aggregate-data element approach.

<! -- Example 1: Weight measurement using Pounds as unit in the UK-->

```
<MEASUREMENT>
  <UNIT>LBR</UNIT>
  <NUMBERFORMATID>UK</NUMBERFORMATID>
  <AMOUNT>34,982.7</AMOUNT>
</MEASUREMENT>
```

<! -- Example 2: Weight measurement using Kilograms as unit in Germany-->

```
<MEASUREMENT>
  <UNIT>KD</UNIT>
  <NUMBERFORMATID>DE</NUMBERFORMATID>
  <AMOUNT>34.982,7</AMOUNT>
</MEASUREMENT>
```

<! -- Example 3: Size measurement using square inches as unit in the USA-->

```
<MEASUREMENT>
  <UNIT>INK</UNIT>
  <NUMBERFORMATID>US</NUMBERFORMATID>
  <AMOUNT>34,982.7</AMOUNT>
</MEASUREMENT>
```

The same result can be achieved with a different approach using attributes instead of sub-elements, as is done in the SIF specification (cf. OtherId element):

<! -- Example 1: Weight measurement using Pounds as unit in the UK (attribute approach)-->

```
<MEASUREMENT UNIT="LBR" NUMBERFORMATID="UK"> 34,982.7</MEASUREMENT>
```

<! -- Example 2: Weight measurement using Kilograms as unit in Germany (attribute approach)-->

```
<MEASUREMENT UNIT="KD" NUMBERFORMATID="DE">34.982,7</MEASUREMENT>
```

<! -- Example 3: Size measurement using square inches as unit in the USA (attribute approach)-->

<MEASUREMENT UNIT="INK" NUMBERFORMATID="US">34,982.7</MEASUREMENT>

The corresponding recommendation is **10.7**

7.7 Actions on *Vocabularies*

Many SIF data elements use vocabularies, defined by the SIF specification or externally defined in the set of codes SPEEDE (Standardization of Postsecondary Education Electronic Data Exchange) [32] and NCES's STUDENTHB (National Center for Education Statistics) [33]. These codes are composed of an abbreviation, which, in turn, may be a two-number code, one, two or three-letter code or a combination of numbers and letters. The code is accompanied by a textual description of its meaning in the English language.

There are two actions that may be taken on SIF vocabularies as far as internationalisation is concerned:

1. Elements within each vocabulary are described using a textual description in the English language. These descriptions should be translated into other languages. This action may be taken by the SIF community following a gradual translation process. Translations should be carried out in the short term for those languages more widely spoken worldwide. An alternative to this option may be to put this responsibility on each SIF-based initiative, which will be responsible for translating SIF vocabularies into those languages relevant to its geographical context.
2. Many SIF vocabularies provide a set of values that are not suitable or do not cover completely the specific scope outside of a US school environment. For example, the attribute *type* in the common object *OtherId* has as its value space: *District-assigned number*, *State-assigned number*, *Migrant number*, *US government VISA number*. This has to be extended/modified for each particular cultural/political setting. An exhaustive analysis of the SIF Data Model is needed to identify those vocabularies that need to be further developed. An initial proposal is presented in section 9.

The corresponding recommendations are **10.8** and **10.9**

8 Harmonisation of SIF with other standards/specifications

8.1 Introduction

The main information involved in SIF message exchange is related to student management data and administration services. This means that there are few objects dealing with educational (e.g. performance, preference) information. The next section will analyse each object and element identified in the SIF specification. From this analysis it will be clear that harmonisation will be needed with those standards and specifications related to learner information. This subsection introduces some of them:

- **IMS Learner Information Package (LIP)** [34]

Learner Information is a collection of information about a Learner (individual or group learners) or a Producer of learning content (creators, providers or vendors).

IMS LIP is a structured information model. The model defines fields into which the data can be placed and the type of data that may be put into these fields. Typical data might be the name of the learner, a course or training completed, a learning objective or a preference for a particular type of technology,.

- **Public And Private Information (PAPI) Learner** [35]

The PAPI Learner Standard describes a particular subset of all possible types of learner information. Learner information is considered a subset of general information about learning technology.

- **vCard** [36]

vCard is the electronic business card. It is a powerful means of Personal Data Interchange (PDI) that is automating the traditional business card. Some important features are:

- vCards carry vital directory information such as name, addresses (business, home, mailing, parcel), telephone numbers (home, business, fax, pager, cellular, ISDN, voice, data, video), email addresses and Internet URLs (Uniform Resource Locators).
- All vCards can also have graphics and multimedia including photographs, company logos and audio clips such as for name pronunciation
- Geographic and time zone information in vCards lets others know when to contact you.
- vCard supports multiple languages

8.2 Main harmonisation issues identified

1. Specifications introduced above define standardised descriptions for learner personal information. This is the main area where SIF may be harmonised with external specifications/standards. Most SIF objects contain elements with personal data (e.g. *Address*, *Email*, *StudentContact*, etc.) This CWA recommends harmonising personal data information included in the SIF specification using any of the standards/specifications introduced above. The specific standard that should be used needs to be decided after a deeper analysis by the SIF and SIF-based initiatives specification developers.
2. Many SIF data elements use vocabularies, defined by the SIF specification or externally defined in the set of codes SPEEDE (Standardization of Postsecondary Education Electronic Data Exchange) [32] and NCES's STUDENTHB (National Center for Education Statistics) [33]. These codes are composed of an abbreviation, which, in turn, may be a two-number code, one, two or three-letter code or a combination of numbers and letters. The code is accompanied by a textual description of its meaning in the English language. The internationalisation section (section 7) mentions the need to describe these meanings in languages other than English, with special attention to those languages in the context of each particular SIF-based specification. Also, additional elements may be needed to cover the specific geographic and cultural needs of each SIF-based environment. For the latter, SIF

and SIF-based specification developers must take into account existing initiatives to develop taxonomies and vocabularies for the educational domain within their context. For example, in Europe there exist several well-known providers of other types of educational vocabularies (e.g. ETB (*European Treasury Browser*) [37] or CEDEFOP (European Centre for the Development of Vocational Training) [38]).

3. The common data element *MeetingTime* defines a time slot for an event within a section or a course. For this element the specifications vCalendar [39], developed by Versit, and the improved iCalendar [40], which is an enhanced version of vCalendar specified by IETF, could be used. Applications supporting iCalendar should support vCalendar, but the reverse may not occur. iCalendar defines a MIME content type for exchanging electronic calendaring and scheduling information. The implementation is in no way limited solely as a MIME content type. The specification provides the definition of iCalendar object methods that will map this content type to a set of messages for supporting calendaring and scheduling operations such as requesting, replying to, modifying and cancelling meetings or appointments, to-dos and journal entries.

The corresponding recommendations are **10.10**, **10.11** and **10.12**

9 Detailed analysis of SIF Data Model

This section includes a detailed analysis of the SIF Data Model in order to identify:

- Data objects and data elements that should be extended to cope with a multi-cultural and multi-lingual environment (e.g. Europe)
- Vocabularies that SIF uses for a concrete data element that do not properly cover non-US school systems.
- Those recommendations presented in section 10 that can be applied to each data element or data object.

A preliminary consideration is that many SIF data objects deal with learner information for which several specifications exist. Recommendation 10.10 suggests the harmonisation of this information with some existing standards for personal information. In the following SIF data objects this recommendation can be applied: Address, Demographics, Email, Name, PhoneNumber, SchoolInfo, StaffPersonal, StudentContact, StudentPersonal, and StudentPicture.

9.1 Common Elements

9.1.1 Address

Definition of addresses depends upon each particular context (e.g. there are many countries where states and counties do not exist). Therefore, recommendation 10.1 should be applied to this object.

Element	Attribute	Comment
Address		
	Type	Apply recommendation 10.8
Street		
Street/Line1		No action
Street/Line2		No action
Street/Line3		No action
Street/Complex		No action
Street/StreetNumber		No action
Street/StreetPrefix		No action
Street/StreetName		No action
Street/StreetType		No action
Street/StreetSuffix		No action
Street/AptType		No action
Street/AptNumPrefix		No action
Street/AptNumber		No action

Street/AptNumSuffix		No action
City		No action
County		No action
StatePr		
	Code	Apply recommendations 10.8, 10.9 and 10.11
Country		
	Code	No action
PostalCode		No action
GridLocation		See common object GridLocation (section 9.1.4)

9.1.2 Demographics

Element	Attribute	Comment
Demographics		
Ethnicity		
	Type	No action
	Code	Apply recommendations 10.8, 10.9 and 10.11
Ethnicity/Proportion		No action
Gender		Apply recommendation 10.8
BirthDate		Apply recommendation 10.5
BirthDateVerification		Apply recommendation 10.8, 10.9 and 10.11
PlaceOfBirth		No action
CountyOfBirth		Apply recommendation 10.1
StateOfBirth		
	Code	Apply recommendations 10.1, 10.8, 10.9 and 10.11
CountryOfBirth		
	Code	No action
CountryOfCitizenship		
	Code	No action
CountryOfResidence		
	Code	No action
CitizenshipStatus		Apply recommendations 10.8, 10.9 and 10.11
EnglishProficiency		

	Code	Apply recommendations 10.1, 10.8, 10.9 and 10.11
Language		
	Type	Apply recommendations 10.3 and 10.4
DwellingArrangement		Apply recommendations 10.8, 10.9 and 10.11
MaritalStatus		Apply recommendations 10.8, 10.9 and 10.11

9.1.3 Email

Element	Attribute	Comment
Email		No action
	Type	Apply recommendation 10.8

9.1.4 GridLocation

No action

9.1.5 MeetingTime

Element	Attribute	Comment
MeetingTime		Apply recommendation 10.12
TimetableDay		No action
TimetablePeriod		No action

9.1.6 Name

The structure for names is different from one country to another. For example, in Spanish culture each person has a first name and two surnames (the first one inherited from the father, the second one inherited from the mother). This culturally-dependent characteristic should be taken into account when defining new SIF-based data models. Therefore, recommendation 10.1 needs to be applied to this object.

Element	Attribute	Comment
Name		
	Type	Apply recommendations 10.8,10.9 and 10.11
Prefix		No action
LastName		No action
FirstName		No action
MiddleName		No action
Suffix		No action

PreferredName		No action
SortName		No action
FullName		No action

9.1.7 OtherId

Element	Attribute	Comment
OtherID		
	Type	Apply recommendations 10.8, 10.9 and 10.11

9.1.8 PhoneNumber

Element	Attribute	Comment
PhoneNumber		No action
	Format	Apply recommendations 10.8, 10.9 and 10.11
	Type	Apply recommendation 10.8

9.2 Food Services Working Group Objects

9.2.1 StudentMeal

Element	Attribute	Comment
StudentMeal		
	StudentPersonalRefId	No action
MealStatus		
	Type	Apply recommendations 10.8, 10.9 and 10.11. It is particularly important here to take into account possible dependencies between diet and religion or other cultural dependencies.
LastBrkDate		Apply recommendation 10.5
LastLunDate		Apply recommendation 10.5
Cash		Apply recommendation 10.6
BrkCredits		No action
LunCredits		No action

9.3 Human Resources & Financials Working Group Objects

9.3.1 Billing

Element	Attribute	Comment
Billing		
	RefId	No action
EntityId		No action
BillingDate		Apply recommendation 10.5
TransactionDescription		No action
BilledAmount		Apply recommendation 10.6

9.3.2 Payment

Element	Attribute	Comment
Payment		
	RefId	No action
EntityId		No action
ReceivedDate		Apply recommendation 10.5
TransactionDescription		No action
ReceivedAmount		Apply recommendation 10.6
ReceivedTransactionId		No action

9.4 Library Automation Working Group Objects

9.4.1 LibraryPatronStatus

Element	Attribute	Comment
LibraryPatronStatus		
	LibraryType	No action
	SifRefId	No action
	SifRefIdType	Apply recommendation 10.8
ElectronicId		No action
	Type	Apply recommendations 10.8, 10.9 and 10.11
CircTx		

CircTx/ItemTitle		No action
CircTx/ItemElectronicId		No action
	Type	Apply recommendations 10.8, 10.9 and 10.11
CircTx/CallNumber		No action
CircTx/CopyPrice		Apply recommendation 10.6
CircTx/DueInfo		
CircTx/DueInfo/Date		Apply recommendation 10.5
CircTx/DueInfo/Time		Apply recommendation 10.5
	Zone	No action
CircTx/FineInfo		
	Type	Apply recommendation 10.8
CircTx/FineInfo/Date		Apply recommendation 10.5
CircTx/FineInfo/Time		Apply recommendation 10.5
	Zone	No action
CircTx/FineInfo/ Description		No action
CircTx/FineInfo/Amount		Apply recommendation 10.6
CircTx/HoldInfo		
	Type	Apply recommendation 10.7
CircTx/HoldInfo/ DatePlaced		Apply recommendation 10.5
CircTx/HoldInfo/ DateNeeded		Apply recommendation 10.5
CircTx/HoldInfo/ MadeAvailable		Apply recommendation 10.5
CircTx/HoldInfo/Expires		Apply recommendation 10.5
Message		
	Priority	Apply recommendation 10.8
Message/Date		Apply recommendation 10.5
Message/Time		Apply recommendation 10.5
	Zone	No action
Message/Text		No action

NumCheckouts		No action
NumOverdues		No action
NumFines		No action
FineAmount		Apply recommendation 10.6
NumRefunds		No action
RefundAmount		Apply recommendation 10.6

9.5 Student Information Working Group Objects

9.5.1 AttendanceCodeInfo

Element	Attribute	Comment
AttendanceCodeInfo		
	RefId	No action
	SchoolInfoRefId	No action
AttendanceCode		No action
AttendanceType		Apply recommendation 10.8
AttendanceStatus		Apply recommendation 10.8
Description		No action

9.5.2 RoomInfo

Element	Attribute	Comment
RoomInfo		
	RefId	No action
	SchoolInfoRefId	No action
RoomNumber		No action
Staff		
	StaffPersonalRefId	No action
Description		No action
Building		No action
HomeRoomNumber		No action
Size		Apply recommendation 10.7
Capacity		No action

PhoneNumber		See common object PhoneNumber (section 9.1.8)
TypeOfRoom		
	RoomTypeRefId	No action

9.5.3 RoomType

No action

9.5.4 SchoolCourseInfo

There exist dependencies between the information encapsulated in this object and the particular educational/political environment. Therefore, recommendation 10.1 should be applied.

Element	Attribute	Comment
SchoolCourseInfo		
	RefId	No action
	SchoolInfoRefId	No action
CourseCode		No action
StateCourseCode		No action
DistrictCourseCode		No action
SubjectArea		No action
	Code	Apply recommendations 10.8, 10.9 and 10.11
CourseTitle		No action
InstructionalLevel		Apply recommendations 10.8, 10.9 and 10.11
CourseCredits		No action
	Code	Apply recommendations 10.8, 10.9 and 10.11

9.5.5 SchoolInfo

There exist dependencies between the information encapsulated in this object and the particular educational/political environment. Therefore, recommendation 10.1 should be applied.

Element	Attribute	Comment
SchoolInfo		
	RefId	No action
SchoolName		No action
SchoolJurisdiction		
	Code	Apply recommendations 10.8, 10.9 and 10.11

SchoolType		
	Code	Apply recommendations 10.8, 10.9 and 10.11
SchoolURL		No action
PrincipallInfo		
PrincipallInfo/ ContactName		No action
PrincipallInfo/ ContactTitle		No action
PhoneNumber		See common object PhoneNumber (section 9.1.8)
Address		See common object Address (section 9.1.1)
IdentificationInfo		No action
	Code	Apply recommendations 10.8, 10.9 and 10.11
SessionType		
	Code	Apply recommendations 10.8, 10.9 and 10.11
LowGradeLevel		Apply recommendations 10.8, 10.9 and 10.11
HighGradeLevel		Apply recommendations 10.8, 10.9 and 10.11

9.5.6 SectionInfo

There exist dependencies between the information encapsulated in this object and the particular educational/political environment. Therefore, recommendation 10.1 should be applied.

Element	Attribute	Comment
SectionInfo		
	RefId	No action
	SchoolInfoRefId	No action
ScheduleInfo		
	TermInfoRefId	No action
ScheduleInfo/Teacher		
	StaffPersonalRefId	No action
ScheduleInfo/ SectionRoom		
	RoomInfoRefId	No action
ScheduleInfo/ MeetingTime		See common object MeetingTime (section 9.1.5)

MediumOfInstruction		
	Code	Apply recommendations 10.8, 10.9 and 10.11
LanguageOfInstruction		Apply recommendations 10.3 and 10.4
LocationOfInstruction		No action
	Code	Apply recommendations 10.8, 10.9 and 10.11
SchoolCourseInfoOverride		
	Override	Apply recommendation 10.8
SchoolCourseInfoOverride/ CourseCodeOverride		No action
SchoolCourseInfoOverride/ StateCourseCodeOverride		No action
SchoolCourseInfoOverride/ DistrictCourseCodeOverride		No action
SchoolCourseInfoOverride/ SubjectAreaOverride		No action
	Code	Apply recommendations 10.8, 10.9 and 10.11
SchoolCourseInfoOverride/ CourseTitleOverride		No action
SchoolCourseInfoOverride/ InstructionalLevelOverride		Apply recommendations 10.8, 10.9 and 10.11
SchoolCourseInfoOverride/ CourseCreditsOverride		No action
	Code	Apply recommendations 10.8, 10.9 and 10.11

9.5.7 StaffPersonal

Element	Attribute	Comment
StaffPersonal		
	RefId	No action
OtherId		See common object OtherId (section 9.1.7)
Name		See common object Name (section 9.1.6)
Title		No action
Email		See common object Email (section 9.1.3)
Demographics		See common object Demographics (section 9.1.2)
Address		See common object Address (section 9.1.1)

PhoneNumber		See common object PhoneNumber (section 9.1.8)
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9.5.8 StudentContact

Element	Attribute	Comment
StudentContact		
	RefId	No action
	StudentPersonalRefId	No action
	Type	Apply recommendations 10.8, 10.9 and 10.11
Name		See common object Name (section 9.1.6)
PhoneNumber		See common object PhoneNumber (section 9.1.8)
Email		See common object Email (section 9.1.3)
Demographics		See common object Demographics (section 9.1.2)
Address		See common object Address (section 9.1.1)
OtherId		See common object OtherId (section 9.1.7)
Relationship		
	Code	Apply recommendation 10.8
EmployerType		
	Code	Apply recommendations 10.8, 10.9 and 10.11
EducationalLevel		
	Code	Apply recommendations 10.8, 10.9 and 10.11
Pickup Rights		Apply recommendation 10.8

9.5.9 StudentDailyAttendance

Element	Attribute	Comment
StudentDailyAttendance		
	StudentPersonalRefId	No action
	SchoolInfoRefId	No action
	Date	Apply recommendation 10.5
DailyAttendanceCode		No action
	AttendanceCodeInfo	No action
	RefId	

TimeIn		Apply recommendation 10.5
TimeOut		Apply recommendation 10.5
AttendanceNote		No action

9.5.10 StudentPersonal

Element	Attribute	Comment
StudentPersonal		
	RefId	No action
AlertMsg		No action
	Type	No action
OtherId		See common object OtherId (section 9.1.7)
Name		See common object Name (section 9.1.6)
Email		See common object Email (section 9.1.3)
GradYear		No action
	Type	Apply recommendation 10.8
Demographics		See common object Demographics (section 9.1.2)
StudentAddress		
	PickupOrDropoff	Apply recommendation 10.8
	DayOfWeek	Apply recommendation 10.8
StudentAddress/Address		See common object Address (section 9.1.1)
PhoneNumber		See common object PhoneNumber (section 9.1.8)

9.5.11 StudentPicture

No action

9.5.12 StudentSchoolEnrollment

There exist dependencies between the information encapsulated in this object and the particular educational/political environment. Therefore, recommendation 10.1 should be applied.

Element	Attribute	Comment
StudentSchoolEnrollment		
	RefId	No action

	StudentPersonalRefId	No action
	SchoolInfoRefId	No action
	MembershipType	Apply recommendation 10.8
	TimeFrame	Apply recommendation 10.8
EnrollStatus		
	Code	Apply recommendations 10.8, 10.9 and 10.11
EntryDate		Apply recommendation 10.5
EntryType		
	Code	Apply recommendations 10.8 and 10.9
GradeLevel		
	Code	Apply recommendations 10.8, 10.9 and 10.11
HomeRoom		
	RoomInfoRefId	No action
StaffAssigned		
	Type	Apply recommendations 10.8, 10.9 and 10.11
	StaffPersonalRefId	No action
ExitDate		Apply recommendation 10.5
ExitStatus		
	Code	Apply recommendations 10.8, 10.9 and 10.11
ExitType		
	Code	Apply recommendations 10.8 and 10.9
FTE		No action
FTPTStatus		Apply recommendation 10.8

9.5.13 StudentSectionEnrollment

There exist dependencies between the information encapsulated in this object and the particular educational/political environment. Therefore, recommendation 10.1 should be applied.

Element	Attribute	Comment
StudentSectionEnrollment		
	RefId	No action
	StudentPersonalRefId	No action
	SectionInfoRefId	No action

EntryDate		Apply recommendation 10.5
ExitDate		Apply recommendation 10.5
ScheduleInfoOverride		
	Override	Apply recommendation 10.8
	TermInfoRefId	No action
ScheduleInfoOverride/ MeetingTime		See common object MeetingTime (section 9.1.5)

9.5.14 TermInfo

Recommendation 10.12 can be used here.

Element	Attribute	Comment
TermInfo		
	RefId	No action
	SchoolInfoRefId	No action
	SchoolYear	No action
StartDate		Apply recommendation 10.5
EndDate		Apply recommendation 10.5
Description		No action
RelativeDuration		No action
TermCode		No action
Track		No action
TermSpan		No action
	Code	Apply recommendations 10.8, 10.9 and 10.11

9.6 Transportation and Geographic Information Working Group Objects

9.6.1 BusEquipment

No action

9.6.2 BusInfo

No action

9.6.3 BusRouteDetail

Element	Attribute	Comment
BusRouteDetail		
	RefId	No action
	BusRouteInfoRefId	No action
BusStop		
	BusStopInfoRefId	No action
ArrivalTime		Apply recommendation 10.5
	Zone	No action

9.6.4 BusRouteInfo

Element	Attribute	Comment
BusRouteInfo		
	RefId	No action
Bus		
	BusInfoRefId	No action
RouteNumber		No action
RouteType		Apply recommendation 10.8
MaximunLoad		No action
Description		No action
Name		See common object Name (section 9.1.6)
RouteDuration		Apply recommendation 10.4
	Type	Apply recommendation 10.8
RouteDistance		Apply recommendation 10.7
	Type	Apply recommendation 10.8

9.6.5 BusStopInfo

No action

9.6.6 StudentTransportInfo

Element	Attribute	Comment
StudentTransportInfo		
	RefId	No action
	StudentPersonalRefId	No action
	Type	Apply recommendation 10.8
	DayOfWeek	Apply recommendation 10.8
	SchoolInfoRefId	No action
Eligibility		Apply recommendation 10.8
HomeBusRouteDetail		
	BusRouteDetailRefId	No action
TransferPoint		
	EmbarkBusRoute	No action
	DisembarkBusRoute DetailRefId	No action
SchoolBusRouteDetail		
	BusRouteDetailRefId	No action

10 Recommendations

This section contains concrete recommendations based on the analysis made in the previous three sections.

10.1 Recommendation 1 – Incomplete or unsuitable objects and elements

The need There are several data objects that show the need of adaptation of the SIF Data Model when used in a different educational/cultural setting. These include Address, Name, SchoolInfo, StudentSectionEnrollment, TermInfo, etc.

Action To adapt these objects to each different cultural environment changing the necessary elements or adding/removing elements.

10.2 Recommendation 2 – Data coding

The need The SIF specification does not identify the character set repertoire that should be used to represent textual information and this is an important issue when dealing with multilingual environments.

Moreover, there is no way to specify the writing style (left to right/right to left or horizontal/vertical).

Action Update the SIF specification to define a repertoire character set wide enough to cope with as many languages as possible. ISO/IEC 10646 and Unicode should be used for this purpose. Also, when the script is relevant, the ISO 15924 needs to be used.

An alternative would be to specify, for each cultural environment where a SIF-based specification is to be used, the repertoire set needed to properly represent the actual language/s used in that context.

10.3 Recommendation 3 – *Language* elements

The need The value space for *Language* (Demographics object) and *LanguageOfInstruction* (SectionInfo object) is the ANSI/NISO Z39.53-2001: *Codes for the Representation of Languages for Information Interchange*.

This language representation has several disadvantages for its use in a worldwide environment. This format does not allow the use of dialects or variations. For example, a variation/dialect of Spanish, Asturian, is not included in Z39.53. Variations of the same language depending on the country or region where it is spoken cannot be managed using this standard.

Action To specify the use of a standard wider than Z39.53. This CWA proposes the use of ISO 639 series

10.4 Recommendation 4 – *Variations* of the language

The need As ISO 639 series are not completely developed a new representation format is needed in the meantime to cope with the needs shown in recommendation 3. It is predictable that an update of the format will be needed when the ISO 639 series are finished.

Action To adopt the following format (based on CWA 14643, RFC 3066 and current ISO 639 standards):

Langcode(“-“Subcode(“-“Variant))

where

Langcode: Three letter code according to the standard ISO 639-2:1998

Subcode-Variant: Identification of the region where the language is spoken according to ISO 3166-2. This standard should be used whenever it contains a suitable identification for the language variant. When this is not the case the following meaning for these two fields needs to be used:

Subcode: Two letter code for identification of countries according to the standard ISO 3166-1:1997 and ISO 3166-3:1999.

Variant: Code for the variation of the language identified by the *Langcode* and *Subcode* fields.

10.5 Recommendation 5 – *Date-value elements*

The need The SIF Data Model does not specify how dates should be represented. The only reference in the specification to date formats is in the section where encapsulation of SIF messages over HTTP is presented. Specification of date formats should be done at the conceptual data level.

Action To explicitly define the date format in the conceptual data model description section within the SIF specification. For this, an initial proposal may be a widely used standard like ISO 8601. The proposed format by this CWA is in the form YYYY-MM-DD, as ISO 8601:2000 recommends.

To add an extension to the specification of the DateTime item in order to make it possible to use a Localised DateTime when it can be relevant for a particular cultural context. The extension recommended by this CWA is reported in section 7.4 of this document.

10.6 Recommendation 6 – *Currency-based values*

The need There are several elements in the SIF Data Model that are defined to encapsulate numbers representing monetary amounts (e.g. BilledAmount in the object BillingObject).

Action The previously presented objects should be extended to allow the specification of the particular currency being used to indicate each amount. This CWA recommends the creation of an aggregate data element (e.g. MonetaryAmount) with three sub-elements (e.g. Currency, NumberFormatID and Amount).

Currency represents the identifier for the actual currency being used. The identifier for the currency must follow a widely used standard. This CWA recommends the use of ISO 4217:2001. *Codes for the representation of currencies and funds.*

NumberFormatID lets us take into account different representations for numeric amounts (e.g. for the amount one thousand and fifty six cents the representation may be 1.000,56 or 1,000.56). The use of the country code, according to the ISO standards 3166-1 and 3166-3, is proposed to identify each particular format.

10.7 Recommendation 7 – *Measurement-type* values

The need The SIF Data Model makes no reference to the possibility of using objects whose value represents measurements in an environment where several measurement formats are used (e.g. kilometres and miles).

Action To extend those data objects to allow the specification of the particular measurement type being used (e.g. miles, feet, pounds, kilometres, kilograms). This CWA recommends the creation of an aggregate data element (e.g. Measurement) with three sub-elements (e.g. Unit, NumberFormatID and Amount).

Unit represents the identifier for the actual measurement type being used. The identifier for the measurement unit must follow a widely used standard. This CWA recommends the use of ISO 31:1992, *Quantities and Units. Part 0: General Principles, Units and Symbols. Part 1: Space and time.*

NumberFormatID lets us take into account different representations for numeric amounts (e.g. for the amount one thousand and fifty six pounds the representation may be 1.000,56 or 1,000.56). The use of the country code, according to the ISO standards 3166-1 and 3166-3, is proposed to identify each particular format.

10.8 Recommendation 8 – Internationalisation of Vocabularies

- The need* Many SIF data elements use vocabularies defined by the SIF specification or externally defined in two sets of codes. These codes are composed of an abbreviation and a textual description of its meaning in the English language
- Action* To translate descriptions into other languages. This action may be taken by the SIF community following a gradual translation process. Translations should be carried out in the short term for those languages more widely spoken worldwide. An alternative to this option may be to put this responsibility onto each SIF-based initiative.

10.9 Recommendation 9 – *Proposals for Vocabularies*

The need Many SIF vocabularies may provide a set of values that are not suitable or do not cover completely the specific scope outside of a US school environment.

Action To extend/modify vocabularies for each particular cultural/political setting.

10.10 Recommendation 10 – Harmonisation of *Personal Information*

The need The main information involved in message exchange is related to student management data and administration services.

Most SIF objects contain elements with personal data.

Action To harmonise personal data information included in the SIF specification using any of the following standards/specifications: IMS LIP (*Learner Information Package*), PAPI (*Public And Private Information Learner*) and vCard.

10.11 Recommendation 11 – *Harmonisation of vocabularies*

The need Many SIF data elements use vocabularies, defined by the SIF specification or externally defined in two sets of codes. The space value covered by these vocabularies may have been previously defined in other existing initiatives.

Action To take into account existing initiatives to develop taxonomies and vocabularies for the educational domain, which should be multilingual and take cultural dependencies into consideration.

In Europe there exist several well-known providers of other types of educational vocabularies (e.g. ETB (*European Treasury Browser*) [37] or CEDEFOP (European Centre for the Development of Vocational Training) [38]).

10.12 Recommendation 12 – *iCalendar*

The need The common data element *MeetingTime* defines a time slot for an event within a section or a course. This element can be harmonised with other standards.

Action To take into account existing specifications like *iCalendar*, which provides a suitable data model to be used in this context.