

## eCH-0165 SIARD Format Specification

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## Summary

This document contains the specification for the SIARD file format. SIARD stands for Software Independent Archival of Relational Databases. The format was developed by the Swiss Federal Archives. It is a normative description of a file format for the long-term preservation of relational databases.

The SIARD format is based on standards including the ISO standards Unicode and XML and the industry standards SQL:1999 and ZIP. The aim of employing internationally recognised standards is to ensure the long-term preservation of, and access to, the widely used relational database model.

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## 1 Status of the document

This document was **approved** by the committee of experts on 6 March 2013. It has the force of a standard for its defined area of use in the specified scope of validity.

## 2 Introduction

### 2.1 Structure of the document

#### 2.1.1 Structure of chapters

Each chapter in this Specification is constructed according to the same pattern. After a brief introduction, the requirements are listed in a table.

ID	Description of requirement	M/O
contains the ID of the requirement	contains the text of the requirement	stipulates whether mandatory or optional

A requirement is frequently further explained by means of recommendations, notes and examples, each of which is specifically indicated as such.

ID	Description of requirement	M/O
A_3.1-1	<p>Text of requirement</p> <p><b>Example</b> Text of example</p> <p><b>Note</b> Text of note</p> <p><b>Recommendation</b> <i>The text of recommendations is in italics.</i></p>	M

#### 2.1.2 ID for requirements

The requirements are unambiguously identifiable by means of an ID.

ID
A_3.1-1

This ID is constructed according to the following pattern:

G_	Letter + _	identifies main chapters
G_	=	General requirements / principles

- T\_ = Requirements for table data
- M\_ = Requirements for metadata
- P\_ = Requirements for package structure

3.1-1 The number begins with the number of the chapter (which groups together requirements on the same topic), and the number after the dash is consecutive, thus designating all the requirements in the chapter.

### 2.1.3 Distinction between mandatory and optional requirements

Each requirement is either mandatory or optional. This is indicated by a letter:

Abbreviation	Meaning
M	Mandatory requirement This requirement must be met in order to obtain a valid SIARD file.
O	Optional requirement This requirement should be met. It simplifies handling and constitutes best practice.

### 2.1.4 Notation of folders, files and folder structures

The following symbols and parameters are used for the notation of folders, files, etc.

Symbol	Meaning
/	Folder
header/	A folder with the name "header"
xy.txt	File (with file extension "txt")
dir1/	Example folders (in red)
abc.pdf	Example files (in red)
...	Placeholder for files or folders that are not relevant to the explanation
[ ]	Placeholder for an expression or basic type such as "string", "integer", etc.
<xx>	Placeholder for any desired string of characters

## 2.2 Addressees / target group

This is a technical document for IT specialists involved in the long-term archiving of relational databases.

## 2.3 Background

The term “SIARD” stands for Software Independent Archival of Relational Databases. It is an open file format for the long-term archiving of relational databases in the form of text data based on XML that are packaged in a container file (SIARD archive)<sup>1</sup>.

Long-term archiving is the preservation, normally without a time limit, of the information stored in the SIARD files while retaining the bit stream and the ability to interpret and display the data in a way that is human-readable and comprehensible.

If the structure and content of a relational database are translated into the SIARD format, it will subsequently be possible to access the data in the database at any time, even when the original database software is no longer available or can no longer be run. This has been achieved by the use of suitable standards for the SIARD format that are widely supported internationally. This long-term interpretability of the database content is essentially based on two standards: XML and SQL:1999.

## 2.4 Distinctions

It should be noted that the SIARD format is only the long-term storage format for a specific type of digital documents (relational databases) and is therefore designed entirely independently of package structures such as the SIP (Submission Information Package), AIP (Archival Information Package) and DIP (Dissemination Information Package) in the OAIS model.

It is assumed that a database in SIARD format is archived as part of an information package together with other documents (documentation, business documents relevant to the understanding of the database, etc.).

Just as an XML-based Word or e-mail file contains an internal file structure consisting of metadata, primary data and various auxiliary data, an archived relational database in SIARD format contains its own metadata describing the document more precisely in addition to the actual table data – regardless of the metadata catalogue that an archive records in its OAIS packages.

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<sup>1</sup> The SIARD database archiving format is distinct from the SIARD Suite application. This was developed by the Swiss Federal Archives SFA in order to generate and edit SIARD files and import them back into database environments

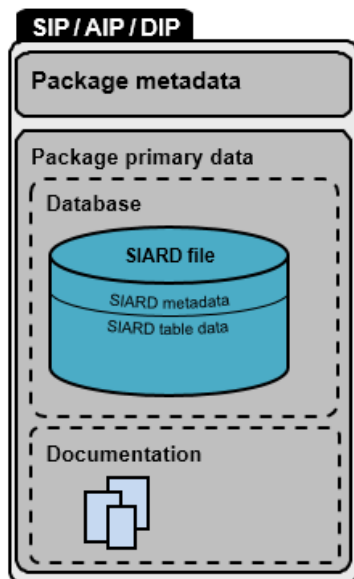


Fig. 1: Diagram of an information package containing a SIARD file



### 3 General requirements / principles

#### 3.1 Use of standards

To ensure that the contents of a database remain interpretable over a long period, the SIARD format is essentially based on two ISO standards: XML and SQL:1999.

ID	Description of requirement	M/O
G_3.1-1	All database content is stored in a collection of XML files in accordance with ISO/IEC 19503:2005. The schema definitions and SQL code must in each case conform to SQL:1999 in accordance with ISO/IEC 9075.  The only exceptions are BLOB and CLOB data (Binary Large Objects and Character Large Objects) from a specific size upwards (see T_6.2-4), which are stored in separate binary files but are referenced in the XML files.	M

#### 3.2 Databases as documents

A relational database is treated as a single document to be archived, so that the references between the data in individual tables are preserved.

ID	Description of requirement	M/O
G_3.2-1	A relational database is archived in a single SIARD file.	M
G_3.2-2	The primary data in a relational database are completely archived in a SIARD file. This means that each SELECT enquiry directed to the original and the archived data yields the same results.	M

#### 3.3 Character sets and characters

ID	Description of requirement	M/O
G_3.3-1	In general, all the data are stored in the Unicode character set in accordance with ISO 10646.	M
G_3.3-2	When extracting from databases that support other character sets, mapping to the corresponding Unicode character sets is carried out. For this reason, the national character string types (NCHAR, NVARCHAR, NCLOB) from the database product must generally be translated into non-national types (CHAR, VARCHAR or CLOB).  This convention is supported by XML, irrespective of whether an XML file is stored in UTF-8 format or in UTF-16 format.	M
G_3.3-3	In the XML files in the SIARD format, all characters that have a special meaning in the XML syntax are replaced by unit references, of the type xs:string in all fields.  Additionally, the Unicode control characters 0-31 and 127-159 are coded using the solidus ("/") to ensure that the validity of the XML file is guaranteed.	M

ID	Description of requirement	M/O																						
G_3.3-4	<p>Characters that cannot be represented in UNICODE (codes 0-8, 14-31, 127-159), as well as the escape character '\' and multiple space characters are escaped as \u00&lt;xx&gt; in XML. Quote, less than and ampersand are represented in XML as entity references.</p> <table border="1"> <thead> <tr> <th>Original characters</th> <th>Characters in the SIARD format</th> </tr> </thead> <tbody> <tr> <td>0 to 8</td> <td>\u0000 to \u0008</td> </tr> <tr> <td>14 to 31</td> <td>\u000E to \u001F</td> </tr> <tr> <td>32</td> <td>\u0020, for multiple spaces</td> </tr> <tr> <td>"</td> <td>&amp;quot;</td> </tr> <tr> <td>&amp;</td> <td>&amp;amp;</td> </tr> <tr> <td>'</td> <td>&amp;apos;</td> </tr> <tr> <td>&lt;</td> <td>&amp;lt;</td> </tr> <tr> <td>&gt;</td> <td>&amp;gt;</td> </tr> <tr> <td>\</td> <td>\u005c</td> </tr> <tr> <td>127 to 159</td> <td>\u007F to \u009F</td> </tr> </tbody> </table>	Original characters	Characters in the SIARD format	0 to 8	\u0000 to \u0008	14 to 31	\u000E to \u001F	32	\u0020, for multiple spaces	"	&quot;	&	&amp;	'	&apos;	<	&lt;	>	&gt;	\	\u005c	127 to 159	\u007F to \u009F	M
Original characters	Characters in the SIARD format																							
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32	\u0020, for multiple spaces																							
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&	&amp;																							
'	&apos;																							
<	&lt;																							
>	&gt;																							
\	\u005c																							
127 to 159	\u007F to \u009F																							

### 3.4 Identifiers and regular identifiers

In SQL:1999 there are regular identifiers<sup>2</sup> excluding spaces and special characters which are not case-sensitive but are stored in upper case, and delimited identifiers which are case-sensitive and may also contain special characters. These are enclosed in double quotation marks in expressions.

The definition of what constitutes a special character is set out in the SQL standard. The upper-case version of a letter is defined by the Unicode standard.

In metadata, a regular identifier is stored in upper case, while a delimited identifier is stored in quotation marks. The SQL:1999 standard stipulates that as soon as an identifier contains a character that is not permitted in a regular identifier, it is deemed to be a delimited identifier.

ID	Description of requirement	M/O
G_3.4-1	In general, all identifiers are stored in the Unicode character set.	M
G_3.4-2	Regular identifiers are in upper case without quotation marks.	M
G_3.4-3	Delimited identifiers are enclosed in quotation marks.	M

<sup>2</sup> An SQL:1999 identifier must begin with a letter (A-Z) or an underscore (\_) followed by letters (A-Z), numbers (0-9) or an underscore (\_), with a maximum of 128 characters.

## 4 Requirements for the format structure

### 4.1 Construction of the SIARD archive file

The SIARD archive file is realised as a ZIP archive.

ID	Description of requirement	M/O
G_4.1-1	The SIARD file is stored as a single, uncompressed ZIP archive in accordance with the specification published by the company PkWare, version 6.3.2 <sup>3</sup> .	M
G_4.1-2	The SIARD file is not password-protected or encrypted.	M
G_4.1-3	Both the ZIP32 and ZIP64 variants are permitted for the ZIP archive.	M
G_4.1-4	The ZIP archive has the file extension ".siard".	M

### 4.2 Structure of the SIARD archive file

A relational database archived in the SIARD format consists of two components: the metadata, which describe the structure of the archived database, and the table data, which represent the table content. The metadata also indicate where the various table data are to be found in the archive.

ID	Description of requirement	M/O
P_4.2-1	<p>The table data are located in the <code>content/</code> folder and the metadata in the <code>header/</code> folder. No further folders or files are permitted.</p> <p><b>Example</b> Structure of the SIARD file (schematic)</p> <pre> Northwind.siard   content/   header/           </pre>	M

<sup>3</sup> ZIP files were originally defined by Phil Katz and are today extensively used as a de facto standard. The current version 6.3.2 of the specification published by PkWare can be found at <http://www.pkware.com/documents/casestudies/APPNOTE.TXT>.

ID	Description of requirement	M/O
P_4.2-2	<p>The <code>content/</code> folder contains one or more schema folders in which the individual table folders are located. No other folders or files are permitted.</p> <p><b>Example</b> Structure of the SIARD file (schematic)</p> <pre data-bbox="432 477 1318 786"> Northwind.siard   content/     schema0/       table0/       table1/       table2/     ...     schema1/       table0/     ... </pre> <p><b>Recommendation</b> <i>It is advisable to normalise the schema and table folders and to use, for example, <code>schema0/</code> and <code>table0/</code> instead of the actual name (see restrictions under P_4.2-5).</i></p>	M
P_4.2-3	<p>The individual table folders contain an XML file and an XSD file, the names of which (folder designation and both file names) must be identical. With the exception of BLOB and CLOB folders together with their content (BIN or TXT files), no other folders or files are permitted.</p> <p><b>Example</b> Structure of the SIARD file (schematic)</p> <pre data-bbox="432 1238 1318 1675"> Northwind.siard   content/     schema0/       table0/         table0.xml         table0.xsd       lob4<sup>4</sup>/         record0.bin         record1.bin       table1/         table1.xml         table1.xsd     ... </pre> <p><b>Recommendation</b> <i>It is advisable to normalise the lob folders and lob files and to use, for example, <code>lob4/</code> and <code>record0.bin</code> or <code>record0.txt</code> instead of the actual name.</i></p>	M

<sup>4</sup> In this example, column 4 contains additional lob files that are accordingly stored in `lob4/`.

ID	Description of requirement	M/O
P_4.2-4	<p>The <code>metadata.xml</code> and <code>metadata.xsd</code> files must be present in the <code>header/</code> folder. Additional files, such as style sheets, are permitted.</p> <p><b>Example</b> Structure of the SIARD file (schematic)</p> <pre data-bbox="432 479 1318 696"> Northwind.siard   content/   ...   header/     metadata.xml     metadata.xsd   ... </pre>	M
P_4.2-5	<p>All file and folder names must be structured as follows: The name must begin with a letter [a-z or A-Z] and must then contain only the following characters:</p> <ul style="list-style-type: none"> <li>• a-z</li> <li>• A-Z</li> <li>• 0-9</li> <li>• -</li> <li>• . (may only be used to separate the name from the extension)</li> </ul> <p><b>Recommendation</b> <i>Where possible, the length of the file and folder names should not exceed 20 characters to avoid problems with excessively long path lengths in Windows.</i></p>	M

### 4.3 Correspondence between metadata and table data

<p>P_4.3-1</p>	<p>The structure prescribed in the metadata.xml must be identical to that in the content/ folder.</p> <p><b>Example</b></p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="437 443 963 1435" style="border: 1px solid #add8e6; padding: 10px; width: 45%;"> <p style="text-align: center; font-weight: bold;">SIARD metadata</p> <pre> ... &lt;dbname&gt;northwind&lt;/dbname&gt; ... &lt;schemas&gt;   &lt;schema&gt;     &lt;name&gt;admin&lt;/name&gt;     &lt;folder&gt;schema0&lt;/folder&gt;     &lt;tables&gt;       &lt;table&gt;         &lt;name&gt;Products&lt;/name&gt;         &lt;folder&gt;table0&lt;/folder&gt;         ...       &lt;/table&gt;       &lt;table&gt;         &lt;name&gt;Shippers&lt;/name&gt;         &lt;folder&gt;table1&lt;/folder&gt;         ...       &lt;/table&gt;       &lt;table&gt;         &lt;name&gt;Orders&lt;/name&gt;         &lt;folder&gt;table2&lt;/folder&gt;         ...       &lt;/table&gt;       &lt;table&gt;         &lt;name&gt;Categories&lt;/name&gt;         &lt;folder&gt;table3&lt;/folder&gt;         ...       &lt;/table&gt;       &lt;table&gt;         &lt;name&gt;Customers&lt;/name&gt;         &lt;folder&gt;table4&lt;/folder&gt;         ...     ...           </pre> </div> <div data-bbox="995 443 1331 1435" style="border: 1px solid #add8e6; padding: 10px; width: 45%;"> <p style="text-align: center; font-weight: bold;">content structure</p> </div> </div>	<p>M</p>
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<p>P_4.3-2</p>	<p>The number of columns in a table specified in the metadata .xml must be identical to that in the corresponding table [number] .xsd file.</p> <p><b>Example</b></p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="432 383 743 999" style="border: 1px solid #ccc; padding: 5px;"> <p style="text-align: center; margin: 0;">SIARD metadata</p> <pre style="margin: 0;"> ... &lt;dbname&gt;northwind&lt;/dbname&gt; ... &lt;schemas&gt;   &lt;schema&gt;     &lt;name&gt;admin&lt;/name&gt;     &lt;folder&gt;schema0&lt;/folder&gt;     &lt;tables&gt;       &lt;table&gt;         &lt;name&gt;Products&lt;/name&gt;         &lt;folder&gt;table0&lt;/folder&gt;         &lt;description/&gt;         &lt;columns&gt;           &lt;column&gt;           &lt;column&gt;           &lt;column&gt;           &lt;column&gt;           &lt;column&gt;           &lt;column&gt;           &lt;column&gt;           &lt;column&gt;           &lt;column&gt;           &lt;column&gt;           &lt;column&gt;           &lt;column&gt;           &lt;/columns&gt;           &lt;primaryKey&gt;           &lt;foreignKeys&gt;           &lt;rows&gt;77&lt;/rows&gt;         &lt;/table&gt;         ...           </pre> </div> <div data-bbox="778 383 1299 999" style="border: 1px solid #ccc; padding: 5px;"> <p style="text-align: center; margin: 0;">content – table0.xsd</p> <pre style="margin: 0;"> &lt;?xml version="1.0" encoding="UTF-8" ?&gt; &lt;xs:schema attributeFormDefault="unqualified" elementFormDefault="qualified" xmlns:xs="http://www.w3.org/2001/XMLSchema-instance"&gt;   &lt;xs:element name="table"&gt;     &lt;xs:complexType name="rowType"&gt;       &lt;xs:sequence&gt;         &lt;xs:element name="c1" type="xs:integer"/&gt;         &lt;xs:element minOccurs="0" name="c2" type="xs:string"/&gt;         &lt;xs:element minOccurs="0" name="c3" type="xs:integer"/&gt;         &lt;xs:element minOccurs="0" name="c4" type="xs:integer"/&gt;         &lt;xs:element minOccurs="0" name="c5" type="xs:string"/&gt;         &lt;xs:element minOccurs="0" name="c6" type="xs:decimal"/&gt;         &lt;xs:element minOccurs="0" name="c7" type="xs:integer"/&gt;         &lt;xs:element minOccurs="0" name="c8" type="xs:integer"/&gt;         &lt;xs:element minOccurs="0" name="c9" type="xs:integer"/&gt;         &lt;xs:element minOccurs="0" name="c10" type="xs:boolean"/&gt;       &lt;/xs:sequence&gt;     &lt;/xs:complexType&gt;   &lt;/xs:element&gt; &lt;/xs:schema&gt;           </pre> </div> </div>	<p>M</p>
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P\_4.3-3

The data type information on the column definitions in the metadata.xml must be identical to that in the corresponding table[number].xsd file.

M

The SQL:1999 data types are converted into XML data types in the table[number].xsd schema files in accordance with the following table.

SQL:1999	XML
BINARY LARGE OBJECT	blobType <sup>5</sup>
BIT VARYING(...)	xs:hexBinary
BIT(...)	xs:hexBinary
BOOLEAN	xs:boolean
CHARACTER LARGE OBJECT	clobType <sup>5</sup>
CHARACTER VARYING(...)	xs:string
CHARACTER(...)	xs:string
DATE	xs:date
DECIMAL(...)	xs:decimal
DOUBLE PRECISION	xs:float
FLOAT(...)	xs:float
INTEGER	xs:integer
INTERVAL <sup>6</sup>	
NATIONAL CHARACTER LARGE OBJECT	clobType <sup>5</sup>
NATIONAL CHARACTER VARYING(...)	xs:string
NATIONAL CHARACTER(...)	xs:string
NUMERIC(...)	xs:decimal
REAL	xs:float
SMALLINT	xs:integer
TIME	xs:time
TIME WITH TIME ZONE <sup>7</sup>	
TIMESTAMP	xs:dateTime
TIMESTAMP WITH TIME ZONE <sup>7</sup>	

**Example**

SIARD metadata

```

...
<name>ProductID</name>
<folder>table0</folder>
<description/>
<columns>
  <column>
    <name>ProductID</name>
    <type>INTEGER</type>
    <typeOriginal>COUNTER</typeOriginal>
    <nullable>false</nullable>
    <description/>
  </column>
  <column>
    <name>ProductName</name>
    <type>CHARACTER_VARYING(40)</type>
    <typeOriginal>VARCHAR(40)</typeOriginal>
    <nullable>true</nullable>
  </column>
...

```

content – table0.xsd

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema attributeFormDefault="unqualified" elementFormDefault="qualified">
  <xs:element name="table">
    <xs:complexType name="rowType">
      <xs:sequence>
        <xs:element name="o1" type="xs:integer"/>
        <xs:element minOccurs="0" name="o2" type="xs:string"/>
        <xs:element minOccurs="0" name="o3" type="xs:integer"/>
        <xs:element minOccurs="0" name="o4" type="xs:integer"/>
        <xs:element minOccurs="0" name="o5" type="xs:string"/>
        <xs:element minOccurs="0" name="o6" type="xs:decimal"/>
        <xs:element minOccurs="0" name="o7" type="xs:integer"/>
        <xs:element minOccurs="0" name="o8" type="xs:integer"/>
        <xs:element minOccurs="0" name="o9" type="xs:integer"/>
        <xs:element name="o10" type="xs:boolean"/>
      </xs:sequence>
    </xs:complexType>
  </xs:schema>

```

<sup>5</sup> On the XML data types *blobType* and *clobType* see G\_3.1-1.

<sup>6</sup> The SQL:1999 data types INTERVAL, TIME WITH TIME ZONE, and TIMESTAMP WITH TIME ZONE are not yet supported in this SIARD version.



<p>P_4.3-4</p>	<p>The nullable information on the column definitions in the metadata.xml must be identical to that in the corresponding table[number].xsd file.</p> <p><b>Example</b></p> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid #add8e6; padding: 5px; width: 45%;"> <p style="text-align: center;">SIARD metadata</p> <pre> ... &lt;name&gt;ProductID&lt;/name&gt; &lt;type&gt;INTEGER&lt;/type&gt; &lt;typeOriginal&gt;COUNTER&lt;/typeOriginal&gt; &lt;nullable&gt;&gt;false&lt;/nullable&gt; &lt;description&gt; &lt;/column&gt; &lt;column&gt; &lt;name&gt;ProductName&lt;/name&gt; &lt;type&gt;CHARACTER VARYING(40)&lt;/type&gt; &lt;typeOriginal&gt;VARCHAR(40)&lt;/typeOriginal&gt; &lt;nullable&gt;&gt;true&lt;/nullable&gt; ...                     </pre> </div> <div style="border: 1px solid #add8e6; padding: 5px; width: 45%;"> <p style="text-align: center;">content – table0.xsd</p> <pre> &lt;?xml version="1.0" encoding="UTF-8"?&gt; &lt;xs:schema attributeFormDefault="unqualified" elementFormDefault="unqualified"&gt;   &lt;xs:element name="table"&gt;     &lt;xs:complexType name="rowType"&gt;       &lt;xs:sequence&gt;         &lt;xs:element name="c1" type="xs:integer"/&gt;         &lt;xs:element minOccurs="0" name="c2" type="xs:string"/&gt;         &lt;xs:element minOccurs="1" name="c3" type="xs:integer"/&gt;         &lt;xs:element minOccurs="1" name="c4" type="xs:integer"/&gt;         &lt;xs:element minOccurs="1" name="c5" type="xs:string"/&gt;         &lt;xs:element minOccurs="1" name="c6" type="xs:decimal"/&gt;         &lt;xs:element minOccurs="1" name="c7" type="xs:integer"/&gt;         &lt;xs:element minOccurs="1" name="c8" type="xs:integer"/&gt;         &lt;xs:element minOccurs="1" name="c9" type="xs:integer"/&gt;         &lt;xs:element name="c10" type="xs:boolean"/&gt;       &lt;/xs:sequence&gt;     &lt;/xs:complexType&gt;   &lt;/xs:element&gt; &lt;/xs:schema&gt;                     </pre> </div> </div> <p><b>Note</b></p> <p>The SQL:1999 notation "&lt;nullable&gt;&gt;true&lt;/nullable&gt;" becomes "minOccurs="0"" in XML. "&lt;nullable&gt;&gt;false&lt;/nullable&gt;" corresponds to "minOccurs="1"" in XML; however, as this is the default value, it is often omitted.</p>	<p>M</p>
<p>P_4.3-5</p>	<p>The column sequence in the metadata.xml must be identical to that in the corresponding table[number].xsd.</p>	<p>M</p>
<p>P_4.3-6</p>	<p>The number of lines in a table in metadata.xml must fit into the area specified in the corresponding table[number].xsd.</p> <p>The number of lines in a table in metadata.xml must be identical to the number of lines in the corresponding table[number].xml.</p> <p><b>Example</b></p> <div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="border: 1px solid #add8e6; padding: 5px; width: 45%; margin-bottom: 10px;"> <p style="text-align: center;">SIARD metadata</p> <pre> ... &lt;dbname&gt;northwind&lt;/dbname&gt; ... &lt;schemas&gt;   &lt;schema&gt;     &lt;name&gt;admin&lt;/name&gt;     &lt;folder&gt;schema0&lt;/folder&gt;     &lt;tables&gt;       &lt;table&gt;         &lt;name&gt;Products&lt;/name&gt;         &lt;folder&gt;table0&lt;/folder&gt;         &lt;description/&gt;         &lt;columns&gt;         &lt;primaryKey&gt;         &lt;foreignKeys&gt;         &lt;rows&gt;77&lt;/rows&gt;       &lt;/table&gt;     &lt;/schemas&gt; ...                     </pre> </div> <div style="display: flex; justify-content: space-around; width: 100%;"> <div style="border: 1px solid #add8e6; padding: 5px; width: 45%;"> <p style="text-align: center;">content – table0.xsd</p> <pre> &lt;?xml version="1.0" encoding="UTF-8"?&gt; &lt;xs:schema attributeFormDefault="unqualified" elementFormDefault="qualified" target="http://www.admin.ch/xmns/siard/1.0/schema0/table0.xsd"&gt;   &lt;xs:element name="table"&gt;     &lt;xs:complexType name="table"&gt;       &lt;xs:sequence&gt;         &lt;xs:element maxOccurs="unbounded" minOccurs="0" name="row" type="rowType"/&gt;       &lt;/xs:sequence&gt;     &lt;/xs:complexType&gt;   &lt;/xs:element&gt; ...                     </pre> </div> <div style="border: 1px solid #add8e6; padding: 5px; width: 45%;"> <p style="text-align: center;">content – table0.xml</p> <pre> &lt;?xml version="1.0" encoding="utf-8"?&gt; &lt;table xmlns:schemaLocation="http://www.admin.ch/xmns/siard/1.0/schema0/table0.xsd table0.xsd" xmlns="http://www.admin.ch/xmns/siard/1.0/schema0/table0.xsd" xmlns:si="http://www.w3.org/2001/XMLSchema-instance"&gt;   &lt;row&gt;&lt;c1&gt;1&lt;/c1&gt;&lt;c2&gt;Chai&lt;/c2&gt;&lt;c3&gt;1&lt;/c3&gt;&lt;c4&gt;1&lt;/c4&gt; ... &lt;c10&gt;&gt;false&lt;/c10&gt;&lt;/row&gt;   &lt;row&gt;&lt;c1&gt;2&lt;/c1&gt;&lt;c2&gt;Chang&lt;/c2&gt;&lt;c3&gt;1&lt;/c3&gt;&lt;c4&gt;1&lt;/c4&gt; ... &lt;c10&gt;&gt;false&lt;/c10&gt;&lt;/row&gt;   &lt;row&gt;&lt;c1&gt;3&lt;/c1&gt;&lt;c2&gt;Aniseed Syrup&lt;/c2&gt;&lt;c3&gt;1&lt;/c3&gt;&lt;c4&gt;2&lt;/c4&gt; ... &lt;c10&gt;&gt;false&lt;/c10&gt;&lt;/row&gt;   ...   &lt;row&gt;&lt;c1&gt;75&lt;/c1&gt;&lt;c2&gt;Rheinbräu Klosterbräu&lt;/c2&gt;&lt;c3&gt;12&lt;/c3&gt;&lt;c4&gt;1&lt;/c4&gt; ... &lt;c10&gt;&gt;false&lt;/c10&gt;&lt;/row&gt;   &lt;row&gt;&lt;c1&gt;76&lt;/c1&gt;&lt;c2&gt;Lakalikööri&lt;/c2&gt;&lt;c3&gt;23&lt;/c3&gt;&lt;c4&gt;1&lt;/c4&gt; ... &lt;c10&gt;&gt;false&lt;/c10&gt;&lt;/row&gt;   &lt;row&gt;&lt;c1&gt;77&lt;/c1&gt;&lt;c2&gt;Frankfurter grüne Soße&lt;/c2&gt;&lt;c3&gt;12&lt;/c3&gt;&lt;c4&gt;2&lt;/c4&gt; ... &lt;c10&gt;&gt;false&lt;/c10&gt;&lt;/row&gt; &lt;/table&gt;                     </pre> </div> </div> </div> <p><b>Recommendation</b></p> <p>It is advisable to use the range 0 to infinity (maxOccurs="unbounded" minOccurs="0") in the table[number].xsd. This avoids problems when validating table[number].xml against table[number].xsd.</p>	<p>M</p>

## 5 Requirements for metadata

The metadata in the SIARD archive store the structure of the archived database and indicate where different table data are to be found in the archive.

All the metadata are collated in a single `metadata.xml` file in the `header/` folder. Unlike a relational database, the file has a hierarchical structure.

There is a schema definition `metadata.xsd` for the `metadata.xml` file. This is also stored in the `header/` folder.

ID	Description of requirement	M/O
M_5.0-1	The schema definition <code>metadata.xsd</code> must be complied with for the <code>metadata.xml</code> file. This means that <code>metadata.xml</code> must be capable of being positively validated against <code>metadata.xsd</code> .	M

The contents of the individual levels are defined below.

### 5.1 Database level metadata

The `metadata.xml` file contains the following global information at database level:

ID	Description of requirement	M/O
M_5.1-1	All metadata that are designated as mandatory in <code>metadata.xsd</code> at database level must be completed accordingly.	M

The following database metadata are stored in the `metadata.xml` file:

Identifier	Meaning	M/O
version	SIARD format version	M
dbname	Short database identifier	M
description	Description of the meaning and content of the database as a whole	O
archiver	Name of the person who carried out the archiving of the table data from the database	O
archiverContact	Contact details (telephone, e-mail) of the person who carried out the archiving of the table data from the database	O
dataOwner	Owner of the data in the database; the institution or person that, at the time of archiving, has the right to grant usage rights for the data and is responsible for compliance with legal obligations such as data protection guidelines	M
dataOriginTimespan	Origination period of the data in the database; approximate indication in text form	M
producerApplication	Name and version of the application that downloaded the SIARD file.	O

Identifier	Meaning	M/O
archivalDate	Date on which the table data were archived	M
messageDigest	<p>Hexadecimal message digest code over the <code>content/</code> folder with a prefix indicating the type of digest algorithm (MD5 or SHA1)</p> <p><b>Recommendation</b>  <i>If the message digest option is used, the following must be implemented:</i>  <i>The content and header directories are stored in the ZIP file as separate (empty) <code>content/</code> and <code>header/</code> entries. To ensure that the integrity of the primary data can be checked, the entry for the header directories must be inserted after all the primary data and before all the other metadata entries. The message digest mentioned below is computed from offset 0 to the offset of the <code>header/</code> entry.</i></p>	O
clientMachine	DNS name of the (client) computer on which the archiving was carried out	O
databaseProduct	Database product and version from which the archiving of the table data was carried out	O
connection	Connection string used to archive the table data	O
databaseUser	Database user ID of the user of the SIARD tool for archiving the table data from the database	O
schemas	List of schemas in the database	M
users	List of database users	M
roles	List of database roles	O
privileges	List of user and role privileges	O

## 5.2 Schema level metadata

The schema metadata are archived in the `metadata.xml` file as with the global information on the database.

ID	Description of requirement	M/O
M_5.2-1	All metadata that are designated as mandatory in <code>metadata.xsd</code> schema level must be completed accordingly.	M

The following schema metadata are stored in the `metadata.xml` file:

Identifier	Meaning	M/O
name	Schema name in the database	M
folder	Name of the schema folder under <code>content/</code> in the SIARD archive	M
description	Description of the meaning and content of the schema	O
tables	List of the tables in the database	M
views	List of the queries stored in the database	O
routines	List of the routines (formerly “stored procedures”) in the schema	O

### 5.3 Table level metadata

Like the global information on the database and the schema metadata, table level metadata are archived in the `metadata.xml` file.

ID	Description of requirement	M/O
M_5.3-1	All metadata that are designated as mandatory in <code>metadata.xsd</code> at table level must be completed accordingly.	M

The following table metadata are stored in the `metadata.xml` file:

Identifier	Meaning	M/O
name	Table name in the schema	M
folder	Name of the table folder in the schema folder	M
description	Description of the meaning and content of the table	O
columns	List of the columns in the table	M
primaryKey	Primary key of the table	O
foreignKeys	List of the foreign keys in the table	O
candidateKeys	List of the candidate keys in the table	O
checkConstraints	List of the constraints in the table	O
triggers	List of the triggers in the table	O
rows	Number of datasets	M

## 5.4 Column level metadata

Like the global information on the database, the schema metadata and the table level metadata, the column level metadata are archived in the `metadata.xml` file.

ID	Description of requirement	M/O
M_5.4-1	All metadata that are designated as mandatory in the <code>metadata.xsd</code> column level must be completed appropriately.	M

The following column metadata are stored in the `metadata.xml` file:

Identifier	Meaning	M/O
name	Column name in the table The column name must be unambiguous within a given table.	M
folder	Name of the LOB folder in the table folder  <b>Note</b> The optional LOB folder name is only needed for columns of the large object types (e.g. BLOB or CLOB). The files that the large object fields represent are stored in these folders and are called <code>record0.txt</code> , <code>record1.txt</code> , and <code>record0.bin</code> , <code>record1.bin</code> , ... These are referenced in the data XML file.	O
type	SQL:1999 column type	M
typeOriginal	Original column type  <b>Note</b> As the various database programs that describe themselves as SQL-compliant permit very different data types, the <i>original</i> type is listed here as well as the SQL:1999 type. A translation of the proprietary types to SQL:1999 types is to be defined and documented in the corresponding application for each database program that supports the SIARD format.	O
defaultValue	Default value of the column	O
nullable	Optional entry	O
description	Description of the meaning and content of the column	O

## 5.5 Primary key metadata

ID	Description of requirement	M/O
M_5.5-1	The primary key metadata of a table can be archived in the <code>metadata.xml</code> file	O

The following primary key metadata are stored in the `metadata.xml` file if a primary key is archived:

Identifier	Meaning	M/O
name	Name of the primary key	M
column	List of the columns in the primary key	M
description	Description of the meaning and content of the primary key	O

## 5.6 Foreign key metadata

ID	Description of requirement	M/O
M_5.6-1	The foreign key metadata in a table can be archived in the <code>metadata.xml</code> file	O

The following foreign key metadata are stored in the `metadata.xml` file if a foreign key is archived:

Identifier	Meaning	M/O
name	Name of the foreign key	M
referencedSchema	Schema of the table referenced	M
referencedTable	Table that is referenced  <b>Note</b> The external table name referenced can be of the table or schema.table type. Delimited identifiers are enclosed in quotation marks..	M
reference	List of columns and referenced columns	M
matchType	Match type (FULL, PARTIAL or SIMPLE)	O
deleteAction	Delete action, e.g. CASCADE  <b>Note</b> The delete and change actions contain the actions permitted by the SQL:1999 standard.	O
updateAction	Change action, e.g. SET DEFAULT	O
description	Description of the meaning and content of the foreign key	O

## 5.7 Reference metadata

ID	Description of requirement	M/O
M_5.7-1	The metadata of the references used in the foreign key can be archived in the <code>metadata.xml</code> file	O

The following reference metadata are stored in the `metadata.xml` file if a foreign key is archived:

Identifier	Meaning	M/O
column	Name of the column	M
referenced	Name of the referenced column	M

## 5.8 Candidate key metadata

ID	Description of requirement	M/O
M_5.8-1	The metadata of the candidate key of a table can be archived in the <code>metadata.xml</code> file	O

The following candidate key metadata are stored in the `metadata.xml` file if a candidate key is archived:

Identifier	Meaning	M/O
name	Name of the candidate key	M
column	List of the columns in the candidate key	M
description	Description of the meaning and content of the candidate key	O

## 5.9 Check constraint metadata

The check constraint consists of a condition that is to be examined. This is indicated as an **BOOLEAN** expression (having the value *true*, *false* or *unknown*) in SQL:1999 syntax.

ID	Description of requirement	M/O
M_5.9-1	The metadata of the check constraint of a table can be archived in the <code>metadata.xml</code> file	O

The following check constraint metadata are stored in the `metadata.xml` file if a check constraint is archived:

Identifier	Meaning	M/O
name	Name of the check constraint	M
condition	Condition of the check constraint	M
description	Description of the meaning and content of the check constraint	O

## 5.10 Trigger level metadata

ID	Description of requirement	M/O
M_5.10-1	The trigger metadata of a table can be archived in the <code>metadata.xml</code> file	O

The following trigger metadata are stored in the `metadata.xml` file if a trigger is archived:

Identifier	Meaning	M/O
name	Trigger name in the table	M
actionTime	BEFORE or AFTER	M
triggerEvent	INSERT, DELETE, UPDATE [OF <trigger column list>]	M
aliasList	<old or new value alias list>	O
triggeredAction	<triggered action>	M
description	Description of the meaning and content of the trigger	O

## 5.11 View level metadata

ID	Description of requirement	M/O
M_5.11-1	The view metadata of a schema can be archived in the <code>metadata.xml</code> file	O

The following view metadata are stored in the `metadata.xml` file if a view is archived:

Identifier	Meaning	M/O
name	Name of the view in the schema	M
columns	List of the column names in the view  <b>Note</b> The column metadata of a view are structured identically to those of a table.	M
query	SQL:1999 query that defines the view	O
queryOriginal	Original SQL query that defines the view  <b>Note</b> As the various database programs that describe themselves as SQL-compliant permit very different query syntaxes, the original query is listed here as well as the SQL:1999 query. A translation of the proprietary query syntax to SQL:1999 types is to be defined and documented in the corresponding application for each database program that supports the SIARD format.	O



Identifier	Meaning	M/O
description	Description of the meaning and content of the view	O

## 5.12 Routine level metadata

ID	Description of requirement	M/O
M_5.12-1	The routine metadata of a schema can be archived in the <code>metadata.xml</code> file	O

The following routine metadata are stored in the `metadata.xml` file if a routine is archived:

Identifier	Meaning	M/O
name	Routine name in the schema	M
description	Description of the meaning and content of the routine	O
source	Original source code of the routine (VBA, PL/SQL, JAVA)  <b>Note</b> Since many database programs have proprietary routines that cannot be transformed into an SQL:1999-compliant query, the original source code of the routine (e.g. in PL/SQL for Oracle databases, VBA for MS Access modules) can be archived here.	O
body	SQL:1999-compliant source code of the routine	O
characteristic	Characteristic of the routine	O
returnType	Return type of the routine (if it is a function)	O
parameters	List of parameters	O

## 5.13 Parameter metadata

ID	Description of requirement	M/O
M_5.13-1	The parameter metadata that are used in the routine can be archived in the <code>metadata.xml</code> file	O

The following parameter metadata are stored in the `metadata.xml` file if a routine is archived:

Identifier	Meaning	M/O
name	Name of the parameter	M
mode	Mode of the parameter (IN, OUT or INOUT)	M
type	SQL:1999 type of the parameter	M

Identifier	Meaning	M/O
typeOriginal	Original parameter type  <b>Note</b> As with the column descriptions, the <i>original</i> – proprietary – parameter type can be indicated here.	O
description	Description of the meaning and function of the routine	O

#### 5.14 User level metadata

ID	Description of requirement	M/O
M_5.14-1	The user metadata can be archived in the <code>metadata.xml</code> file	O

The following user metadata are stored in the `metadata.xml` file:

Identifier	Meaning	M/O
name	Name of the user	M
description	Description of the significance and function of the user	O

#### 5.15 Role level metadata

ID	Description of requirement	M/O
M_5.15-1	The role metadata can be archived in the <code>metadata.xml</code> file	O

The following role metadata are stored in the `metadata.xml` file:

Identifier	Meaning	M/O
name	Name of the role	M
admin	Administrator of the role (user or role)	M
description	Description of the meaning and function of the role	O

#### 5.16 Privilege level metadata

ID	Description of requirement	M/O
M_5.16-1	The privilege metadata can be archived in the <code>metadata.xml</code> file	O

The following privilege metadata are stored in the `metadata.xml` file:

Identifier	Meaning	M/O
type	Privilege granted (e.g. SELECT)	M
object	Object to which the privilege is to be applied	O
grantor	Authorised grantor of the privilege	M
grantee	Recipient of the privilege (user or role)	M
option	Grant option (ADMIN or GRANT)	O
description	Description of the significance and function of the grant	O

## 6 Requirements for table data

As described above, the table data of an archived relational database are located in the `content/` folder in the document root of the SIARD archive. They are filed there in the schema and table folder concerned.

Table data are always stored in an XML file. An XML schema definition is generated for each table that indicates the XML storage format of the table data. This means that for each table there is a `table[number].xml` file to the schema definition `table[number].xsd`.

ID	Description of requirement	M/O
T_6.0-1	All the table data (primary data) must meet the consistency requirements of SQL:1999. A SIARD file that validates syntactically against the various XSDs but infringes the SQL standard semantically is not compliant with this format description.  In particular, the table values must correspond to the constraints of the SQL types in the metadata. Additionally, the primary, candidate and foreign key conditions and nullability conditions stored in the metadata must all be met.	M
T_6.0-2	The schema definition <code>table[number].xsd</code> must be complied with for the <code>table[number].xml</code> file. This means that <code>table[number].xml</code> must be capable of being positively validated against <code>table[number].xsd</code> .	M

### 6.1 Table schema definition

The `table[number].xsd` file contains the following schema definitions for a table:

ID	Description of requirement	M/O
T_6.1-1	There must be an XML schema definition for each table that indicates the XML storage format of the table data.	M

ID	Description of requirement	M/O
T_6.1-2	<p>This schema definition reflects the SQL schema metadata of the table and indicates that the table is stored as a sequence of lines containing a sequence of column entries with various XML types. The name of the table tag is <i>table</i>, that of the dataset tag is <i>row</i>, while the column tags are called <i>c1</i>, <i>c2</i>, ... (or <i>siard:c1</i> ... if the name space were written out).</p> <p><b>Example</b></p> <pre data-bbox="432 577 1302 1126"> content-table0.xsd &lt;?xml version="1.0" encoding="UTF-8"?&gt; &lt;xs:schema attributeFormDefault="unqualified" elementFormDefault="qualified" targetNamespace="http://www.admin.ch/xmlns/siard/1.0/schema0/table0.xsd" xmlns="http://www.admin.ch/xmlns/siard/1.0/schema0/table0.xsd" xmlns:xs="http://www.w3.org/2001/XMLSchema"&gt;   &lt;xs:element name="table"&gt;     &lt;xs:complexType&gt;       &lt;xs:sequence&gt;         &lt;xs:element maxOccurs="unbounded" minOccurs="0" name="row" type="rowType"/&gt;       &lt;/xs:sequence&gt;     &lt;/xs:complexType&gt;   &lt;/xs:element&gt;   &lt;xs:complexType name="rowType"&gt;     &lt;xs:sequence&gt;       &lt;xs:element name="c1" type="xs:integer"/&gt;       &lt;xs:element minOccurs="0" name="c2" type="xs:string"/&gt;       &lt;xs:element minOccurs="0" name="c3" type="xs:integer"/&gt;       &lt;xs:element minOccurs="0" name="c4" type="xs:integer"/&gt;       &lt;xs:element minOccurs="0" name="c5" type="xs:string"/&gt;       &lt;xs:element minOccurs="0" name="c6" type="xs:decimal"/&gt;       &lt;xs:element minOccurs="0" name="c7" type="xs:integer"/&gt;       &lt;xs:element minOccurs="0" name="c8" type="xs:integer"/&gt;       &lt;xs:element minOccurs="0" name="c9" type="xs:integer"/&gt;       &lt;xs:element name="c10" type="xs:boolean"/&gt;     &lt;/xs:sequence&gt;   &lt;/xs:complexType&gt; &lt;/xs:schema&gt; </pre>	M

## 6.2 Table data

The `table[number].xml` file contains the following table data for this table:

ID	Description of requirement	M/O
T_6.2-1	The table data for each table must be stored in an XML file.	M
T_6.2-2	<p>The <i>table</i> file consists of <i>row</i> elements containing the data of a line subdivided into the various columns (<i>c1</i>, <i>c2</i> ...).</p> <p><b>Example</b></p> <pre data-bbox="432 1621 1302 1917"> content-table0.xml &lt;?xml version="1.0" encoding="utf-8"?&gt; &lt;table   xsi:schemaLocation="http://www.admin.ch/xmlns/siard/1.0/schema0/table0.xsd table0.xsd"   xmlns="http://www.admin.ch/xmlns/siard/1.0/schema0/table0.xsd"   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"&gt;   &lt;row&gt;&lt;c1&gt;1&lt;/c1&gt;&lt;c2&gt;Chai&lt;/c2&gt;&lt;c3&gt;1&lt;/c3&gt;&lt;c4&gt;1&lt;/c4&gt; ... &lt;c10&gt;&gt;false&lt;/c10&gt;&lt;/row&gt;   &lt;row&gt;&lt;c1&gt;2&lt;/c1&gt;&lt;c2&gt;Chang&lt;/c2&gt;&lt;c3&gt;1&lt;/c3&gt;&lt;c4&gt;1&lt;/c4&gt; ... &lt;c10&gt;&gt;false&lt;/c10&gt;&lt;/row&gt;   &lt;row&gt;&lt;c1&gt;3&lt;/c1&gt;&lt;c2&gt;Aniseed Syrup&lt;/c2&gt;&lt;c3&gt;1&lt;/c3&gt;&lt;c4&gt;2&lt;/c4&gt; ... &lt;c10&gt;&gt;false&lt;/c10&gt;&lt;/row&gt;   ...   &lt;row&gt;&lt;c1&gt;75&lt;/c1&gt;&lt;c2&gt;Rhönbräu Klosterbier&lt;/c2&gt;&lt;c3&gt;12&lt;/c3&gt;&lt;c4&gt;1&lt;/c4&gt; ... &lt;c10&gt;&gt;false&lt;/c10&gt;&lt;/row&gt;   &lt;row&gt;&lt;c1&gt;76&lt;/c1&gt;&lt;c2&gt;Lakkalikööri&lt;/c2&gt;&lt;c3&gt;23&lt;/c3&gt;&lt;c4&gt;1&lt;/c4&gt; ... &lt;c10&gt;&gt;false&lt;/c10&gt;&lt;/row&gt;   &lt;row&gt;&lt;c1&gt;77&lt;/c1&gt;&lt;c2&gt;Frankfurter grüne Soße&lt;/c2&gt;&lt;c3&gt;12&lt;/c3&gt;&lt;c4&gt;2&lt;/c4&gt; ... &lt;c10&gt;&gt;false&lt;/c10&gt;&lt;/row&gt; &lt;/table&gt; </pre>	M

ID	Description of requirement	M/O
T_6.2-3	<p>If a cell of a column does not contain a value, this may be omitted or empty.</p> <p><b>Example</b></p> <div data-bbox="432 409 1302 663" style="border: 1px solid #add8e6; padding: 5px;"> <p style="text-align: center;">content- table1.xml</p> <pre>&lt;?xml version="1.0" encoding="utf-8"?&gt; &lt;table   xsi:schemaLocation="http://www.admin.ch/xmlns/siard/1.0/schema0/table1.xsd table1.xsd"   xmlns="http://www.admin.ch/xmlns/siard/1.0/schema0/table1.xsd"   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"&gt;   &lt;row&gt;&lt;c1&gt;1&lt;/c1&gt;&lt;c2&gt;Speedy Express&lt;/c2&gt;&lt;/row&gt;   &lt;row&gt;&lt;c1&gt;2&lt;/c1&gt;&lt;c2&gt;United Package&lt;/c2&gt;&lt;c3&gt;&lt;/c3&gt;&lt;/row&gt;   &lt;row&gt;&lt;c1&gt;3&lt;/c1&gt;&lt;c2&gt;Federal Shipping&lt;/c2&gt;&lt;c3&gt;&lt;/c3&gt;&lt;/row&gt; &lt;/table&gt;</pre> </div>	O
T_6.2-4	<p>If a table contains data of the large object types (BLOB, CLOB, ...) that are more than 2000 bytes or 2000 characters in size, separate files are produced for these and the storage location of the file is stored instead of the cell content. To avoid creating empty folders, folders are only created when they are necessary, i.e. contain data.</p> <p><b>Example</b></p> <div data-bbox="432 943 1302 1279" style="border: 1px solid #add8e6; padding: 5px;"> <p style="text-align: center;">content- table3.xml</p> <pre>&lt;?xml version="1.0" encoding="utf-8"?&gt; &lt;table   xsi:schemaLocation="http://www.admin.ch/xmlns/siard/1.0/schema0/table3.xsd table3.xsd"   xmlns="http://www.admin.ch/xmlns/siard/1.0/schema0/table3.xsd"   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"&gt;   &lt;row&gt;&lt;c1&gt;1&lt;/c1&gt;&lt;c2&gt;Beverages&lt;/c2&gt;&lt;c3&gt;Soft drinks, coffees, teas, beers, and ales&lt;/c3&gt;&lt;c4 length="10746" file="content/schema0/table3/lob4/record0.bin"/&gt;&lt;/row&gt;   &lt;row&gt;&lt;c1&gt;2&lt;/c1&gt;&lt;c2&gt;Condiments&lt;/c2&gt;&lt;c3&gt;Sweet and savory sauces, relishes, spreads, and seasonings&lt;/c3&gt;&lt;c4 length="10746" file="content/schema0/table3/lob4/record1.bin"/&gt;&lt;/row&gt;   ...   &lt;row&gt;&lt;c1&gt;7&lt;/c1&gt;&lt;c2&gt;Produce&lt;/c2&gt;&lt;c3&gt;Dried fruit and bean curd&lt;/c3&gt;&lt;c4 length="10746" file="content/schema0/table3/lob4/record6.bin"/&gt;&lt;/row&gt;   &lt;row&gt;&lt;c1&gt;8&lt;/c1&gt;&lt;c2&gt;Seafood&lt;/c2&gt;&lt;c3&gt;Seaweed and fish&lt;/c3&gt;&lt;c4 length="10746" file="content/schema0/table3/lob4/record7.bin"/&gt;&lt;/row&gt; &lt;/table&gt;</pre> </div> <p><b>Recommendation</b></p> <p><i>It is advisable to normalise the lob folders and lob files and to use, for example, lob4/ and record0.bin or record0.txt instead of the actual name.</i></p> <p><i>The type of the individual LOBs should be recorded in the metadata or the documentation.</i></p>	M

## 7 Version and validity of the specification

The current version of the Specification is 1.0. The content of the Specification is reviewed periodically by the eCH digital archiving expert group and amended as necessary.

## 8 Change management process

The change management process for this standard follows [eCH-0150], scenario 3. The *change manager* is the head of the expert group; the *change board* is a committee mandated by the expert group or a subject group.

## 9 Exclusion of liability / notice regarding third-party rights

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These provisions apply solely to the standards drawn up by **eCH**, and not to standards or products of third parties that are referred to in the **eCH** standards. The standards contain corresponding references to the rights of third parties.



## **Appendix A – Participation and Review**

Hedi Bruggisser, Thurgau State Archives

Georg Büchler, KOST

Alain Dubois, Valais State Archives

Martin Kaiser, KOST

Lambert Kansy, Basel Stadt State Archives

Markus Lischer, Lucerne State Archives

Claire Röhliisberger-Jourdan, KOST

Hartwig Thomas, Enter AG

Andreas Voss, Swiss Federal Archives

## Appendix B – Abbreviations and Glossary

Term	Description
AIP	Archival Information Package. AIPs result from SIPs during the process of archiving digital documents. They represent the form of information packages in which digital documents are stored in the digital repository.
Archive	<ol style="list-style-type: none"> <li>1. Institution or body responsible for cataloguing, keeping and preserving archive records and making them available.</li> <li>2. Archived documents of an organisation.</li> <li>3. Building or institution that was constructed or established for the purpose of archiving documents.</li> <li>4. Term for a file that contains other files. See also archive file and the synonym container file.</li> </ol>
Archive records	Refers to documents that have been accepted by the archive for safekeeping, or that are independently archived by other bodies in accordance with the same principles.
Database	<p>A database normally consists of one or more database schemas as well as defined access rights of individual users and roles to certain parts of the database. In SQL:1999 users and roles can be holders of privileges.</p> <p>A relational database therefore consists of a number of structured database objects (e.g. schema, view) and the table content.</p> <p>A database schema is a kind of namespace prefix. A database catalogue contains the metadata of all the schemas in the catalogue. The catalogue level in SQL:1999 corresponds to the “document database” that can be converted into an archival format using SIARD.</p>
DIP	Dissemination Information Package: According to OAIS, a DIP is a container for dossiers that are requested by a user via an ordering procedure.
DNS	Domain Name System, a distributed database that administers the name space in the Internet.
Documents	Documents are all recorded information, irrespective of the medium, that is received or produced in the fulfilment of public duties, as well as all finding aids and supplementary data that are required in order to understand and use this information.
Dossier	All the documents relating to a specific business matter. A dossier basically corresponds to a business matter. However, by combining similar business matters or dividing dossiers into subdossiers, this basic structure can be adapted to meet the corresponding needs. The compilation of dossiers is carried out on the basis of the classification system.
Information package	A conceptual container made up of optional content information and optional associated preservation metadata. It includes packaging information that distinguishes the content information and the package description from each other, identifies them and enables the content information to be searched for.

Term	Description
Long-term archiving	Storing digital information and maintaining its long-term availability, normally without a time limit. In addition to retaining the bit stream of the archived information it also includes the ability to interpret and display it in human-readable and understandable form at all times.
MD5	Message-Digest Algorithm 5
Metadata	Metadata can be described as “information about primary data” (data about data), since they have a descriptive nature.
OAIS	Open Archival Information System, ISO 14721:2003. A reference model that describes an archive as an organisation in which people and systems work together to preserve information and make it available to a designated community.
Primary data	Primary data are the data that make up the content of documents. Within a SIARD file, the table data perform the function of primary data
Records creator	Refers to the authority or organisational unit that created and managed the documents.
Routines	SQL routines (also known as stored procedures) are mainly important to understanding the view queries in which they can occur as partial expressions.
Schemas	Schemas are containers for the tables, views and routines.
SFA	Swiss Federal Archives
SHA1	Secure Hash Algorithm 1
SIP	Submission Information Package: According to OAIS, SIPs are information packages that are submitted to the archive by the records-creating authorities. They contain digital documents (primary data and metadata).
Tables	Tables consist of a table definition with fields that assign a name and type to each column in the table, datasets that contain the actual table data, an optional primary key, foreign keys that ensure referential integrity, candidate keys that serve to identify a dataset, and constraints that guarantee consistency. Triggers may optionally be defined for a table.
UTF	Unicode Transformation Format
Views	Views are standard queries stored in the database. The query result is a table that also contains fields and data sets.
XSD	XML Schema Definition

## Appendix C – List of Standards Used

eCH-0150      eCH-0150 Change und Release Management von eCH-Standards  
<http://www.ech.ch/>

SQL:1999	ISO/IEC 9075(1-4,9-11,13,14):2011: Information technology -- Database languages – SQL <a href="http://www.iso.org/iso/home/store/catalogue_ics/catalogue_detail_ics.htm?csnumber=53681">http://www.iso.org/iso/home/store/catalogue_ics/catalogue_detail_ics.htm?csnumber=53681</a>
Unicode	Unicode 6.1.0 Unicode, Inc. <a href="http://www.unicode.org/versions/Unicode6.1.0/">http://www.unicode.org/versions/Unicode6.1.0/</a> (corresponds to ISO/IEC 10646:2012: Information technology -- Universal Coded Character Set (UCS)) <a href="http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=56921">http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=56921</a> )
XML	Extensible Markup Language (XML), 1.1 (Second Edition) W3C Recommendation 16 August 2006, edited in place 29 September 2006 <a href="http://www.w3.org/TR/2006/REC-xml11-20060816/">http://www.w3.org/TR/2006/REC-xml11-20060816/</a> (corresponds to ISO/IEC 19503:2005: Information technology -- XML Metadata Interchange (XMI)), <a href="http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=32622">http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=32622</a> )
ZIP	.ZIP File Format Specification, Version 6.3.3 September 1, 2012 PKWARE Inc. <a href="http://www.pkware.com/documents/casestudies/APPNOTE.TXT">http://www.pkware.com/documents/casestudies/APPNOTE.TXT</a>

## Appendix D – XML Schema Definitions

### D.1 metadata.xsd

The XML schema definition `metadata.xsd` defines the structure of the `metadata.xml` file in the `header/` folder. It is published separately as an annex to this Specification.

### D.2 Example of a metadata.xml

The following is an example of a metadata description of a database that is compliant with the XML schema for SIARD:

```
<?xml version="1.0" encoding="UTF-8"?>
<siardArchive xmlns="http://www.bar.admin.ch/xmlns/siard/1.0/metadata.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.0"
xsi:schemaLocation="http://www.bar.admin.ch/xmlns/siard/1.0/metadata.xsd metadata.xsd">
  <dbname>jdbc:oracle:thin:@dbhost.enternet.ch:1521:SIARD1</dbname>
  <dataOwner>SIARD</dataOwner>
  <dataOriginTimespan>Fri May 16 11:21:39 CEST 2008</dataOriginTimespan>
  <archivalDate>2008-05-16</archivalDate>
  <messageDigest>MD5B9FB4FA23EFC27F10957533D747A4300</messageDigest>
  <clientMachine>blue2400.entereg.ch</clientMachine>
  <databaseProduct>
    Oracle Oracle9i Enterprise Edition Release 9.2.0.1.0 -
    Production\u000AWith the Partitioning, OLAP and Oracle Data Mining
    options\u000AJSERVER Release 9.2.0.1.0 - Production
  </databaseProduct>
```

```

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```

```

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    <grantee>SIARD2</grantee>
  </privilege>
  <privilege>
    <type>UPDATE</type>
    <object>TABLE TABLETEST2</object>
    <grantor>SIARD</grantor>
    <grantee>SIARD2</grantee>
  </privilege>
  <privilege>
    <type>UPDATE</type>
    <object>TABLE TABLETEST2</object>
    <grantor>SIARD</grantor>
    <grantee>SIARD3</grantee>
  </privilege>
  <privilege>
    <type>SELECT</type>
    <object>TABLE "TableTest1"</object>
    <grantor>SIARD</grantor>
    <grantee>"siardrole2"</grantee>
  </privilege>
</privileges>
</siardArchive>

```

### D.3 Example of the XML schema definition of a table: table0.xsd

SIARD generates an XML schema definition for each table that assigns the correct XML data types to the columns.

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns="http://www.bar.admin.ch/xmlns/siard/1.0/schema0/table0.xsd"
attributeFormDefault="unqualified" elementFormDefault="qualified"
targetNamespace="http://www.bar.admin.ch/xmlns/siard/1.0/schema0/table0.xsd">
  <xs:element name="table">
    <xs:complexType>
      <xs:sequence>
        <xs:element maxOccurs="unbounded" minOccurs="0" name="row" type="rowType"/>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:complexType name="rowType">
    <xs:sequence>
      <xs:element name="c1" type="xs:decimal"/>
      <xs:element minOccurs="0" name="c2" type="xs:string"/>
      <xs:element name="c3" type="xs:date"/>
    </xs:sequence>
  </xs:complexType>
</xs:schema>
```

#### D.4 Example of the table data of a table: table0.xml

The table data are stored in an XML file that satisfies the XML schema definition of the table.

```
<?xml version="1.0" encoding="utf-8"?>
<table
  xsi:schemaLocation="http://www.bar.admin.ch/xmlns/siard/1.0/schema0/table0.xsd table0.xsd"
  xmlns="http://www.bar.admin.ch/xmlns/siard/1.0/schema0/table0.xsd"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <row><c1>1</c1><c2>First Name</c2><c3>2008-05-09</c3></row>
  <row><c1>2</c1><c2>Second Name</c2><c3>2008-05-10</c3></row>
</table>
```