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Dentistry — Interoperability of CAD/CAM systems

Médecine bucco-dentaire — Interopérabilité des systèmes de CFAO

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Foreword

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This document was prepared by Technical Committee ISO/TC 106, *Dentistry*, Subcommittee SC 9, *CAD/CAM Systems.*

Introduction

Manufacturers of dental CAD/CAM systems differ in how they exchange manufacturing information and three dimensional data. This causes difficulty in data processing, design processes, and manufacturing processes for users of those systems. In order to overcome these interoperability issues, this document has been prepared to facilitate open interoperability between CAD/CAM systems in dentistry.

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Dentistry — Interoperability of CAD/CAM systems

1 Scope

This document specifies an extensible markup language (XML) format to facilitate the transfer of dental case data and CAD/CAM data between software systems.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1942, *Dentistry — Vocabulary*

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

ISO 3950, *Dentistry — Designation system for teeth and areas of the oral cavity*

ISO 16443, *Dentistry — Vocabulary for dental implants systems and related procedure*

ISO 18739, *Dentistry — Vocabulary of process chain for CAD/CAM systems*

ISO 19429:2015, *Dentistry — Designation system for dental implants' after 'ISO 18739, Dentistry — Vocabulary of process chain for CAD/CAM systems'*

W3C — Extensible Markup Language (XML) 1.0 (Fifth Edition), November 2008

W3C XML Schema Definition Language (XSD) 1.1, 2012

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1942, ISO 16443, ISO 18739, W3C XML1.0, W3C XSD 1.1and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

NOTE 1 Throughout the IDS (interface for dental CAD/CAM systems) schema there are terms that have special meaning or definition. Understanding the use of these terms is the key to well-defined IDS documents that all parties can understand universally.

NOTE 2 The IDS schema defines several peer level nodes immediately within the enveloping root <IDS> element that organizes the IDS document into structures for specific transactions. They represent a submission, a query, an update of a previous submission, a notification of an event or status change and a series of catalogs. A single IDS document can contain a combination of different transaction nodes or consist of only a single transactional node.

NOTE 3 In addition to the transactional nodes mentioned above, the IDS schema also defines several nodes that provide traceability and source identification features as well as provide information on how to reply to a document transaction.

3.1 General terms

3.1.1
broker
entity that acts as a middleman or intermediary

Note 1 to entry: Such organizations may take multiple orders from multiple sources and consolidate them into a single order for a Provider or they may take single orders from an originator and split them among multiple providers or they may just pass orders through between originators and providers.

3.1.2
originator
entity (organization or person) that is responsible for creating the current document, order, submission, etc.

Note 1 to entry: As such, they are the "originator" of the data being exchanged.

Note 2 to entry: Most often an originator would be a dental practice. In some cases, an originator may be a dental laboratory that is outsourcing work to another lab.

3.1.3
provider
entity (company, lab, etc.) that is responsible for providing the services or products that are being requested in an order

Note 1 to entry: Most often, this would be a dental laboratory or manufacturer.

3.2 Terms and definitions relating to XML content

3.2.1
CADDataCatalog
collection of nodes describing CAD data associated with one or more of the orders and/or restorations

Note 1 to entry: It can include digital scan and/or design files, etc.

3.2.2
case
set of one or more orders for dental appliances, products or services, all of which are being submitted for a single patient

EXAMPLE A case might contain one order for a crown, and another order for a bridge.

3.2.3
catalogs
data that are referenced in other elements or areas

Note 1 to entry: The catalogs are subdivided by the data they are grouping, making it easier to manage and reference.

3.2.4
DeliveryRequest
information for the out-going, finished order, which will be sent to the originator (or an originator's agent) as a separate delivery

Note 1 to entry: A delivery may be physical, electronic, or both.

3.2.5
dentist
dentist or responsible clinician who requested the order

3.2.6
DentistCatalog
collection of *dentist* (3.2.5) nodes that provides attribute and elements to define the dentists being referenced within this document

Note 1 to entry: The definition can include billing information, license information, etc.

3.2.7
ExtraInfo
child node that can be used to extend the schema with undefined XML

EXAMPLE Many of the elements will contain child nodes with the suffix "ExtraInfo" (i.e. <DentistExtraInfo>, <OrderExtraInfo>, etc. These sections are intended to be areas that can be used to extend the defined schema with proprietary or undefined XML. For example, an implementation may use one (or more) of these sections to embed XML that is only of use to the implementer for an internal workflow. Another use could be two business partners using these sections to experiment with XML they intend to propose for future versions or to pass proprietary XML they have previously defined between themselves. The IDS schema and XSD will ignore the contents of these sections so they will not be validated as part of the IDS schema. It is highly recommended that if these sections are used, that any XML be enclosed within some proprietary element tag so that if the XML document passes through multiple handlers there are no conflicts:

```
<DentistExtraInfo>
    <MyCompanyData>
        data specific and of use only to "MyCompany"…
    </MyCompanyData>
</DentistExtraInfo>
```


3.2.8
FileCatalog
collection of <IDSFile> nodes that describe files associated with the <Case>, <Order> or CAD data (scans, design files, etc.)

3.2.9
host service
system that receives the IDS document and processes the contents

3.2.10
IdMapCatalog
collection of <IdMapItem> nodes which provide a means of defining alternate identifiers for key elements within the IDS

3.2.11
notification
means for publishing or returning a defined status, event or message related to an order

Note 1 to entry: Within the notification node is an untyped element that can be defined according to the needs of the parties exchanging information.

3.2.12
order
request for a self-contained dental appliance, service or product that is being requested by an originator

Note 1 to entry: Each order in a case might be created or manufactured by a different provider. Each order contains its own delivery (or reply) instruction nodes.

3.2.13
OrderCatalog
collection of <Order> nodes that provide attributes and elements necessary to define or describe an order

Note 1 to entry: An <Order> will often contain one or more <Restoration> nodes but may omit those nodes when not needed.

3.2.14
parcel
physical package that is mailed

3.2.15
patient
patient for whom a case is being manufactured

Note 1 to entry: Patient info is not a mandatory part of the IDS schema.

3.2.16
PatientCatalog
collection of <Patient> nodes that provide attributes and elements to define patients that are referenced in the <Order> or <Case> elements

Note 1 to entry: Because patients may be referenced in multiple <Order> nodes and/or multiple <Case> nodes the patient information is grouped into a catalog.

3.2.17
prescription
written directive from the dentist or responsible clinician to the supplier specifying the product that should be manufactured for the patient

3.2.18
ProductCatalog
means for a provider or broker to publish the products that will be available for ordering

Note 1 to entry: The node provides attribute and elements to define a product, include multiple descriptions in different languages and specify ordering options and variations.

3.2.19
ProductSKU
product stocking unit used my manufacturers to identify their products to their internal systems

3.2.20
DataQuery
method to request data from another system or entity

Note 1 to entry: It provides elements to define the data elements to be searched or matched on as well as elements to define the data requested in response.

3.2.21
submission
batch or group of one or more <Cases> described in the IDS document

Note 1 to entry: In traditional (non digital) dentistry a submission would be equivalent to receiving a physical package [*parcel* (3.2.14)] containing one or more cases. In the digital IDS realm, the submission may represent any combination of one or more physical and/or digital cases that are being “submitted” to a provider for production.

3.2.22
UUID
universally unique identifier. It will be denoted in the document as string(36) to correspond to the xsd definition for the UUIDTypeDef. 128-bit (16 bytes) number represented as a 36-character string of its hexadecimal presentation (32 characters + separators including leading 0 values) in the format: XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX.

Note 1 to entry: UUIDs are a means of identifying key elements within the document.

Note 2 to entry: An <IdMap> section within the <Catalogs> section of the document provides a means of equating the UUID with alternate identifiers that carry external meaning, such as a lab management system ids for a dentist, case or patient.

Note 3 to entry: UUID values can have multiple alternate ids in the <IdMap> section but each UUID shall be defined only once and used on a single key element.

EXAMPLE If the UUID "107face6-fc51-4366-805d-2ee23014d835" is assigned to the dentist "smith", that UUID value may not be used on any other element as a key identifier and may only be used as a reference in other elements needing to associate with that specific dentist.

3.2.23
update
means to send an abbreviated set of data elements to update or modify a previously submitted <Order>

Note 1 to entry: It contains elements that allow the update to match expected values in addition to providing the new values.

4 Data security and storage methods

The Internet has proven to be an effective means of communication, yet its vulnerability to interception raises issues of privacy, authentication and integrity of the communicated message. Therefore, data security is of utmost importance to users of dental information systems.

Because of the personal and private nature of health records, the dental practitioner needs to understand the security issues associated with "data at rest" and "data in transit." This document is not intended to explain security concepts and the risks associated with the maintenance of data in storage and transit, and over an internet connection. The ADA (American Dental Association) Standards Committee on Dental Informatics has published a series of technical reports that provide dental practitioners with guidelines in addressing issues of security of data in storage and transmission over the Internet.

A ZIP file format is recommended for transport of the IDS XML file and related files, however, implementation of a file container is left up to the implementer.

5 Naming

The file name shall end with an .ids extension. The file name can be prepended with any naming convention that the user desires.

6 Tooth numbering system

Throughout the entire document, the tooth number system shall be based on ISO 3950 for tooth numbering.

7 Measurement units

All units are in millimetres unless otherwise specified.

8 Additional restrictions on IDS XML documents

In addition to the schema provided above, a valid IDS document shall also meet the following requirements.

a) The total length of the document shall not exceed 2 megabytes (MB).

b) The document shall contain a Unique Identifier for ProviderIds.

c) The document shall contain a Unique Identifier for BrokerIds.

9 XSD Description

The definition of the elements of the XSD schema provided in Annex A shall be used. The XSD definition document is available by e-mailing standards@ada.org.

Annex A
(normative)

XML Schema for IDS

A.1 General

NOTE Below is a description of the IDS schema. Please note the following conventions used in this annex:

a) An asterisk (*) denotes a ***required*** XML node or attribute. Unless marked with an asterisk, all nodes and attributes are considered optional. Note that some optional nodes have required attributes, which means that if the node is present at all, then those attributes marked with * are also present.

b) For nodes and attributes of type "String," the allowed length of the string is unlimited unless the length is specified [e.g. String(100)].

c) The data type "Datetime UTC" implies a DateTime value, stored in ISO 8601.

d) All data types refer to the XML schema data types: string, integer, boolean, dateTime, etc.

A.2 XML schema for IDS root section

IDS *		
The root node for all IDS documents.		
Attribute	**Data Type**	**Description**
IDSVersion *	String (10)	The version identifier of the XML schema of the message.
IDSUUID *	String(36)	A globally unique identifier for the IDS message.

IDS/IDSSource		
An optional node describing the system from which the document originates.		
Attribute	**Data Type**	**Description**
HostName	String (100)	The network name of the source host system creating and sending the message.
IPAddress	String(15)	An IPv4 address of the source host system creating and sending the message.
IPAddress6	String(45)	An IPv6 address of the source host system creating and sending the message.
MACAddress	String(15)	A MAC address of the source host system creating and sending the message.
OperatorID	String(100)	A network user identifier for the user account on the source host system creating and sending the message.
NetworkDomain	String(100)	A network name identifier for the domain containing the system sending the message.
ApplicationName	String(100)	A value indicating the Application (by name) that was used to generate or originate the IDS message.
SystemName	String(100)	A value indicating the system (by name) that the IDS document originated in.
SystemID	String(100)	A value indicating the originating system by identifier or version.

SubSystemName	String	An identifying name of a subsystem originating the message.
SubSystemID	String	A value indicating the originating subsystem by identifier or version.
SystemVersion	String	The software or system version information from the system originating the message.

IDS/IDSReplies/**ReplyTo**		
An Element specifying address information used for IDS message responses.		
Attribute	**Data Type**	**Description**
Address	String (200)	The text of an address. The address itself may be one of a variety of formats.
AddressType	String(5)	An Enumerated value identifying the format of the address provided. Acceptable values are: — URL — WCF — MSMQ — IPV4 — IPV6 — UNC

A.3 XML schema for IDS <Submission> request

IDS/Submission *		
The root node for the submission XML.		
Attribute	**Data Type**	**Description**
UUID *	String(36)	A globally unique identifier for this Submission. This UUID would change for each new submission and should be provided by the Originator.
DateUTCSubmitted	DateTime UTC	The date and time the Submission was first submitted to the receiver.
DateUTCReceived	DateTime UTC	The date and time the Submission was actually received by the receiver. This value will be populated by the receiver (Broker or Provider) and should be omitted (or left blank) on new submissions.

IDS/Submission/**Originator** *		
Contains information describing the person or business entity that has created the Submission.		
Attribute	**Data Type**	**Description**
UUID *	String(36)	A unique identifier for this element that can be used by reference elsewhere in the document. It should be defined within the <IdMapCatalog> section along with any alternate identifiers from external (non IDS) sources.
Name *	String (255)	Name of the Originator.

BusinessType	String (3)	A three-character code signifying the Originator's entity type. Valid values are as follows: LAB — Lab DOC — Dentist SRV — A Broker or intermediary service OTH — Other
FacilityId	String (50)	The Originator's Id for the facility where this Submission originated.
FacilityUTCOffset	Time	The UTC Offset for this Originator facility. Note that this is an xs:time value, represented at the Midnight plus/minus the UTC Offset. For example, a Facility in the Eastern time zone would have a value of 00:00:00-05:00.

IDS/Submission/Originator/**Address**		
The postal address of the Originator.		
Attribute	**Data Type**	**Description**
Street1 *	String (125)	Line 1 of the street address.
Street2	String (125)	Line 2 of the street address.
City *	String (125)	The Name of the City or Town.
State	String(64)	A two-character state code (in the US) or up to 64 characters for a postal zone, other region (and sub-region) name, such as province, department, canton or county area outside the US.
PostalCode	String(100)	The Postal Code (Zipcode in the US).
Country *	String(3)	Three-character country code signifying the Originator's country. The value should conform to the ISO 3166-1 Alpha-3 standard.

IDS/Submission/Originator/**BillingAddress**		
The billing address of the Originator.		
Attribute	**Data Type**	**Description**
Street1 *	String (125)	Line 1 of the street address.
Street2	String (125)	Line 2 of the street address.
City *	String (125)	The Name of the City or Town.
State	String(64)	A two-character state code (in the US) or up to 64 characters for a postal zone, other region (and sub-region) name, such as province, department, canton or county area outside the US.
PostalCode	String(100)	The Postal Code (Zipcode in the US).
Country *	String(3)	Three-character country code signifying the Originator's country. The value should conform to the ISO 3166-1 Alpha-3 standard.

IDS/Submission/Originator/**Contact**		
The Originator's contact information.		
Attribute	**Data Type**	**Description**
Name	String (255)	Contact person's name.
Phone	String (255)	Contact phone number (business).
Fax	String (255)	Contact fax number.
MobilePhone	String (255)	Contact mobile number.
Email	String(254)	Contact email address.