



Joint Council for
Qualifications^{CIC}



JCQ^{CIC} A2C Data Standards Specification

Section 10

Data Architecture

2022 Version

28th February 2022

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1 Summary

This section explains how data will be shared across the A2C system. The business data architecture provides a universal context for subsequent technical design standards (XML Schema) to exchange data between centres and awarding organisations. This is based on the development of a reusable integrated set of data blocks, which define a consistent common business vocabulary that allow stakeholders to hold and exchange data in a standardised format without any physical representation of the data. This design approach ensures consistency of the semantics of the data across all aspects of the A2C system.

The A2C business data architecture is aligned with the corresponding architecture published by the Information Standards Board (ISB). ISB was created as an advisory body to the Department for Education (DfE) and the Department for Business, Innovation and Skills (BIS); since the merger with BIS it is now funded by DfE. Consequently the standards are reflective of the generic requirements of all stakeholders, not just within the context of A2C, but the wider scope of the Education, Skills and Children's Services (ESCS) sector. The development of such a consistent approach is a major benefit to the large number of stakeholders involved as the resultant data architecture will have a greater degree of stability.

The benefit of this consistent approach is reflected in several subject areas, in particular the Qualification subject area. The Qualification Element entity and related entity Qualification Element Relationship offer a standardised common data structure to enable awarding organisations to represent and electronically communicate their qualification structures to centres. The logical design accommodates existing Vocational and General Qualifications and is regarded as sufficiently future-proof to meet forthcoming challenges in the qualification arena.

Party Role reflects the main participants (awarding organisation, centre and learner) of the data exchange within the scope of the A2C system and the key relationships between them. The Party Name concept addresses the existing problems experienced in sharing learner names between the numerous disparate systems within the education sector. The alignment of this part of the data architecture with the ISB data architecture reflects the data requirements of MIS suppliers, awarding organisations and other key stakeholders for sharing learner names using a single common data format.

The QE Outcome concept allows for a high level QE Outcome to be reported as a breakdown of the individual contributing QE Outcomes that comprise the overall qualification award.

The QE Booking concept caters for various awarding organisation data requirements to support their core business processes and the QE Learner Booking entity provides the means to associate named learners with an order for a specific qualification.

1.1 Objective

A2C is a significant upgrade to the mechanism currently used to exchange data with learning providers. The current technical design standards are recognised as limited and have ceased to fully support the requirements of JCQ^{CIC} awarding organisation members and other stakeholders. A2C addresses these concerns, is extensible to other awarding organisations, supports vocational qualifications and international learning providers and is consistent with other data exchanges in the UK education sector.

The primary objectives of the business data architecture are to:

- provide a framework to define data standards and act as a reference model against which physical data exchanges (XML schema) are specified to share data across the A2C system
- promote the importance of data as an asset across the new A2C system
- provide formalisation and a single version of the truth by supplying a single unambiguous definition for data elements within the business data architecture
- support communication and understanding of terminology, assumptions and business rules
- illustrate dependencies between key business data objects
- improve consistency and sharing of data between stakeholders of the A2C system
- improve impact analysis, scoping, planning and accuracy in determining degree of complexity to respond to change.

1.2 Business Process Scope

The scope and purpose of the business data architecture is to establish a common understanding of the data from a business perspective independent of any technology solution. The business data architecture is appropriate for all stakeholder concerns regarding the technical design standards to support data exchange between centres, awarding organisations and other stakeholders. The business data architecture is not restricted to general qualifications, is extensible to non-JCQ^{CIC} awarding organisations, will support vocational qualifications and international centres as well as UK-based centres. The scope of the A2C system in terms of processes and data is summarised below:

- processes currently covered by JCQ EDI, Pearson EDIFACT, City & Guilds' Walled Garden systems and facilitate future changes to modified business requirements
- supply of the product catalogue, which is an enriched form of base data currently supplied by all awarding organisations over a public or secure website
- generically defined examination booking processes that are independent of qualification type, including Entry and Registration
- inclusion of submission processes for Centre Assessed Outcomes and Award Claims
- publication of Results
- publication of indicative fee charges.

The A2C business processes are each documented in respective process design documents that include information on attributes that are required to support the specific business process.

1.3 Assumptions

Business data architecture assumptions:

- a common business language and agreed definitions for data across the scope of the A2C system
- logical and physical data models, such as the XML Schema, are linked, or at least mapped to the A2C business data architecture
- a conceptual reference data model against which technical data exchange standards will be specified and used to share data across the A2C system
- a single unique number to identify an individual that everyone can use is unlikely in the short term, but existing personal identifiers (such as ULN and UCI) will have to be used in a way that enables awarding organisations to manage learner identity for each centre (learner is unique within context of awarding organisation and centre). Due to the short term issues around ULN and UCI the A2C Project is now mandating the use of the MIS Assigned Learner Identifier to uniquely identify each learner within the context of awarding organisation and centre; ie the MIS Assigned Learner Identifier will be used as the Learner Party Identifier
- consensus to rework the NCN centre number to provide more flexibility for operational and approval processes, whilst recognising the future limitations of its use as a single number within the A2C system
- establish independence of current processes from the series concept and ensure consistent use of series codes where they are still required
- indicative fee information to be provided
- ensure consistent terminology, definitions, relationships and hierarchies and consensus on common terminology and definitions that are applicable to all qualifications
- provide a more informative product catalogue to support the A2C business processes
- address the views of all stakeholders.

1.4 Alignment to ISB Data Standards

A2C standards are aligned with ISB, although A2C uses a subset of the full ISB model.

2 Subject Areas

The overall data model is divided into subject areas for reasons of clarity and ease of understanding. The concepts behind the foundation data entities that are important to the A2C system are described within this section.

2.1 Qualification Element and Qualification Relationship

The design concept recognises that there are differences in the behaviour of qualification elements at specific levels within a qualification structure.

The Qualification Element type distinguishes five discernible properties as:

- describing the high level properties of a Qualification (Scheme)
- directly certificating (Award)
- reflecting the subdivision of a qualification into parts that assist in the learning and assessment (Learning Unit)
- discretely assessable (Assessable)
- deterministic of the choices available within a qualification structure (Pathway).

The A2C Qualification Element design has several key features:

- enables different qualification structures within individual awarding organisations to use a common data transfer format
- allows different qualification structures to co-exist within a single awarding organisation, but each of these different internal implementations will be able to use the same A2C Qualification Element design to transfer data
- does not dictate, or mandate, a specific logical design for electronically storing qualification data, so is agnostic to physical implementations of qualification structures in existing stakeholder data storage systems.

The Qualification Element type distinguishes discernible properties that appear common to all awarding organisation qualification structures and logically divides the total attribute pool into five groupings (sub types).

The reasons for using sub types are that they are:

- inherent to the way the Qualification Element is intended to behave
- enable any Qualification Element to be reused at different levels within different qualification hierarchies in conjunction with the entity Qualification Element Relationship
- allow unique identification of individual Qualification Elements within the A2C system, irrespective of how they are identified within individual awarding organisations
- facilitate management of the overall attribute pool
- enhance understanding of the Qualification Element concept.

The hierarchical structure accommodates the existing qualification structures of awarding organisations and is sufficiently future-proof to meet forthcoming challenges in the qualification arena. The properties of the Qualification Element tend to be information that is predominantly static for the intended life span of the entity, such as accreditation related data.

The main implication of the use of sub types is that more than a single sub type (specific attribute pool) will be required when sending data via the A2C system to populate the product catalogue.

Other implications include:

- a Qualification Element Relationship will also be required for each pair of Qualification Element sub types that are required to be sent. The Qualification Element Relationship type will indicate if the relationship between two QEs is allowed or disallowed
- a shift in thinking about existing qualification structures in awarding organisations is required, which is more focused towards the attributes and their purpose within a qualification
- existing entities and their respective attributes will need to be mapped in a consistent manner to the A2C Qualification Element design.

2.2 Qualification Instance and Availability

The concept of QE Availability represents an instance of a Qualification Element that is regarded as a window of opportunity. This window has associated marketing and supply chain related events, such as making an Order and supply of a QE Outcome. Each Key Event has absolute dates and times and the model retains flexibility, such that an availability of a Qualification Element is not necessarily restricted to an awarding organisation concept of a series. The Key Events are defined specifically to the appropriate part of a qualification, which facilitates ease of understanding.

2.3 Party, Party Relationship and Party Role

A Party can be a Person or an Organisation.

A Party Relationship defines a link between two parties and contains information about a party that is declared within the context of that specific relationship. This data is regarded as generic to any event that might involve a relationship between the two parties. Attributes include start and end dates, declared gender, supplied photograph and signature, and other data relating to the relationship between the two parties.

A Party Role exists only within the context of a specific event or activity (referred to as an event based role), or within the context of a relationship between two parties as described above. The implication of the latter context is that a Party Role is bestowed (this is a generic term inclusive of approval, accredits, grants, etc) upon a second party by the first party and the Party Role does not exist in isolation. The data model enables this to be represented by the entity Party Relationship Role (PRR). This entity is defined as: a party included in a Party Relationship and their Party Role that results from that relationship as identified by the Party Role Type. The entity is sub typed based upon the Party Role Type. The entity provides a consistent basis upon which to determine the existence of Party Roles that exist purely from an event only context and other Party Roles that reflect a more generic business context.

Examples of bestowed roles that are defined as sub types of Party Relationship Role and are relevant to A2C include: awarding organisation, centre and learner. Attributes include start and end dates relating to the Party Role and reference numbers relevant to the second Party. Bestowed roles are distinguished in the data model by prefixing the Party_Id attribute with the appropriate Party Role (eg Centre_Party_Id). Event based roles are distinguished in the data model by suffixing the Party_Id attribute with the appropriate Party Role (eg Party_Id_Originator).

2.4 Party Identifiers

The importance of the party identifier within A2C cannot be understated as it is the single attribute that is responsible for linking the relevant data blocks containing associated information for a specific party within an A2C message payload. Party identifiers to be used within the A2C data architecture are mandated as:

- Centre - NCN [HCN] or AO Assigned Centre Identifier
- Learner - MIS Assigned Learner Identifier
- Awarding organisation - JCQ^{CIC} Awarding Organisation Identifier.

The implication of these mandated party identifiers for the sender of an A2C transaction type is that all data blocks within the message payload contain the appropriate value for each respective Party Role. The only Party Role with potential for variation in the identifier type used is the centre; in reality there will be no variation because the identifier used must match that used to procure the transport certificate from the awarding organisation.

The centre is regarded as the Party Role that primarily manages the identity of the learner from an A2C perspective. The party identifier for a learner acts as the unique identifier within A2C for that individual learner in all messages between sender and receiver. The party identifier will first be sent to the awarding organisation by the centre with a full set of learner details, and that party identifier will then be the sole identifier of the learner used in future transactions. It is essential that consistency in the party identifier is maintained for learners. For A2C data exchange the MIS Assigned Learner Identifier is mandated as the Learner Party Identifier.

The table below summarises the respective attribute values for the entity Party Relationship Role and the various learner identifiers. Product catalogues published by awarding organisations will provide information on any learner identifier requirements but it is recommended that all available learner identifiers are provided with the first order for a learner. See Section 4 *Orders* for further guidance. The identifier shown in bold in the table below is the mandated learner party identifier for A2C and must be provided in all messages which contain learner information. Identifiers in italics are values; others are literals.

Party Id 1st (responsible for allocating identifier)	Party ID 2nd / Relationship Reference	Party Role Type	Party RR Reference Type	Notes
JCQ	<i>JCQ Awarding Organisation ID</i>	Awarding Organisation	JCQ Awarding Organisation ID	1
<i>JCQ Awarding Organisation ID</i>	<i>AO Assigned Centre ID</i>	Centre	AO Assigned Centre ID	2
JCQ	NCN (HCN)	Centre	NCN (HCN)	2
<i>JCQ Awarding Organisation ID</i>	<i>AO Assigned Learner ID</i>	Learner	AO Assigned Learner ID	
<i>Driving Licence Authority</i>	<i>Driving Licence Number</i>	Learner	Driving Licence Number	3

¹ See PartyRelationshipRole sheet in Appendix 2 for values

² Either NCN (HCN) or AO Assigned Centre ID (as used for transport access key) must be used as centre party identifier

³ DVLA for England, Scotland and Wales, DVA for Northern Ireland; for all other countries the party is the alpha-2 country code followed by "Driving Licence Authority".

<i>Centre Identifier</i>	<i>MIS Assigned Learner Identifier</i>	Learner	MIS Assigned Learner Identifier	⁴
<i>National Identity Authority</i>	<i>National Identity Number</i>	Learner	National Identity Number	⁵
HMRC	<i>National Insurance Number</i>	Learner	National Insurance Number	
<i>Passport Office</i>	<i>Passport Number</i>	Learner	Passport Number	⁶
SQA	<i>Scottish Candidate Number (SCN)</i>	Learner	Scottish Candidate Number (SCN)	
UCAS	<i>UCAS Personal ID</i>	Learner	UCAS Personal ID	
JCQ	<i>UCI</i>	Learner	UCI	
LRS	<i>ULN</i>	Learner	ULN	
DfE	<i>UPN</i>	Learner	UPN	

Table 1 Party Identifiers

The actual learner identifiers required may depend on both the qualification and the receiving awarding organisation. The entity QE Learner Identifier enables individual awarding organisations to define their own preferences for learner identifiers at a specific Qualification Element level. Although the data architecture allows this degree of flexibility, for A2C preferences will be stated at the Scheme level and all lower levels of the Qualification Element hierarchy will inherit those preferences; this avoids repetitively defining preferences against all other QE sub types. It is envisaged that the number of different identifiers required by various awarding organisations will decline in the future, but the data model will accommodate the existing situation.

The party identifier for a centre acts as the unique identifier within A2C for that individual centre in all messages between sender and receiver. The party identifier to be used by the centre will first be sent to the awarding organisation by the centre and that party identifier will then be the sole identifier of the centre used in future transactions. It is anticipated that the first provision of centre data from a centre to an awarding organisation occurs as part of the Centre Set-up Notification process (or the Request Product Catalogue process), which is regarded as a one-off message to alert an awarding organisation that a centre is now using an A2C compliant Management Information System (MIS). The actual identifier to be used as the Centre party identifier must match that used to procure the A2C transport certificate; this will be either the NCN (HCN) or the AO Assigned Centre Identifier.

All awarding organisations using A2C will be allocated a single identifier (Party Identifier) that will be managed by JCQ^{CIC}. Other non-JCQ^{CIC} awarding organisations will be allocated an A2C Awarding Organisation identifier as part of an agreement to use JCQ^{CIC}'s A2C

⁴ MIS Assigned Learner Identifier must be used as the primary learner party identifier

⁵ For UK National Insurance Number should be used rather than National Identity Number; for all other countries the party is the alpha-2 country code followed by "National Identity Authority".

⁶ HMPO for British passports; for all other countries the party is the alpha-2 country code followed by "Passport Office".

system. The assumption is that this identifier will persist for the lifetime of the awarding organisation from an A2C perspective.

2.5 Party Name

The A2C data model is fully aligned with the published ISB Party Name data standard. The context for party name within the JCQ^{CIC} data architecture is primarily concerned with Learner Names. Party name introduces a design for learner names that addresses existing problems faced by the awarding organisations and provides a robust, flexible and standardised format that will cater for potential future data requirements for 'international' style learner names. The design is capable of accurately conveying all names that a party uses and specifying the name component information. This enables the receiver to comprehend which part(s) of a person's name constitute the family name and which part(s) the given names. The design enables an Award Certificate Name, that is regarded as a party name usage, to be defined within the entity Party Relationship Name. This name is composed of stated name component(s) in the correct order of desired appearance within specified business rules. The data model will not restrict usage of name components for a learner name.

2.6 Booking and Outcome

The entity QE Outcome encompasses Results, Centre Assessed Outcomes and Award Claims. A QE Outcome is regarded as a measure of ability, or potential ability based upon a series of observations, or prescribed rules (inclusive of Assessment Criteria). A single instance of a QE Outcome is generated for each QE Outcome Type (Award Claims, Centre Assessed Outcomes and Results) and has a single QE Outcome Value Type (covers banded scores, raw marks, points, credits, uniform mark scale, percentage uniform mark scale, scaled/ weighted marks and grades).

The Booking entity has a child entity of QE Learner Booking which reflects a specific order of a QE for a learner.

2.7 Grades

QE Grades refer to Grade Sets, which can be linked to performance measures.

2.8 Preferences

2.8.1 AO Preferences

AO Preferences serve two purposes:

1. Differing AO behaviours are defined, meaning that MIS do not need to 'hard code' differences between AOs.
2. There are some QE Preferences that apply to all QEs (of a particular sub-type) for an AO. For these, AOs would need to set only one preference and MIS would be able to store and check a single preference. They are unlikely to change. Product catalogues are smaller than if the same QE Preference is defined on each QE. It is unlikely that many of the "mandatory" QE Preferences would apply to *all* qualifications for an AO.

AO Preferences are defined for all JCQ AOs, whether or not they are using A2C.

Effective dates are not required as the preferences would be checked only at the time of creating a transaction.

AO Preferences are defined as reference data in Appendix 2 and are not included in the A2C schema.

2.9 Deleting Records

A2C does not have a mechanism for marking records to be deleted. It does however allow records to be marked as no longer effective. For the majority of entities this is achieved by setting an effective end date.

A sending system will not be aware of whether the receiving systems have already made reference to the data that is no longer effective, so is unable to determine whether records can be deleted.

It is recommended that receiving systems check during import whether records with effective end dates can be deleted rather than updated, if they have not been referenced. Alternatively, this could be performed as part of regular housekeeping.

Effective end dates may be set to a date in the past – it must not be before the effective from date of the record, but may be the same. Receiving systems should check whether any related records have been created since that date, and flag appropriate issues to the user. These issues would need to be resolved outside A2C by dialogue with the relevant awarding organisation. Depending on the nature of the correction and likely impact, awarding organisations should not rely solely on the A2C message to communicate the problem to centres; direct contact with affected centres or notices on Awarding Organisation websites may be appropriate.

Reference Data

- Some reference data (defined in Appendix 2 and distributed as A2CRefData.xml) have effective dates, eg GradeSets. These will be maintained by the A2C programme and records will not be deleted.
- Controlled Lists and some other reference data do not have effective dates. These are used for validation at the time of creating a transaction, so from a processing point of view only the current records are required. Implementers may of course record changes over time if they wish, either by archiving or introducing effective dates which can be set when updating from A2CRefData (using the publication date).

Some entities have an alternative means of marking records as no longer effective:

- Outcomes and Contributing Outcomes
Would be updated with an appropriate status (such as 'Annulled').
- QE_Availability_Maximum_Mark
Update QE_Availability_Maximum_Mark with a null value. MIS could either delete the existing record or update the QE_Availability_Maximum_Mark to null.
- QEA_Max_Mark_Grade_Boundary
Update Grade_Boundary_Lower_Limit with a null value. MIS could either delete the existing record or update the Grade_Boundary_Lower_Limit to null. MIS could delete any records where the Grade_Boundary_Lower_Limit is null and the Grade is not in the Grade_Set for the QE.
- QE_Grade_Performance_Point
If they were issued for a QE which shouldn't have had performance points the AO could update with a zero value. MIS could either delete the existing record or set Performance_Points to zero.
- Qual_Performance_Table_QE
If MIS choose to delete ineffective QE_Grade_Performance_Point records, they could

also delete records from Qual_Performance_Table_QE which have no records with effective related records in QE_Grade_Performance_Point.

- QE_Learner_Identifier
Set the QE_Learner_Identifier_Qualifier_Type to 'Not Required'
- QE_Preference
Set the QE_Preference_Qualifier_Type to 'Not Required'
- QE_Qualification_Category
- There is a constraint that there can be only one value for each qualification category type. The category would be updated to the most appropriate value for the category type.
- Qual_Element_Framework
If they were issued for a QE which shouldn't have had credit values the AO would update with a zero value. MIS could either delete the existing record or set QE_Framework_Credit_Value to zero.

For Centre to AO transactions the appropriate cancellation transaction should be used.

2.10 Countries

In the ISB model Country_Type is used for National_Identity_Country_Type and Domicile_Country_Type for a Person. A2C has neither of these attributes and therefore there is no A2C requirement for the Country_Type entity or controlled list.

The only use of countries in A2C is to identify the issuer of passports, driving licences and national identity documents. This is achieved by including a country identifier in the Party_Id in the Party Relationship Role.

Parties have been defined in Appendix 2 for countries that issue passports, driving licences and national identity documents.

Party IDs are named with a standard prefix followed by an alpha-2 country code. Party Names are named with the country name followed by a standard suffix. For each relevant Party_RR_Reference_Type these are:

Party_RR_Reference_Number	Party_ID Prefix	Party_Name Suffix
Driving Licence Number	Driving Licence Authority	Driving Licence Authority
National Identity Number	National Identity Authority	National Identity Authority
Passport Number	Passport Office	Passport Office

Party Names and Party Name Components are defined in Appendix 2, with a Party_Name_Type of 'Known as'. Full names could be added by implementers if users would like alternative names.

For the UK the following parties should be used:

- Driving Licence Number
 - DVLA – for England, Scotland and Wales
 - DVA – for Northern Ireland
- Passport Number
 - HMPO
- National Insurance Number
 - HMRC

National Identity Number should not be used for NINOs.

The country codes and names used for Party IDs and Party Names are derived from the ISO 3166 list. Where possible A2C uses the same codes as the ILR (which are defined by HESA). In common with HESA, variations defined by ONS in the National Statistics Country Classification have been used

(<https://www.ons.gov.uk/methodology/classificationsandstandards/otherclassifications/nationalstatisticscountryclassification>).

The Country sheet in Appendix 2 lists the country codes and names used to define the party IDs and Names.

Note that Country Names contain diacritics, eg “Åland Islands”. These are encoded as character references in A2CRefData.xml.

2.10.1 Differences from ISO 3166

The differences from ISO 3166 are:

2.10.1.1 Kosovo

The international community is split on whether to recognise Kosovo as a separate country and therefore ISO has not allocated a code. The UK has recognised Kosovo. The European Commission is using 'XK' as a temporary country code for Kosovo until ISO officially assigns a code. HESA is unable to use XK as it is already allocated so uses the NSCC code QO. A2C has adopted the same code.

2.10.1.2 Uninhabited Countries

The following countries have been excluded (in line with HESA/ILR):

AQ	Antarctica	Since there are no settled inhabitants in Antarctica, AQ is invalid for both domicile and nationality
BV	Bouvet Island	Bouvet Island is a Norwegian island in the South Atlantic Ocean, but has no settled inhabitants, so code BV is invalid for both domicile and nationality.
HM	Heard Island and MacDonal Islands	Heard Island and MacDonal Islands are a territory of Australia with no settled inhabitants. The code HM is accordingly invalid for both domicile and nationality.
TF	French Southern Territories	Metropolitan France and the five Overseas Departments are all part of the European Union. For domicile, the code FR must be used only for Metropolitan France, and other codes must be used with their natural meaning, except that there are no settled inhabitants in the French Southern Territories, so code TF is invalid. For nationality the code FR must be used throughout, and all the other codes in this group are invalid.
UM	United States Minor Outlying Islands (the)	Have no settled inhabitants and the code UM is accordingly invalid for both domicile and nationality.

Table 2 Countries with no settled inhabitants

2.10.1.3 Country Names

Suggested names are included in Appendix 2, but implementers are free to amend these if they wish and even use different names in different regions of the world.

For Country_Name, the following rules have been applied:

- Removed “(the)” from:
 - United Arab Emirates (the)

- Cocos (Keeling) Islands (the)
- Central African Republic (the)
- Congo (the)
- Cook Islands (the)
- Dominican Republic (the)
- Falkland Islands (the) [Malvinas]
- Faroe Islands (the)
- British Indian Ocean Territory (the)
- Comoros (the)
- Cayman Islands (the)
- Marshall Islands (the)
- Northern Mariana Islands (the)
- Niger (the)
- Netherlands (the)
- Philippines (the)
- Russian Federation (the)
- Sudan (the)
- Turks and Caicos Islands (the)
- United States of America (the)
- remove "the" and "of the"
 - Congo (the Democratic Republic of the)
- remove "of Great Britain and Northern Ireland (the)"
 - United Kingdom of Great Britain and Northern Ireland (the)
- Remove asterisk from
 - Western Sahara*
- Replace "(the)" with ", The" for:
 - Gambia, The
 - Bahamas, The
- Remove text in brackets / after comma from:
 - Bolivia (Plurinational State of)
 - Micronesia (Federated States of)
 - Iran (Islamic Republic of)
 - Moldova (the Republic of)
 - Macedonia (the former Yugoslav Republic of)
 - Tanzania, United Republic of
 - Venezuela (Bolivarian Republic of)
- ISO name followed by PCGN name in brackets / after hyphen
 - Côte d'Ivoire (Ivory Coast)
 - Cabo Verde (Cape Verde)
 - Myanmar (Burma)
 - Lao People's Democratic Republic (Laos)
 - Timor-Leste (East Timor)
 - Holy See (Vatican City State)
 - Korea (the Republic of) – South Korea
 - Korea (the Democratic People's Republic of) – North Korea

3 Standards

3.1 Standards and Notation

The business data architecture introduces a formalised approach to define a single precise unambiguous definition for every business term. The notation that has been used for the entity relationship diagrams associated with the A2C business data architecture is that used by the Entity Relationship Diagram software tool CA Erwin. A set of standards for naming entities, attributes, relationships, primary keys and descriptions is an important principle to ensure consistency for future development of the business data architecture models.

The data formats defined within the A2C business data architecture are based on the published business data architecture for the Education, Skills and Children's Services, which incorporates Information Standards Board (ISB) approved data standards.

The A2C system will allow all character set attributes to potentially support Western European and Latin subsets of UTF-8 (Unicode Transformation Format, which is variable length character encoding for Unicode). Business rules may impose some restrictions on selected attributes as deemed appropriate. Further detail of data formats is provided in Appendix 1.

3.2 Naming Standards

A set of standards was used for naming entities, attributes, relationships, primary and foreign keys to maintain a level of consistency across the data model and any view subsequently derived from it. The names defined in the business data architecture must be used as stated (not modified) in the physical XML to ensure consistency. The preference for naming standards for entities is to remove the space between names used in the data model with initial capitals for each word in the resultant XML schema ('Time Window Schedule' becomes 'TimeWindowSchedule'), and to retain the underscores used for attribute names.

3.2.1 Entity and Attribute Names

- Name must be unique in the business data architecture
- Only nouns may be used
- Name must be singular
- Name must be business based and reflect a business level understanding
- Names must follow the following format:
 - First letter must be a capital letter; following letters must be lower case;
 - Must not contain any special characters and contain only letters or numbers
- Controlled lists have the suffix '_Type'.
- Abbreviations are used only if the name exceeds 30 characters
- Acronyms are used where the acronym is more readily understood than the full name eg URL rather than Uniform Resource Locator.
- If abbreviations are used they must be approved. See table of approved abbreviations below
- Maximum length of 45 characters including spaces/underscores
- If the entity name is constructed of more than one word, then there must be a space between words
- If the attribute name is constructed of more than one word, then there must be an underscore between words
- Attribute names are qualified for clarity as appropriate, so in the case of a subtype then the attribute is qualified by use of a prefix, or if the qualifier is added as a discriminator then it is added as a suffix.

3.2.2 Approved Abbreviations

Term	Abbreviation
Accred	Accreditation
Administrator	Admin
Alternative	Alt
Amendment	Amndmnt
Assessment	Assmnt
Assessment Delivery Time	ADT
Authentication	Auth
Awarding Organisation	AO
Calendar	Clndr
Certificate	Cert
Classification	Clas or Class
Considerations	Cons
Declaration	Decl
Description	Descr
Effective	Eff
Evidence	Evid
First	1 st
Framework	Frmwrk
Geog	Geographical
Identifier	Id
Indicator	Ind
Maximum	Max
Minimum	Min
Minutes	Mins
Number	Num
Objective	Objctv
Performance	Perf
PRR	Party Relationship Role
Qualification	Qual
Qualification Element	QE
Qualification Element Availability	QEA
Qualification Element Relationship	QER
Reference	Ref
Required	Reqd
Requirement	Reqmnt
RR	Relationship Role
Second	2 nd
Sequence	Seq
Service Level Agreement	SLA
Special	Spec
Statement	Stmnt
Test Resource Booking	TRB
Uniform Resource Locator	URL

Table 3 Approved abbreviations

3.2.3 Friendly Names

Friendly names have been defined for use with feedback messages which may be displayed to users.

Underscores have been replaced with spaces and the following abbreviations expanded:

Id	Identifier
1st	First
2nd	Second
Accred	Accreditation
ADT	Assessment Delivery Time
Amndmnt	Amendment
AO	Awarding Organisation
Assmnt	Assessment
Auth	Authentication
Clas	Classification
Class	Classification
Cndr	Calendar
Cons	Considerations
Date Time	Date/Time
DateTime	Date/Time
Decl	Declaration
Descr	Description
Eff	Effective
Evid	Evidence
Frmwrk	Framework
Num	Number
Objctv	Objective
OnDemand	On Demand
Perf	Performance
QE	Qualification Element
QEA	Qualification Element Availability
QER	Qualification Element Relationship
Qual	Qualification
Reqd	Required
Reqmnt	Requirement
RR	Relationship Role
Seq	Sequence
SLA	Service Level Agreement
Spec	Special
Stmnt	Statement
TRB	Test Resource Booking
URL	Uniform Resource Locator

Table 4 Friendly Names

3.3 Entity and Attribute Definition

The definition must describe clearly and in business terms the meaning of the entity or attribute.

3.4 Relationships

Each relationship name must be a verb construct and use only one of the entity names involved in the relationship, preferably the parent entity.

Relationships are listed in a table in Appendix 1 and shown diagrammatically in Appendix 4.

3.5 Type Lists

There are two categories of type list within A2C: Controlled lists and Harmonised lists.

3.5.1 ISB Controlled List

A controlled List is a canonical set of values ie they are a standard set of values that are unlikely to exist in the individual systems but are necessary for the behaviour of the data model and are used as a 'currency conversion' ie they are used to triangulate from one set of values to another between two systems. The controlled list is also a constrained set and no other values may be used without careful evaluation of any proposed changes to ensure the changes still behave in the same manner as the type list intends. These values are maintained by the Education, Skills and Children's Services (ESCS) Information Standards Board (ISB) using the change management process which can be found on their website.

Any requirement to amend the values in an ISB controlled list should be directed to the ISB Secretariat at <https://www.education.gov.uk/escs-isb/contact> which will then start the previously mentioned process to gain sector wide approval for the change.

3.5.2 Harmonised Lists

These are values on which the A2C Data Exchange Project has agreed to harmonise. They do not currently have wider relevance within the sector, although this could change in future and some of these harmonised lists could be adopted by ISB as Controlled Lists.

A2C Harmonised Lists are maintained by a JCQ^{CIC} group on which all stakeholders such as the JCQ^{CIC} Awarding Organisations, MIS suppliers and representative FAB Awarding Organisations are represented. All proposed values (even those that might be unique for an Awarding Organisation) will go through a formal review process in order to resolve potential conflict between values and add clarity for Centres.

Any requirement to amend the values in a Harmonised List should be directed to:
a2c@jcq.org.uk

4 Data Formats

A2C has adopted the ISB guidance on Data Formats. This is described in the document *Business Data Architecture Data Types*. The current version is 7.0. See

<http://data.gov.uk/education-standards/guidance/business-data-architecture-data-types>

In Appendix 1 the following logical types are used. These are mapped to the types used in the xsd as follows:

Primitive Type	XML Schema Type	Logical data model type
Simple_Integer	integer	INTEGER
Simple_Binary	base64Binary	BINARY
Simple_Date	date	DATE
Simple_DateTime	dateTime	DATETIME DAY TO SECOND
Simple_Decimal	decimal	DECIMAL
Simple_Flag	string	BOOLEAN
Simple_String	string	VARCHAR()
Unicode_String	string	NVARCHAR()

Table 5 Data Types

4.1 DateTime Format

The ISB Publication *Business Data Architecture Data Types* adopts the W3C date-time standard <http://www.w3.org/TR/NOTE-datetime>.

However, for A2C fractions of a second will not be supported for data exchange. The ISB W3C standard supports all three of the following string representations of a date-time, but A2C will only support (1) and (2)

	Description	Format	Example
1	Complete date plus hours and minutes	YYYY-MM-DDThh:mmTZD	1997-07-16T19:20+01:00
2	Complete date plus hours, minutes and seconds	YYYY-MM-DDThh:mm:ssTZD	1997-07-16T19:20:30+01:00
3	Complete date plus hours, minutes, seconds and a decimal fraction of a second	YYYY-MM-DDThh:mm:ss.sTZD	1997-07-16T19:20:30.45+01:00

Table 6 Date Time Formats

The time zone designator (TZD) is compulsory in all three representations. Valid TZDs are one of:

A positive hours-plus-minutes offset of the format	+hh:mm
A negative hours-plus-minutes offset of the format	-hh:mm
The literal character Z (upper case). This represents UTC , which is equivalent to an offset of zero minutes and zero seconds.	Z

Table 7 Time Zone Designators

UTC stands for 'co-ordinated universal time', and is a more precise equivalent of **GMT** (Greenwich mean time).

Date-times in **GMT** (the winter time zone in the UK) can be represented with any of the three TZDs of:

- +00:00
- -00:00
- Z

The TZDs +00:00, -00:00 and Z are exactly equivalent.

Date-times in BST (the summer time zone in the UK) must be represented with the single TZD of '+01:00'

In terms of consuming compliant string representations of date-times and converting these into system date-time representations, all standard date-time libraries should happily consume both string representations (1) and (2) with no problems.

In terms of producing compliant string representations of date-times, you may choose to generate whichever of the two string representations you prefer and may choose a different representation for different purposes. For example:

- For exam date-times representation (1) could be used, as these are only defined to the nearest minute
- For timestamps (such as in the message header) representation (2) is used, with a precision to the nearest second
- For QE Availability and Key Event start and end date-times, representation (2) is used, with the time part being either '00:00:00' to represent the start of a day or '23:59:59' to represent the end of a day.

The same 'instant of time' can have multiple equivalent representations. For example, the following are all equivalent string representations of the same 'instant in time' (this list is not exhaustive). In a system that represents date-times internally using UTC, these would all be stored as 10.30am UTC on 01 January 2014 once the string representation is converted into a system date-time. Note that two of these equivalent representations do not have the same day as the UTC representation (these are highlighted in green), and the second of these does not even have the same year.

The following examples have a UTC TZD

- 2014-01-01T10:30Z
- 2014-01-01T10:30+00:00
- 2014-01-01T10:30-00:00
- 2014-01-01T10:30:00Z

The following examples have a positive non-UTC TZD

- 2014-01-01T11:30+01:00
- 2014-01-01T15:30+05:00
- 2014-01-01T18:30+08:00
- 2014-01-01T20:30+10:00
- 2014-01-02T00:30+14:00

The following examples have a negative non-UTC TZD

- 2014-01-01T09:30-01:00
- 2014-01-01T05:30-05:00
- 2014-01-01T02:30-08:00
- 2014-01-01T00:30-10:00

- 2013-12-31T23:30-11:00

All equivalent representations of a particular 'instant of time' must be considered equal for the purposes of comparison and database lookups (eg a QEAavailability element for QE1 with a QEA_Effective_Start_Date_Time of 2013-12-31T23:30-11:00 in a received XML message must match a database QEAavailability for QE1 with a QEA_Effective_Start_Date_Time of 2014-01-01T10:30:00Z). In particular, comparing string representations of date-times directly will not give the correct result unless both representations use the exact same time zone designator string. When comparing date-times, one of the following approaches is recommended.

1. Parse date-time strings into an internal time zone aware date-time format (eg DateTimeOffset in .NET). Discard any fractions of a second present in the date-time.
2. Parse date-time strings into an internal non- time zone aware date-time format (eg DateTime in .NET) but convert all date-times to UTC while parsing. Discard any fractions of a second present in the date-time.

Summer exams starting at 09:30 will normally be either 09:30+0100 or 08:30Z

Summer exams starting at 13:30 will normally be either 13:30+0100 or 12:30Z

4.2 Simple_Flag format

The schema uses a Flag datatype (which constrains values to 'Y' or 'N'). Note that all flag attributes are optional. If the flag attribute is not sent and no value has previously been supplied then this equates to a value of 'N'.

The logical data model defines flags as Boolean attributes, which reinforces the rule of assuming False if not set. Implementing flags as bits with default 0 in databases enables xml processing using simple rules to substitute missing values with xsi nil and then mapping 'Y' to True.

4.3 Case Types for Strings

The following guidance should be applied to any new products and any new attributes once Awarding Organisation systems can support the Case Types specified. The guidance is aspirational - Awarding Organisations are not required, or necessarily expected, to apply the guidance retrospectively to legacy migrated values. At some point in the future this guidance should deliver consistency of data presentation across all Awarding Organisations, but there will be no deadline applied.

For the purposes of this guidance the following definitions apply:

- Title Case - The first word and all other words, except articles, prepositions and conjunctions, are capitalised ie the initial letter is in upper case.
- Sentence Case - The first word and proper nouns are capitalised along with any other words which are generally capitalised by a more specific rule.

For both Title and Sentence Case, the natural state of the word must be maintained, so words such as GCSE, ULN etc must be in uppercase.

The Case column in Appendix 1 includes 'Title Case' or 'Sentence Case' against the appropriate attributes. Sentence Case is usually preferred for longer attributes and shorter attributes (or those which relate to some form of title) should use Title Case. For the majority of Unicode_String attributes Case Type can be defined by the originating party. The attributes for which guidance on case type is not relevant are:

- All party identifier, relationship and relationship reference attributes eg MIS may choose Upper Case for MIS Assigned Identifiers
- Order reference numbers eg Centres may choose Upper Case for these
- Type list and harmonised values – Case Type should exactly match Appendix 2 lists of values
- Attributes relating to grades and outcomes – Case Type used should reflect common conventions
- Reference values sourced outside A2C; these should match the source format eg QRN and Learning Aim Code
- Miscellaneous text which is unlikely to be presented in report format such as Carry Forward details
- Attributes which are likely to be populated with URLs eg QE_Assmnt_Material_Source

Note also that specific guidance on Case Type has not been provided for the attribute Party_Name_Component, however the following text has been added to the Business Description for that attribute:

'Learner names submitted must include diacritics where the learner requires these to be included in the name to be printed on certificates.'

4.4 Recommended specifications for signatures and photographs

The following guidance should be applied to any new learner photographs and signatures being captured for A2C purposes.

Developers are not required, or necessarily expected, to apply the guidance retrospectively to legacy migrated images.

4.4.1 Recommended specifications for signatures

- Colour-depth: True colour (24-bit)
- Permitted file types: JPEG
- Maximum file size (prior to base64 encoding): 500 KB
- Minimum/recommended height: 118 pixels (1cm high at 300dpi)

4.4.2 Recommended specifications for photos

Photo must meet the UK passport requirements at <https://www.gov.uk/photos-for-passports>

Common technical image requirements

- Colour-depth: True colour (24-bit)
- Permitted file types: JPEG
- Printable size: 45mm high by 35mm tall (1.77 x 1.38 inches)
- Aspect ratio (height:width): 9:7 (ie height / width = 1.286)
- Maximum file size (prior to base64 encoding): 1 MB

Minimum/recommended physical dimensions (300 dpi resolution)

- Minimum/recommended height: 532 pixels
- Minimum/recommended width: 414 pixels
- Uncompressed size: 661 KB (0.67 MB)
- JPEG at highest quality⁷: 228 KB (0.23 MB)
- JPEG at common 'standard' quality⁸: 77 KB (0.08 MB)

Maximum physical dimensions (600 dpi resolution)

- Maximum height: 1064 pixels
- Maximum width: 828 pixels
- Uncompressed size: 2.65 MB
- JPEG at highest quality⁷: 909 KB (0.91 MB)
- JPEG at common 'standard' quality⁸: 248 KB (0.25 MB)

4.5 Learner Names

A2C subscribe to the ISB data formats (see link at top of this sheet). The ISB guidance on Unicode format (which is used for learner names) indicates that a wide range of characters are supported. A2C implementers are expected to work towards support for this full range of characters. Support for the full range of characters is not currently mandatory.

Implementers should note that Learning Records Service (LRS) guidance suggests a more limited range of characters are acceptable for learner names. The LRS guidance can be referenced in the document below:

[How to prepare an LRB batch \(Learner Registration Bodies\) V1.1 July 2012](#)

This is referenced in:

[LRS Organisation Portal Learner Management User Guide V1.0 June 2014](#)

While some awarding organisation legacy systems currently support a more restricted character set than LRS, they will not reject learner names containing LRS supported characters submitted through A2C transactions.

⁷ JPEG compression at highest quality requires approximately 8.25 bits per pixel (1.03 bytes).

However, using 'standard' settings when saving a JPEG is likely to result in much smaller images

⁸ Passport photo images taken by the Samsung Galaxy S4 smartphone are automatically saved as JPEGs at approximately 10% of their uncompressed size. Saving an uncompressed passport photo image as a JPEG using the standard settings in Microsoft Paint also results in images that are approximately 10% of their uncompressed size.