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To: Members of ISO/TC 46/SC 9
Selected organizations in liaison

c.c. Registration Authorities for ISO/TC 46/SC 9 identifier standards

Subject: Use cases for interoperability of ISO TC46/SC9 identifiers

Background information for agenda item 9.7 of the ISO/TC 46/SC 9 meeting in Chiang Mai, Thailand

Dear Colleagues,

The attached document on use cases for interoperability of identifier systems developed within ISO TC 46/SC 9 is being sent to you as background information for agenda item 9.7 of our meeting in Chiang Mai on February 9, 2006.

Agenda item 9.7 will be a report to ISO TC 46/SC 9 on recent discussions between ISO TC 46/SC 9 Registration Authorities concerning interoperability issues. The attached document was prepared under contract by the U.K. consulting firm Rightscom as a framework and guide for those discussions.

Action to be taken:

- **For immediate distribution to delegates attending the ISO TC 46/SC 9 meeting on 2006-02-09 in Chiang Mai, Thailand.**

With regards,

[original signed by]

Jane Thacker
Secretary, ISO TC 46/SC 9

rightscom

ISO TC46 SC9 identifier standards: Use Cases for interoperability

1 Background to and purpose of this document

Over a number of years, there has been a continuing discussion within ISO TC46 SC9 of the need for "interoperability" between the various standard identifiers for which this committee is responsible. However, the nature of what that interoperability might mean – and how it might be achieved – has not been well explored.

As an initial step towards moving these discussions forward with a little more urgency, in the light of increasing demand being felt by Registration Authorities, an ad hoc group of representatives of TC46 SC9 Registration Authorities and invited experts[1] met in London in a facilitated workshop on 13 December 2005 to develop definitions and use cases, with the intention of providing a framework within which a more structured exploration of the issues might be undertaken.

This document is the output from that meeting. It is being offered as input to a more formal meeting of those with an interest in this issue which is due to take place in Chiang Mai, Thailand on 8 February 2006 (the day before a meeting of TC46 SC9).

This document makes no recommendations, but is rather intended to identify the requirements for interoperability and the range of approaches that might be taken byTC46 SC9 to facilitating interoperability between the standards for which it is responsible. It is anticipated that the meeting on 8 February may be able to make recommendations for specific actions to the meeting of TC46 SC9 on 9 February.

2 Definitions

Any discussion of this kind is made much more difficult in the absence of a clear definition of scope. The initial task of the workshop was therefore to agree a definition of "interoperability". Working with inputs which were provided ahead of the workshop, members first began by agreeing some provisional definitions; these definitions are not being promoted with the intention that they should be seen as canonical, but simply as useful working tools.

The following generic definition of interoperability was accepted by workshop:

> **Interoperability** *is the ability of a federation of independent systems to exchange meaningful information and initiate actions from each other, in order to operate together to mutual benefit. In particular, it describes the ability for loosely-coupled independent systems to be able to collaborate and communicate.*

Exploration of what this might mean in the specific context of "identifier interoperability" suggested three possible areas for exploration:

1. Metadata interoperability

[1] See Appendix

2. The creation of standard mechanisms for the expression of relationships between the referents[2] of different standard identifiers
3. The creation of common services

Each of these is discussed in more detail below.

The importance of the discussion of "metadata" also identified a requirement to define this term. It was agreed that a modification of the <indecs> definition should be adopted:

> **An item of metadata** *is a relationship which somebody claims to exist between two referents.*

In the context of identifiers, a further term of art is required for the metadata which is mandated within an identifier standard. This is sometimes referred to as a "minimum metadata set" but such a description can be misleading (since it simply raises a further question – *minimum for what purpose*?). We therefore agreed to use the term "reference descriptive metadata" for that set of metadata which has been defined within each standard.

2.1 METADATA INTEROPERABILITY

Various descriptions of metadata interoperability had been proposed before the meeting, including:

> *"…metadata associated with an identified entity can be painlessly referenced in the context of one class of entity even though it was originated in the context of another class of entity."*
>
> *"…the ability to exploit a consistent semantic which has been defined in a mapping between comparable attributes in each of the identifier schemes."*
>
> *"…the ability to exploit ISO identifiers and their associated metadata within systems in a consistent manner."*
>
> *"Interoperability…depends on effective sharing of metadata."*

In the absence of a universal implementation of a common metadata scheme for all identifier schemes, these imply that mechanisms need to defined through which is it possible:

- To use items of "reference descriptive" metadata associated with one identifier in the context of another identifier
- To aggregate items of "reference descriptive" metadata associated with several different identifiers in a single context

So far as this is possible, this should be achieved without the loss of semantic value (meaning).

2.2 EXPRESSION OF RELATIONSHIPS BETWEEN REFERENTS

Descriptions proposed included:

> *"…the ability to set as one of the properties of an identified object a reference that links it with another identified object."*

This fulfils illustrative requirements such as:

> *"The book identified with this ISBN is a manifestation of the work identified with this ISTC"*

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[2] A referent is the thing which is identified by an identifier – an essential term for a document discussing identifiers.

> *"The song identified with this ISWC is available as a score identified with this ISMN and as recordings identified with these ISRCs"*
>
> *"The publisher identified with this [standard party identifier] is the publisher of this journal identified with this ISSN."*

This implies the development of a standard set of typed relationships between identifiers with well-defined semantics.

2.3 COMMON SERVICES

Descriptions proposed included:

> *"…the use of a shared syntax or physical interface for the expression of requests and responses for provision of services and/or data."*
>
> *"…allowing for the possibility of their extensible use in services outside the direct control of the issuing assigner…"*

The types of service that might be considered include:

- Metadata look up services, where a user can resolve an identifier to a set of metadata about its referent
- Identifier discovery services, where a user with a limited set of metadata can discover the identifier or identifiers for that object

These can be seen as a development of metadata interoperability – having created the potential for interoperability between metadata sets, how can user value be created.

3 Some further notes on scope

3.1 MACHINE-TO-MACHINE OR HUMAN-TO-MACHINE?

Should the "systems" which need to be interoperable always involve machine to machine interoperability? As we developed use cases, it became apparent that human users would normally be a core element of the systems and that consideration should not exclude interoperability mediated by people.

3.2 BEYOND THE TC46 SC9 IDENTIFIER FAMILY

Discussions within the group deliberately ranged beyond the existing family of TC46 SC9 standards. Discussions included identifiers that have already been discussed as potential TC46 SC9 identifiers, including the Digital Object Identifier and the idea of an international standard "interested party" identifier.

However, discussion also covered trade identifier standards such as EAN/UPC; SMPTE's UMID identifier standard; the music industry's GRid (Global Release Identifier) and MWLI (Musical Works Licence Identifier); and the potential interaction with metadata standards including ONIX, LOM and SCORM.

3.3 TC46 SC9 AND COMMERCIAL CONSIDERATIONS

It is inevitable that discussions should at some point focus on the commercial reality that implementation of interoperability measures will only be possible if they meet some kind of (probably commercial) need to justify the necessary investment. It was agreed that the role of TC46 SC9 is limited to the creation of the standards and governance infrastructure within which it would be *possible* for others – Registration Authorities, Registration

Agencies, third parties – to create implementations should they elect to do so in response to a specific requirement.

The role of TC46 SC9 is to facilitate the task of others in creating interoperability between identifier standard, not to effect interoperability services itself.

4 Use Cases

The following uses cases were developed during the course of the workshop. The intention for the development of these use cases was to be illustrative rather than exhaustive. In discussion, each of the use cases could be seen to be a specialised instance of a more generic requirement which spanned all media types represented at the workshop (even where the specific use cases do not).

4.1 USE CASE1: DISCOVERY OF "RELATED CONTENT" ITEMS

Who	• A consumer of a multimedia content package
What	• Wishes to discover and explore content "related" in some way to the various different items of content included in the multimedia including (for example): o Other music by the same performer o Other works on the same subject o Other versions of "the same" content (eg French language version of Star Wars)
Why	• To purchase related content
Where & when	• Online • Any time
How	• Requires a discovery mechanism through which content with arbitrary shared attributes can be discovered • Implies that the attribute sets used with respect to different content types *either* o Use common semantics *or* o Have a mechanism through which disparate semantics can be mapped
Issues	• Which specific attributes might be used as discovery keys? Any?

4.2 USE CASE 2: DISCOVERY OF DIFFERENT "PRODUCT" VERSIONS OF THE SAME WORK

Although some TC46 SC9 identifiers (particularly ISBN, ISMN) can be correctly characterised as "product" identifiers, some (such as ISAN) emphatically are not. Considerable difficulties arise when an identifier specified for one purposed is used erroneously for a different purpose.

Who	• A manager of audio-visual assets
What	• Collocate all product versions of the same audio visual work
Why	• Internal asset management • To support transparency in the distribution channel

Where & when	• Internal systems • Any time
How	• Mechanism for linking product identifiers (eg EAN/UPC) with audio-visual work identifier (ISAN, V-ISAN)
Issues	• See Section 6 on identifier linking

4.3 USE CASE 3: BROADCAST USE REPORTING

Who	• Broadcast monitoring service
What	• Identify content used in broadcasts
Why	• Automatic creation of usage reports for different constituencies o Musical works broadcast o Recordings broadcast [Note: this is exemplary – could equally apply to audiovisual works]
Where & when	• Online • All the time
How	• Match fingerprint (or other intrinsic attribute) of content to proprietary identifier o This step not necessary if the intrinsic attribute is itself an embedded standard identifier • Match proprietary identifier unambiguously to standard identifiers o of recording (ISRC) o of work (ISWC)
Issues	• Implies a method to: o Create link between proprietary identifier and standard identifier (ISRC) o Discover or create link between standard identifiers (ISRC to ISWC) • See Section 6

4.4 USE CASE 4: AUTOMATED ASSIGNMENT OF RELATED IDENTIFIER

Who	• ISRC Registration Authority • ISAN Registration Authority
What	• Where ISRC is used to identify a video clip (music video) ensure that an ISAN is also issued to the same asset
Why	• Disambiguation of relationships between audiovisual works for third parties
Where & when	• Automated internal systems • Online • Any time
How	• Automated registration of appropriate metadata set • Automated identifier issue
Issues	• Metadata interoperability • There is a specific issue about the precise level of abstraction of what the ISRC identifies and how this maps to the level of abstraction of the ISAN and/or the V-ISAN.

4.5 USE CASE 5:
ESTABLISHMENT OF COMPREHENSIVE IDENTITY AND METADATA RECORD TO FACILITATE SUBSEQUENT DISCOVERY OF RELATIONSHIPS

Who	• Audio-visual production company
What	• Using sound recordings in an audiovisual work • Licensed to use the recordings subject to the creation of a comprehensive metadata record for the audiovisual work, which includes the identity of both the recordings and the musical works used in the audiovisual work
Why	• To meet contractual obligation under terms of licence • To aid subsequent rights administration (eg cable retransmission)
Where & when	• Online • Any time
How	• Issue ISAN • Link ISAN to appropriate ISRCs o Perhaps link UMID to appropriate ISRC • Link ISRCs to appropriate ISWCs (possibly ISTCs for lyrics)

Issues	• Implies a method to:
	  o Discover ISRC
	  o Create link between ISAN and ISRC
	  o Discover or create link between ISRC and ISWC
	• See Section 6

4.6 USE CASE 6:
IDENTIFIER CHAINS

Who	• Musician with a music score
What	• Discover and download a recording of the score
Why	• Learning the music
Where & when	• Online • Anytime

How	• Requires a service that will resolve identifier chains:
	  o ISMN to ISWC
	  o ISWC to ISRCs
	  o ISRCs to GRids (or UPCs)

Issues	• See Section 6

4.7 USE CASE 7: COMPILING MULTIMEDIA OBJECTS

Who	• e-Learning Course Designer
What	• Discover identifiers for a range of different content types to be included in a multimedia e-learning course, which might include one or more of: o Journal article o Chapter from a book o Audiovisual clip o Sound recording o Photograph o Graphic image o Musical score o Software application • Any of this content might be self created or have rights owned by third party
Why	• Rights ownership discovery o Could be contextual: where can I clear rights for this specific use in this particular territory for this time? • Rights clearance • Rights usage reporting • Providing comprehensive metadata for users (see Use Case 1)
Where & when	• On line • Any time
How	• Online identifier discovery and use • Online metadata discovery and use
Issues	• Substantial extension of metadata availability to include mechanisms for discovering rights manager identities for particular objects

4.8 USE CASE 8: IDENTIFIER CHAINS

Who	• Consumer – Frenchman in New York
What	• Discover and download version of French movie with French language sound track but English subtitles
Why	• To watch movie while improving language skills
Where & when	• Online • Anytime
How	• Availability of online catalogue of all versions of “the same” movie • Availability of mechanism to pull together multiple related digital items (if, for example, the movie and the subtitles come from different providers)
Issues	• Access to federated metadata catalogues • (Issues relating to the complexity of managing movie and subtitles from different vendors are beyond the scope of this document!)

4.9 USE CASE 9:
DISTRIBUTION OF REPROGRAPHIC RIGHTS LICENCE REVENUE FROM COLLECTIVE LICENSING

This example relates to the collective management of reprographic rights in literary works; similar use cases could be written relating to creator's rights in musical works; performers and producers rights in recordings; and others. The issues would be slightly different in each case.

Who	• Reproduction rights organisation
What	• Unambiguously link products to works to rightsholders
Why	• To distribute licence revenue associated with a product identifier (eg ISBN) to the appropriate rights holder (particularly the author)
Where & when	• Internal systems • All the time
How	• In the case of an ISBN, requires a link from the ISBN [potentially but not necessarily via a link to an ISTC] to an unambiguous party identifier for the author
Issues	• Lack of any widely deployed party identification systems within the literary media • Difficulties related to the granularity of identification (eg the use of ISSN to identify journals precludes any possibility of identifying authors of specific journal articles that have been copied)

4.10 USE CASE 10:
COLLOCATION IN LIBRARY CATALOGUE

Appendix E of the Committee Draft of the ISTC provides extensive illustrative examples of the potential relationships between ISTC and other TC46 SC9 identifiers (particularly but not exclusively between ISTC, ISBN and ISSN). This not only provides one potential starting point for the semantics required for typing identifier to identifier relationships (see Section 6) it also provides the basis for a considerable number of possible use cases, of which this is just one.

Who	• Librarian
What	• Linking an article published in several different serial publications
Why	• Collocation
Where & when	• In library catalogue system • At any time
How	• Link each article to an ISTC for the article • Link each article to the ISSN of the relevant serial publication
Issues	• Article identification (DOI?) • Discovering and linking using the ISTC

4.11 USE CASE 11: LINKING REPERTOIRE TO "USAGE TERM SETS" IN A NATIONAL LIBRARY

There are many potential examples of the requirement to link a list of repertoire covered by a specific set of usage terms with that set of usage terms. This particular example may be slightly unfamiliar, but is included for precisely that reason.

Who	• A national library
What	• Linking a set of resource identifiers with a set of usage terms
Why	• Unless all resources in a national library archive are managed under "lowest common denominator" usage rights, it is necessary identify the particular set of usage terms that applies to a particular resource in a particular context • Repertoires are likely to overlap (in other words, more than one set of usage terms may relate to the same resource in different contexts – for example, some uses of a resource may be governed by legislation and others by licence) • A set of usage terms may relate to a single resource or to a complete collection or anything in between
Where & when	• In library archive system • In perpetuity…
How	• Likely to be at least semi-automated when resources are ingested
Issues	• Implies an appropriate identifier is available for the set of usage terms as well as the resource – a "licence identifier" perhaps • Only known standard licence identifier known within the group is the Musical Works Licence Identifier (MWLI) which was developed as part of the MI3P initiative and which is managed by CISAC

5 Gaps in the identifier portfolio

During the course of development of the use cases, a number of gaps were identified in the TC46 SC9 portfolio. None of this is necessarily new, but the significance of the gaps is probably increasing. A short note is therefore included here on the most obvious.

5.1 INTERNATIONAL STANDARD INTERESTED PARTY IDENTIFIER

The role of party identifiers in disambiguation of personal and corporate names has been extensively discussed elsewhere[3] and the issues will not be repeated here. However, the requirement for unambiguous party identification is obvious from a number of the use cases discussed here (as indeed is the requirement in some instances to express party to party relationships).

However, it should not be pre-supposed that there is a complete consensus within the rights holder community, for example, for the widespread implementation of a standard interested party ID. Indeed, in some communities of interest we believe that there would be significant opposition. There may be a number of reasons for this, ranging from concerns about privacy and data protection to a commercial interest in

[3] See, for example, the <indecs> *Directory of Parties* report at www.indecs.org or the deliverables of the InterParty project at www.interparty.org. The classic use case is "show me all recordings made by "John Williams" – but *which* "John Williams"?

maintaining ambiguity of identity (and thus depending on more uncertain methods like name string matching – see also Section 6).

It is also possible to envisage the deployment of party identifiers in specific domains, perhaps associated with specific roles (for example, the same individual might have a different identifier as a performer from that which they have as a composer or as an author). This scenario – extensively explored in the InterParty project – substantially reduces the utility of the party identifier across different domains in the absence of some interoperability mechanisms to map the identifiers to one another – which, if it exists, creates precisely the same set of objections as a system based on a single identifier.

This is no reason to reject the concept of a TC46 SC9 International Standard Interested Party Identifier, but it suggests that is introduction and deployment might not be entirely straightforward, however high its apparent utility to many different users.

5.2 IMAGE IDENTIFICATION

The most significant gap in resource identification appears to lie in the domain of graphic images. It has been suggested that ISAN might be applied to digital photographic works; however, there is no certainty that this proposal will be acceptable to the Board of ISAN-IA (and it still leaves a substantial number of classes of graphics without a standard identification mechanism).

5.3 RECORDING "CLIP" IDENTIFIER

The requirement to identify part of a recording was discussed. Currently the only standard mechanism is the ISRC (where an extract of a recording identified with an ISRC must be identified with another ISRC, with no standard mechanism for linking part-to-whole). One possibility which might be explored is a mechanism similar to that used for "versioning" the ISAN (the V-ISAN).

5.4 USAGE TERM SET [OR LICENCE] IDENTIFIER

The requirement for the unambiguous identification of licences (or of usage terms sets where these are not based on licences) has been explicitly recognised in the music industry through the introduction of the Musical Works Licence Identifier (MWLI). However it is clear that the requirement goes beyond the specific requirements of licensing musical works.

6 Creating and maintaining links

6.1 ESTABLISHING IDENTIFIER LINKS

Creating a link between two referents is likely to require a human decision, based on the available data.

Wherever at least one abstraction is involved (say, linking an ISBN to an ISTC, or an ISRC to an ISWC), a human decision will be required at some stage; machines can not directly recognise abstractions. However, the automated establishment of links between digital fixations is achievable, and other links can be derived automatically from this. For example:

if

V-ISAN "1234" contains ISRC "9876",

and

ISRC "9876" contains ISWC "5678",

then it can be inferred that

V-ISAN “1234” contains ISWC “5678”.

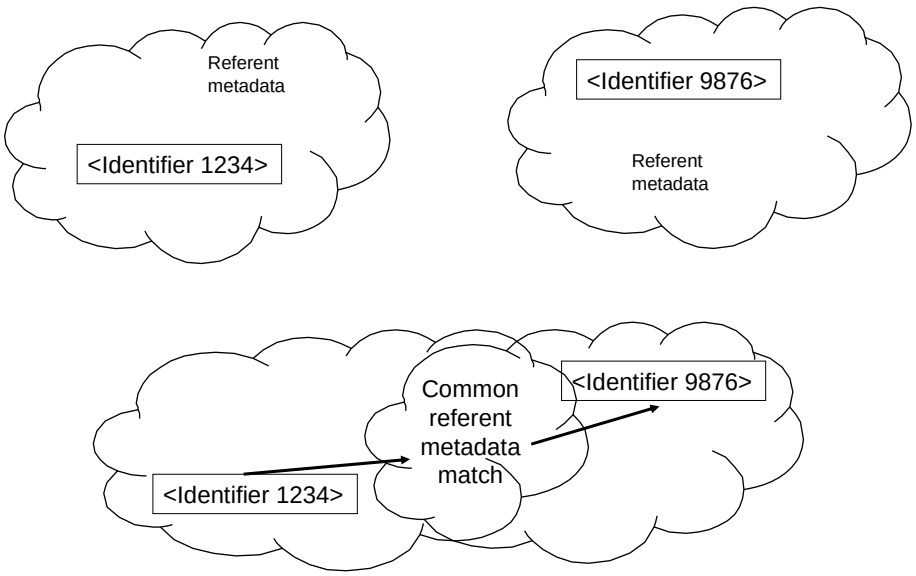
Links are typically made by metadata matching, although the extent to which this can be automated clearly depends on the quality, consistency and comprehensiveness of the available metadata.

The issue has several other facets:

- Is the link created persistently or transiently for a specific transaction (and then the linking repeated when required again)?
- Who makes the claim of the veracity of the link?
- Once the link has been made, to whom is the link data made available?

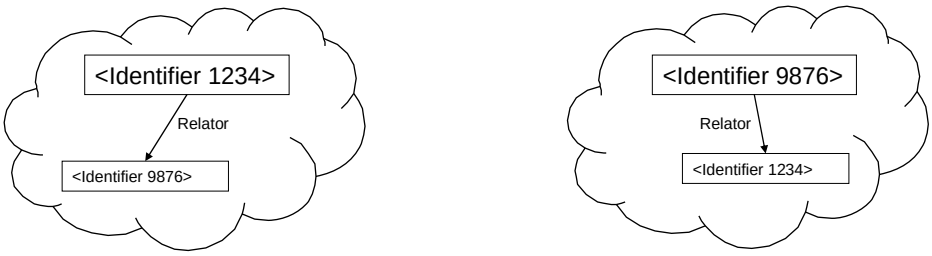
6.2 PERSISTENT OR TRANSIENT (REPETITIVE) LINKING

A link between two referents is primarily created by matching metadata about the referents:



This match may have to be made repeatedly if no mechanism is available to manage a persistent link.

Alternatively, the link may be stored in either of the two metadata sets, or in both:



This clearly has significant efficiency advantages in comparison with making the same link repeatedly, and allows the autonomy of the two separate metadata sets.

The final alternative is to create a definitive link entity (which might be stored in both metadata sets, or might form a separate metadata set). By creating a typed link entity of this kind, the link itself can be given attributes (such as the name of the creator of the link – see Section 6.3)

6.3 WHO MAKES THE CLAIM OF THE VERACITY OF THE LINK

We should return briefly here to the definition of metadata which we adopted in Section 2:

> **An item of metadata** *is a relationship which somebody claims to exist between two referents.*

Here, we have perhaps the perfect example to illustrate the importance of unambiguously identifying the "somebody" who makes the claim. *Anyone* can make a claim, but the *authority* of the claim for those who must depend on it is paramount to any user.

This is at least in part a specialised use case for the adoption of unique party identifiers (although it may also imply mechanisms for authenticating those identities).

The veracity of claims of linkage is particularly important in the management of rights, where significant amounts of money may be distributed.

6.4 ACCESS TO LINK DATA

Many organisations currently create and manage link data of the kind we are considering here within their own systems, and either maintain those links in confidence or share them with a limited range of business partners. Many of the use cases imply a much wider availability of this type of data, and the implications need to be considered carefully. Combining the facets of veracity and access suggests a requirement for a certification or authentication mechanism for identifier links themselves.

7 Possible actions on the part of TC46 SC9

Several possible activities might be undertaken by TC46 SC9 in the light of the results of the meeting described in this document. These are all subject to verification with users to ensure that user requirements are properly identified. The activities might include:

1. The exploration of requirements for additional identifiers (see Section 5)
2. The exploration of requirements for typed links between identifiers (relators) – a possible mechanism to support type linking already exists within ISO/IEC 21000-6 where similar work has been undertaken to support the MPEG-21[4] Digital Item Identifier (DII).[5]

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[4] For a recent easy-to-read description of the (very considerable) scope of MPEG-21, see Drury & Burnett "MPEG-21 in a Backpack Journalism Scenario" *IEEE Multimedia* October – December 2005

[5] An amendment is being developed for presentation at the MPEG-21 meeting in Bangkok in January 2006 which will extent the scope of ISO/IEC 21000-3 (DII) to cover the expression of "the relationship between identifiers" using "Relators as defined in ISO/IEC 21000-6" (the MPEG-21 Rights Data Dictionary). The relationship types which are expected to be made available (through amendment to ISO/IEC 21000-6) are: IsManifestIn; IsManifestationOf; IsAbstractionOf; IsAdaptationOf; IsComponentOf; IsPartOf; IsTransformationOf;

One set of relators which would be of particular value is likely to be role codes (relating interested party identifiers with resource identifiers).[6]

3. The development of a taxonomically-structured glossary to support the development of all TC46 SC9 standards. A substantial non-prescriptive glossary already exists,[7] which draws on definitions within existing ISO standards and would provide an extremely valuable starting point. However, a more rigorously structured approach would provide the opportunity to relate contextual definitions of terms (such as "publisher" or "producer") so that everyone can understand clearly what any term means *in the context of a particular domain*.
4. The extension of the relevant elements of this structured glossary into a "starter set" of reference descriptive metadata which can then be specialised for application to specific identifier standards (as the standards are revised and updated). A starter set of this kind would have the advantage of "designing in" interoperability rather than imposing it as an add-on.
5. The development of a schema to facilitate interoperability between reference descriptive metadata sets (hub and spoke mapping).[8]

None of this will solve the endemic problems of managing identifiers, including poor metadata quality and the inappropriate application of identifiers. As well as working on the technical standards themselves, some thought probably needs to given to best practice issues (including, for examples, business rules about the circumstances in which it may be appropriate to make an authoritative claim of a link between two referents).

Considerable work will remain to be done, even if elements of an interoperability framework are created, to ensure that consensus is built around its application so that it is widely adopted.

IsTranslationOf. The amendments can be expected to become international standards towards the end of 2006.

6 Note that ISO/IEC 21000-6 includes high level "agent" terms which could be specialised for the purpose.

7 http://www.collectionscanada.ca/iso/tc46sc9/standard/glossary.htm

8 The mapping of more comprehensive domain schemas, while desirable, is likely to prove to be a major undertaking, with significant resource implications.

Appendix:
Attendees at the London Workshop 13 December 2005

Patrick Attallah (ISAN-IA: ISAN, V-ISAN)

Ian Baxter (BBC/Siemens: ISAN, V-ISAN)

Brian Green (EDItEUR: TC46 SC9; ISBN)

David Grundy (ALCS: ISTC)

Paul Jessop (IFPI: ISRC)

Rene Lloret (CISAC: ISWC, ISAN, ISTC)

FX Nuttall (CISAC: ISWC, ISAN, ISTC)

Norman Paskin (IDF: DOI)

Julian Sowa (NBD: ISBN, DOI, ISTC)

Niels Rump (Rightscom)

Godfrey Rust (Rightscom)

Mark Bide (Rightscom – workshop facilitator and rapporteur)