DGIWG - 319

DGIWG Standards Document Suite Architecture

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Abstract:	This technical report examines the methodology and findings as a result of the DGIWG document architecture task.
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Executive Summary

In 2018, the DGIWG developed a requirement to understand how the standards that form the DGIWG standards document suite are linked was a missing and essential component. Australia (AUS) volunteered to develop the high-level architecture for DGIWG standards documents and in doing so, considered many of the challenges identified by the Plenary as part of a holistic Quality Assurance (QA) approach. Table 1 below lists the challenges individually and the Annexes within this report that discusses them.

Table 1 DGIWG Opportunities / Challenges

	Opportunity / Challenge	Referring Annex
1.	Requirement for integrated standards / integrated solutions	Annex C
2.	Mitigating conflicts between standards	Annex B,E,F
3.	Promoting understanding of standards	Annex G
4.	Provision of overarching guidance / strategy	Annex A
5.	Requirement for DGIWG architecture documents	Annex G
6.	Identification of components and schedule for development	Annex D

To expose the DGIWG document architecture, AUS refined a technique that data mines each published DGIWG standard and maps the cross-references to other standards. This approach provided insight into the inherent quality control issues wherever alphanumeric nomenclature is utilised. A fluid approach was needed due to the immature and untested method inherent to completing the task, and difficulty in obtaining authoritative lists of documents. Unsuccessful iterations of the technique were built upon, redeployed, and their effectiveness reviewed. AUS used four main steps in the process:

1. Analyse
2. Data mine
3. Normalise / reduce
4. Portrayal of results.

During the analysis phase, AUS quickly realised that a simple string search-and-find approach was not possible due to inconsistencies in the presentation of referenced documents. Therefore, search techniques were implemented to capture the presentation variants of a given standard. Search patterns for each Standards Development Organisation (SDO) were designed in response to the observations obtained via a manual analysis phase. Through a modified data mining application, AUS scoured individual DGIWG documents for patterns in the presentation of standards nomenclature and references. AUS also took the opportunity to utilise other features of the data mining software to identify acronyms by pattern, specific keywords and high frequency word usage extracted from a single pass.

Initial efforts to portray the data were deemed inaccurate due to un-treated detections causing multiple instances of what was actually the same standard. A normalisation and reduction process was developed to enable like-for-like comparisons of referenced standards to improve the portrayal of the architecture. AUS then normalised the data mined results; this requirement became apparent because searches allowed for detections of many referencing presentation styles.

Upon completion of the analysis, AUS recommended the DGIWG employ quality control measures to improve the readability and implementability of DGIWG standards. AUS realised that the term ‘architecture’ requires context. For this reason, the term requires consideration of the point of observation. Henceforth, multiple views of the dataset were created in an attempt to anticipate varied expectations of the task.

i. Contributing Participants

Nation	Parent Organisation
AUS	Australian Geospatial-Intelligence Organisation (AGO)
USA	National Geospatial-Intelligence Agency

ii. Document Points of Contact

All questions regarding this document shall be directed to the secretariat@dgiwg.org

iii. Revision History

Date	Edition number	Primary clauses modified	Description
03 April 2019	1.0	Original	First Release
13 June 2019	1.1	Amendments for public release	Revision 1

1. Introduction

1.1 Scope

The understanding of relationships amongst standards in a standards document suite is important when attempting to identify the impact on secondary or related standards when a primary or source standard changes.

The objective of the DGIWG architecture task was to expose the DGIWG standards documents suite architecture in a *retrospective* (e.g. post published) manner. This technical paper documents the approach limitations, methodology and findings and also highlights opportunities for improvement of the DGIWG quality control system.

1.2 Structure

This document presents the methodology and results of the initial study of the DGIWG standards document suite architecture. The document concludes with recommendations and suggested improvements to the DGIWG quality control system.

1.3 Limitations

This report only addresses the DGIWG standards document suite architecture as at December 2018 and does not include analysis results for standards from other SDOs. This document does not provide instructions pertaining to data portrayal or dataset analysis approaches. As a snapshot in time, it may be beneficial to repeat the work once quality control mechanisms are reviewed, and improvements are implemented and mature.

1.4 Intended audience

This report is intended for contributors and editors of DGIWG standards and standardisation documents.

2. Discovering the DGIWG Standards Document Suite Architecture

2.1 Methodology

For efficiency, AUS used a degree of automation for this work. The task utilised an innovative approach; AUS used software previously developed outside Defence that data mines text and adapted it to target standards.

However, difficulty was encountered due to the fluid nature of presenting long and short names of standards within standards documentation across the various SDOs.

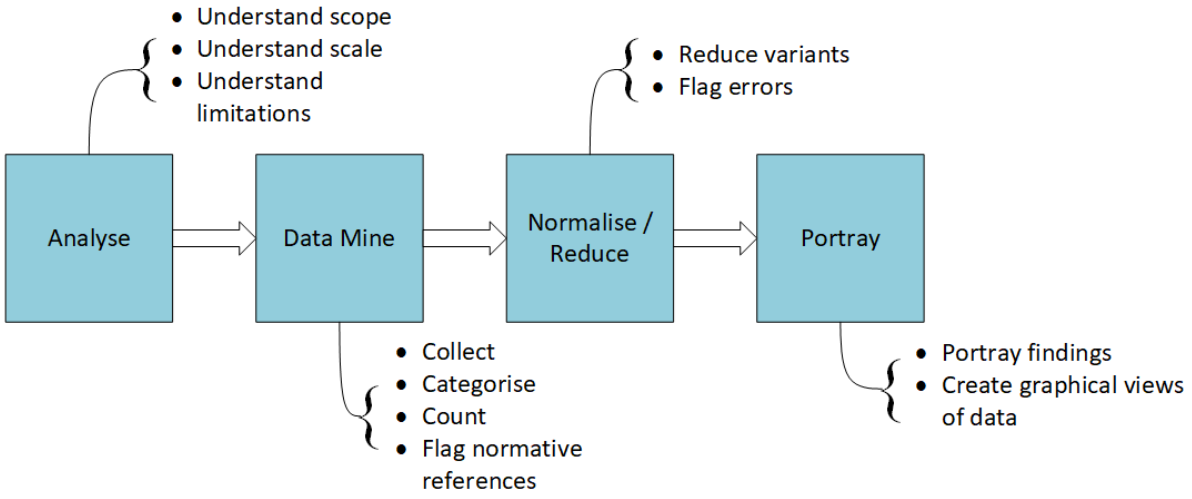
By analysing the DGIWG standards document suite, enterprise information and tacit business intelligence that is invaluable to DGIWG was exposed. Additionally, the approach identified quality control issues that were previously unknown or undiscoverable to DGIWG. Further analysis of the dataset uncovered an acronym list generated by pattern searching rather than human declaration.

DGIWG intends to use this information to establish authoritative standards dictionaries, reference lists and fundamental standards governance and quality control approaches.

AUS determined the four main steps to the task (Figure 1):

1. Analyse
2. Data mine
3. Normalise / reduce
4. Portrayal of results.

Figure 1 Process Overview



Dataset Statistics at a Glance

- 40 documents analysed
- 1061 referrals to standards
- 478 unique standards detected
- 11,632 acronyms detected
- 477,035 data elements.

2.2 Analyse

The task to analyse the DGIWG document architecture was broad in nature. AUS had previously explored the possibility of mapping standards interrelationships and had conducted some preliminary investigation as to the feasibility of data mining standards for the purpose of exposing linkages between documents.

AUS conducted an extensive review of DGIWG documents to gain an understanding of the scale of the task and to set boundaries to prevent scope creep. During the review, each presentation of a standard (e.g. the reference or citation) within a document was recorded and categorised. This information would later shape the search patterns designed to capture identified variants. Care was taken to ensure that search patterns were mutually incompatible. For example, document numbers of standards that are published by the Open Geospatial Consortium (OGC®) and DGIWG are very similar in format and appearance. This resulted in initial data mining effort being contaminated by cross-domain search returns.

Consideration was given to flagging detections bounded by the headings within a standard document. In other words, AUS trialled setting a region of interest that encompassed the normative references section, and therefore any standard detected between the heading “Normative References” and the heading “Terms, definitions, and abbreviations” would be flagged as being a normative reference. However, it was found that some DGIWG normative reference lists contained a narrative of the lifecycle of the standard being analysed, and therefore produced false positive returns.

An unexpected benefit of an un-bordered approach was that obsoleted standards were identified during the normalisation phase. These obsoleted standards may have been otherwise overlooked in future reviews of the subject standard.

2.3 Data Mine

Search pattern designs were the result of manually reviewing one fifth of the published DGIWG document suite. Standards of interest were limited to those belonging to:

- Defence Geospatial Information Working Group (DGIWG)
- Internet Engineering Task Force (IETF)
- International Organization for Standardization (ISO)
- Open Geospatial Consortium (OGC®)
- NATO STANdardization AGreement (STANAG)
- U.S. National Geospatial-Intelligence Agency (NGA).

W3C standards were not considered in the analysis. Within the documents, W3C standards are both presented as an acronym and a title, and are therefore impossible to delineate without an understanding of the context of the usage and declaration.[1]

Search patterns (Figures 2 and 3) inherently supported a degree of 'fuzziness' by allowing titles and references to contain a separator character instead of anticipating a fixed whitespace character. Miss-hits from this approach were limited to the name of technical committees (e.g. TC/211) being detected as a potential ISO standard. These detections were groomed and mitigated during the normalisation process.

Valid detections of standards document references and declarations exceeded 95%. Mutations and editorial malformations such as mid–declaration line breaks or carriage returns impacted upon the ability of the software to detect a standard reference.

A detection could not be classified by context; an appearance would be registered if the detection occurred anywhere within the standard body of text irrespective of the intent of the declaration. Normative references were flagged within the software by hand.

Each declared normative reference within every DGIWG standard was confirmed manually. The reason for this was to ensure accuracy and build confidence in the approach and search patterns.

[1] A new dictionary will need to be designed to detect W3C standards specifically.

Figure 2 DGIWG Standard Search Pattern Design

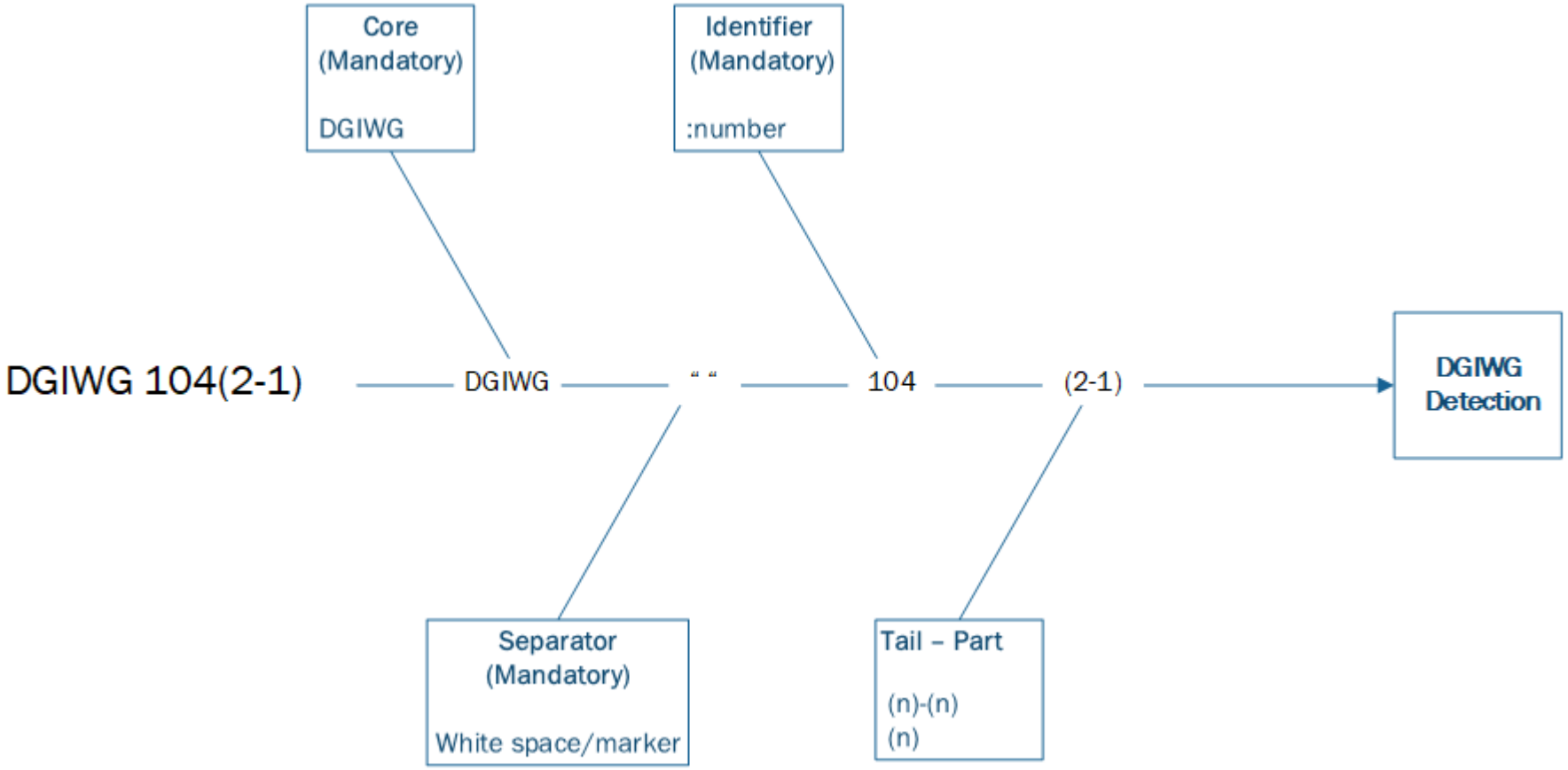
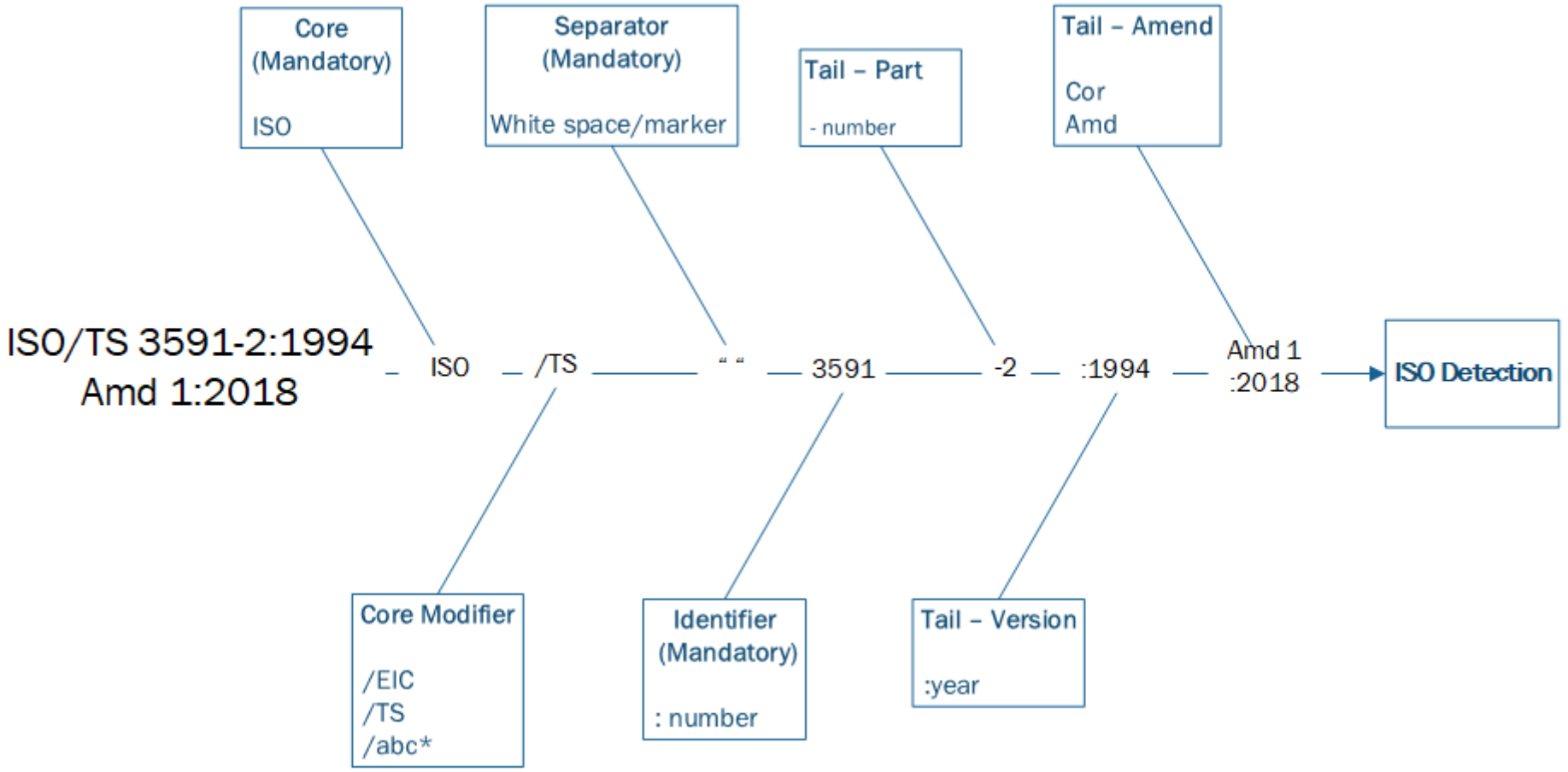


Figure 3 ISO Standard Search Pattern Design



2.4 Normalise / Reduce

Upon completion of the data mining it was realised that a normalisation and reduction treatment was required. This was due to slight variants in presentation resulting in multiple detections of the same standard.

Broadly speaking there were three main components of the Normalise / Reduce phase:

1. Align detection to a predetermined format
2. Correct indisputable errors
3. Remove versioning information.

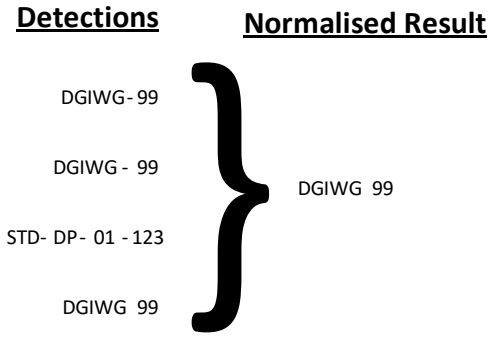
1. Align detection to a predetermined format
To ensure consistent results, AUS implemented a presentation format for the representation of DGIWG standards[2]. This was decided without consultation to streamline the outcome; the selected presentation format is not a prescription of any particular format. The final decision for a standard presentation format for DGIWG standards documents will need to be decided upon at an organisational level and the configuration management documents updated as a result.

2. Correct indisputable errors
Corrections were applied where human induced error was obvious and inarguable; otherwise, they were flagged as a potential quality control error to be investigated by Subject Matter Experts (SMEs).

3. Remove versioning information
Version information was removed from the standards to further enhance the architecture view. By removing the version information multiple versions of a standard were normalised to a single representation (Figure 4). This allowed for a simpler architecture model to be portrayed.

Systematically, each treatment of the dataset was appended rather than overwritten. Normalisation resulted in the reduction of approximately 50% of the node count.
The editor performing the reduction recorded a comment during the normalisation process to highlight abnormalities or issues for review. Abnormality types ranged from nominating incorrect editions of a standard to referencing non-existent standards. The final dataset resided in a MS Excel spreadsheet.

Figure 4 Reduction of Variants



[2] Version information is retained in the dataset and incorporated into the portrayal diagrams.

2.5 Portrayal of Results

AUS investigated different options to portray the dataset, with the ultimate goal being to ensure readers and users could understand the results. yEd Graph Editor was employed as it is free to use and readily available. It can be downloaded from the following link:

yWorks Homepage: https://www.yworks.com/

Node and edge diagrams were produced for each of the DGIWG standards documents (Annex G), and some examples are shown in the following pages. It should be noted that in some cases legibility has been sacrificed in order to portray the result. Readers of this report should be cognisant that the true value of the DGIWG standards document suite architecture resides in the accompanying dataset, not in the diagrams. Diagrams are provided to exemplify complexity of the document architecture and assist understanding.

Each node and edge diagram produced through yEd Graph Editor was the result of an isolated subset of the dataset. Ideally, a database would lend itself to bespoke queries; the creation of a database is out of scope and may be the topic of future discussion.

2.6 Inbound, Outbound and Self-References

The definition of references is relative to the standard being analysed (Figure 5).

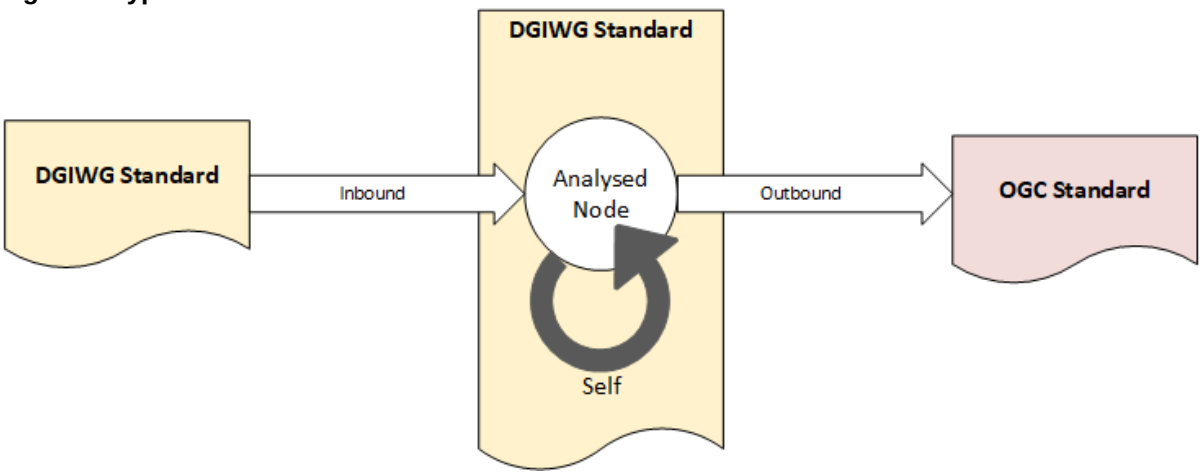
If an identifier of another standard was detected within the text being analysed, the detection is classified as an outbound reference e.g. the reference arrow points away from the body of text.

Conversely, an inbound reference is one from another standard that refers to the standard being analysed.

Finally, should the body of text refer to its own identifier it is classified as a self-reference.

These relationships are not fully visible until the document suite is analysed completely.

Figure 5 Types of References



2.7 Isolated Standard

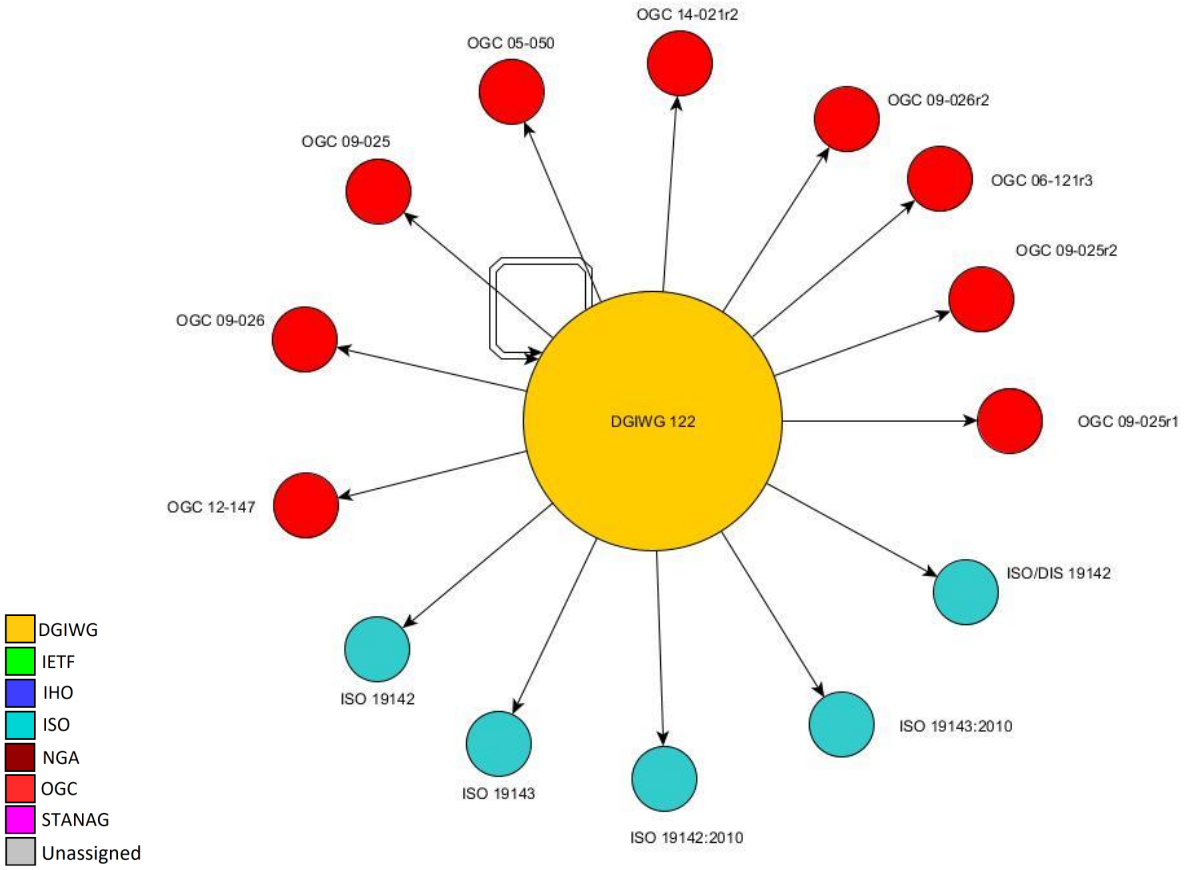
Analysis Profile:

- DGIWG 122 isolated
- Any standard appearing in the body of text

Description

Queries applied to the dataset revealed outbound relationships between the subject DGIWG documents. Figure 6 isolates the outbound connections of DGIWG 122 with the versions intact. Multiple lines represent a count of detections. The size of each node relates to the amount of referrals both inbound (from a referring standard) and outbound (to a referenced standard).

Figure 6 Isolated Standard



2.8 All DGIWG Relationships

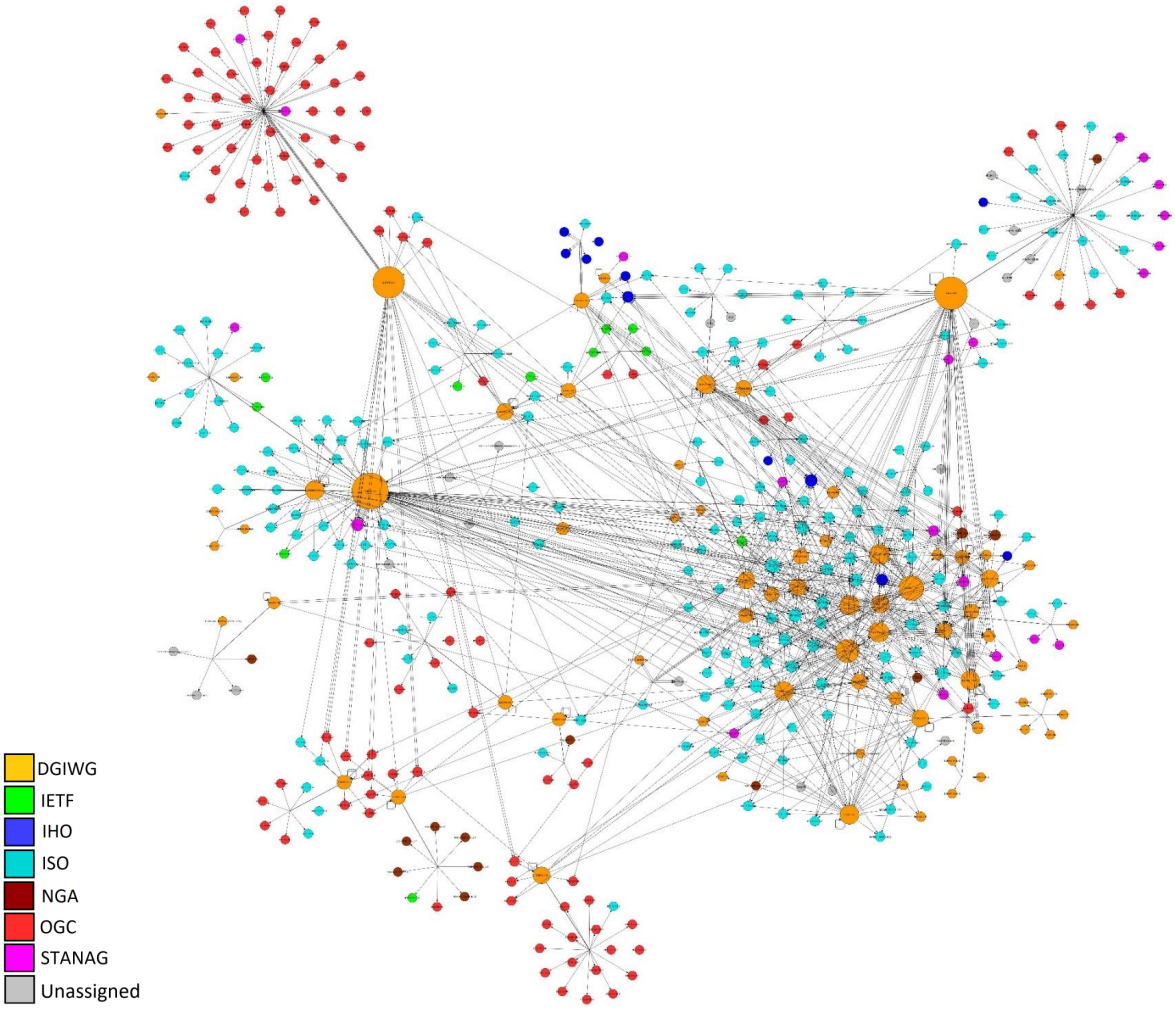
Analysis Profile

- All DGIWG published documents
- Any standard mentioned in the body of text

Description

Figure 7 shows in a single image all connections between the DGIWG standards document suite. Such a portrayal does not yield intelligible value alone, apart from demonstrating the complexity of the DGIWG document 'ecosystem' and its dependency on partner SDOs.

Figure 7 All DGIWG Relationships



2.9 DGIWG Normative References

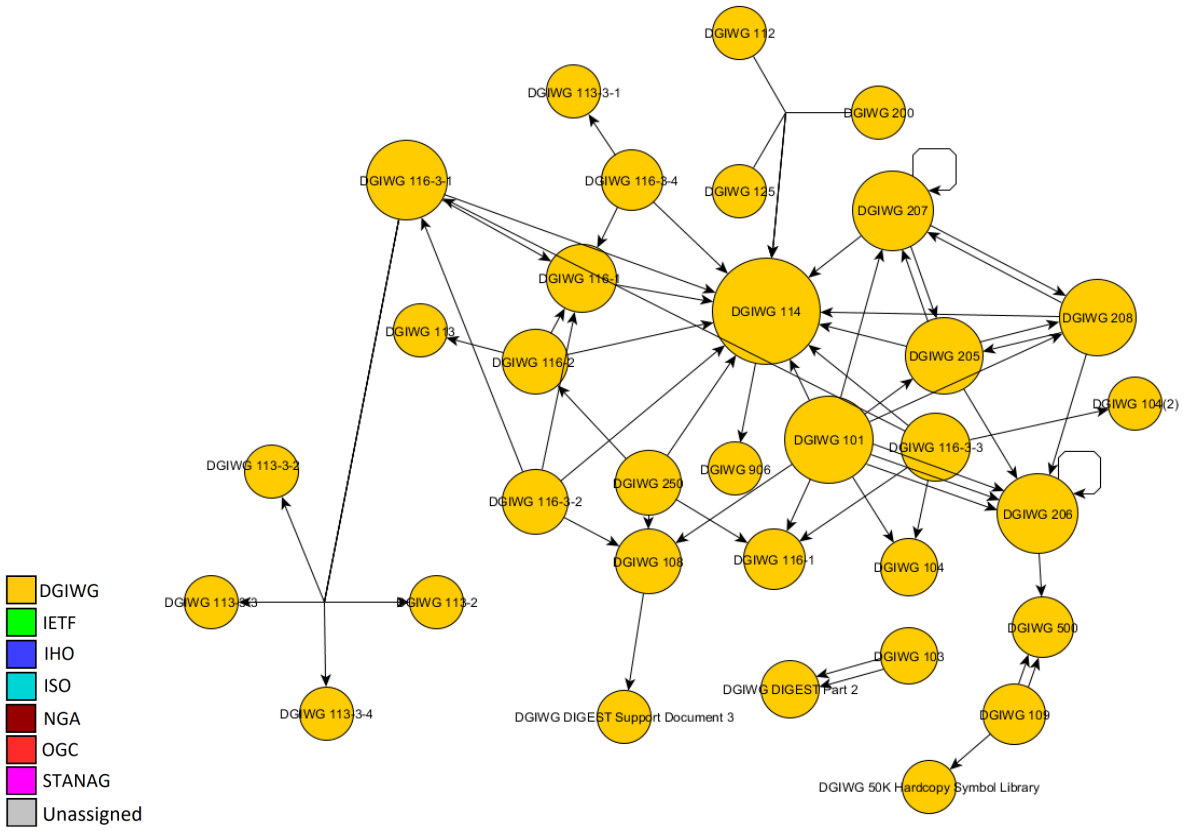
Analysis Profile
- Limited to DGIWG documents
- Limited to DGIWG standards appearing as normative references

Description
Figure 8 portrays the normative references between DGIWG standards in a single diagram.

This analysis highlights some of the fundamental quality control issues discovered whilst conducting the DGIWG architecture task. Self-references are immediately apparent; these are impossible to resolve in a technical sense, but may otherwise be dismissed as an error by an implementer.

Also of note are the nodes manually identified which appear to be obsolete:
1. DGIWG DIGEST Support Document 3
2. DGIWG DIGEST Part 2
3. DGIWG 50K Hardcopy Symbol Library.

Figure 8 DGIWG Normative References



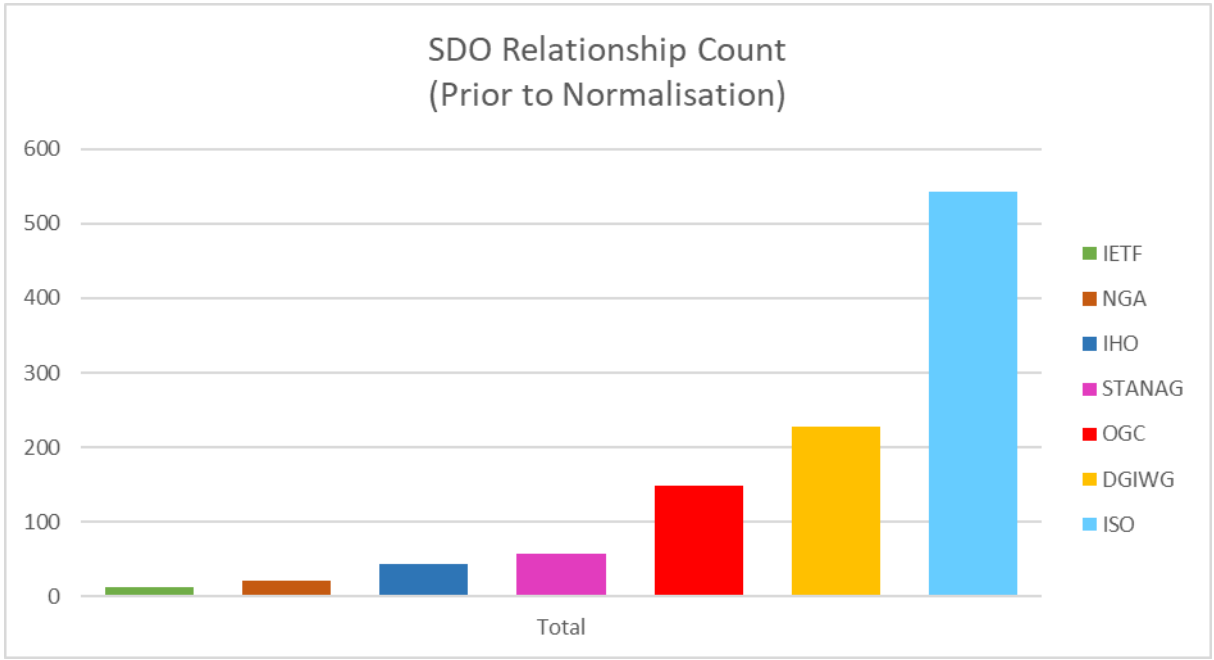
2.10 DGIWG SDO Interrelationships

Analysis Profile
- All DGIWG documents
- Limited to search patterns

Description
Figure 9 represents assigning each detection of a referenced standard to an SDO as searched. It is not specific to the “Normative References” section and represents counts of any detections. The results have not been normalised.

Figure 9 shows that the DGIWG standards document suite contains approximately 550 references to ISO standards and 150 references to OGC® standards.

Figure 9 SDO Interrelationships by Detection



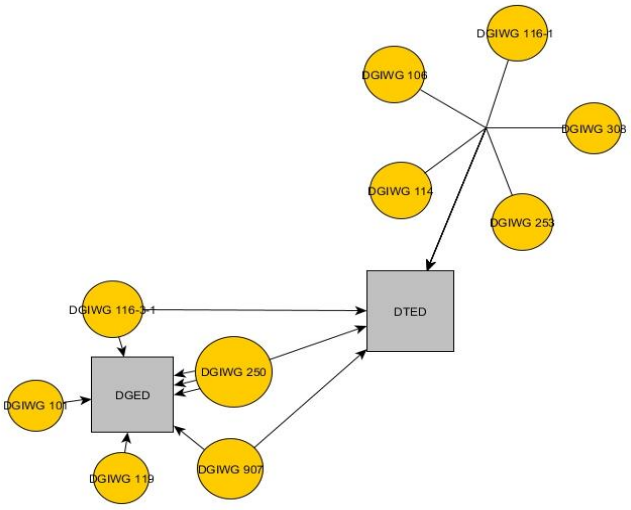
3. Exploring the Dataset Beyond the DGIWG Architecture

The value of the DGIWG standards document suite architecture dataset is not limited to the original intent. AUS has explored other uses for the dataset and interesting insights are obtainable by filtering the dataset to answer specific queries (Table 2). Furthermore, the dataset has not been reviewed for technical validity. Out of scope is possible future work to confirm assumptions that may further refine results.

Table 2 Dataset Exploration

Issue Type	Explanation of Errors
Parallel references	A review was completed of both DGIWG coversheeted[3] standards and referrals to coversheet standards. It appears that both the coversheet standard and the source standard are both referred to simultaneously.
Incorrect references	Obsolete or non-existent documents are being referred to, which is of particular concern when these are declared as a normative reference.
Excessive quantity of normative references	It was observed in some cases that there are excessive normative references, which could make the DGIWG standard impossible to implement.
Acronym as a standard	Without human review, it is near impossible to automatically delineate between the use of “W3C”, “OGC” and “DGIWG” as acronyms versus references. Rigor applied to usage of acronyms may alleviate this issue. Note, this is further discussed in Annex E.
Normative reference lists including self-references	Standards documents that include self-references can cause a ‘loop – back’ resulting in an implementation ‘knot’. Realistically, the reader or implementer would choose to disregard this as an error. Quality control approaches will prevent these in the future.
Understand relationships	Some yEd Graph Editor diagrams have been generated external to the scope of this document that show linkages between concepts or other SDOs. Figure 10 (below) portrays linkages to the acronyms “DTED” and “DGED” and the applicable DGIWG standards. It highlights standards documents that reference the old format (DTED) and the new emerging format (DGED) and highlights future revision work.

Figure 10 Potential Revision Work Required for DTED-DGED Transition



[3] The term ‘coversheet’ refers to the adoption of a standard, in part or in whole, by an organisation that is not the author. The resulting document bears the organisation’s document cover, and the content developed by the original authoring body.

4. DGIWG Standards Development Cycle versus Uptake and Implementation

During completion of this task, AUS detected within the normative references tables of DGIWG standards, instances of standards that were either in development or were anticipated publications; in either case, the documents being referenced were non-existent standards.

Given DGIWG is largely dependent on other SDOs, it is faced with the challenge of developing standards and implementation profiles against source material that it may not be in phase with, particularly from the perspective of a spectrum that follows a 'develop > publish > in service' development timeline. For example, OGC® contemporary standards development is increasingly utilising a rapid development timeline which is being driven by the community.

Figure 11 demonstrates the synchronisation challenges of DGIWG standards development for a fictitious standard "TMB". The main features are numbered as follows:

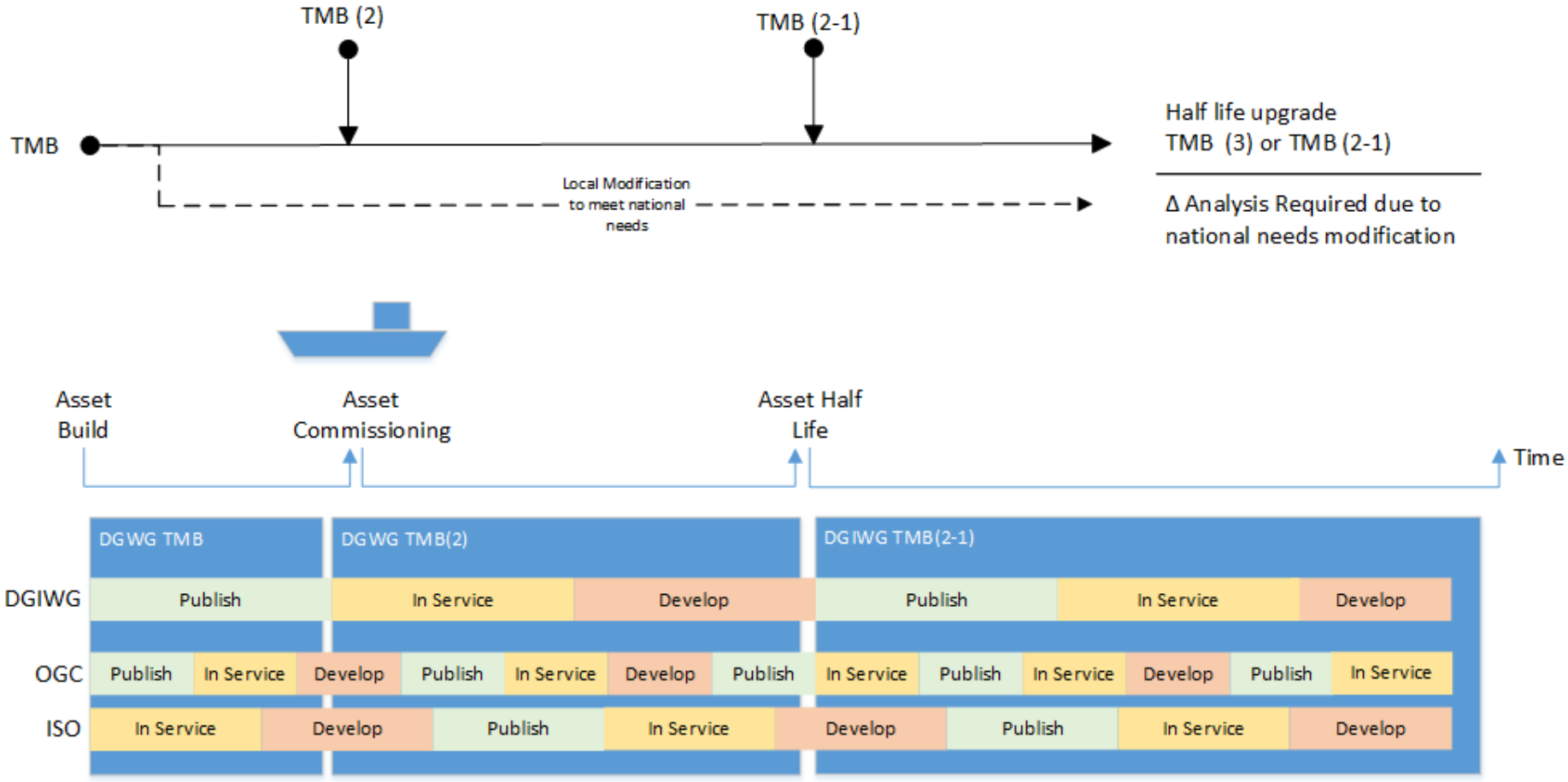
1. SDO development cycles. The actual development cycles of each SDO have not been shown in full complexity; the stages have been simplified to:
   - develop
   - publish
   - in service.
2. A simplified timeline featuring the stages of the implementing assets from build to disposal
3. Data format development branches complicated by national need deviations / amalgamations.

Furthermore, development of DGIWG standards is complicated because national needs may create a branch on the implementation side, which is not measurable and only exists anecdotally or at best within the review comments of proposed standards.

Consider the impact of configuration management when amendments to meet national needs are introduced. Subsequent analysis of the delta between them possibly will result in legacy and remnant requirements.

Additionally, a reactive approach to standards development introduces risk if the development phase of a declared normative reference is out of phase with that of the developing DGIWG standard.

Figure 11 Dependent Lifecycles



5. Recommendations

Completing the DGIWG standards document suite architecture task has led AUS to identify opportunities that DGIWG may consider when implementing quality assurance approaches. AUS has developed a list of recommendations (Table 3 and Annexes) that aim to improve DGIWG standards uptake and implementability. The following list will be subject to the consideration and subsequent prioritisation by DGIWG.

Table 3 AUS Recommendations

	Annex	Recommendation
1.	A	Review current Quality Assurance approaches and develop procedures to measure their effectiveness
2.	B	Commence new work to address referencing errors
3.	B	Define and identify ‘core-standards’ by risk or mathematical threshold
4.	B	Consider reducing the development cycle of those standards considered core
5.	B	Review risks associated with document upkeep latency with a view to prioritise document development
6.	C	Develop a companion / embedded metadata set for DGIWG standards to inform a DGIWG standards database
7.	D	Reduce barriers between academia and implementation
8.	D	Define the term ‘normative reference’
9.	E	Inform a conformance and compliance regime
10.	F	Establish a Quality Assurance (QA) checklist
11.	G	Provide a DGIWG document suite architecture dataset to DGIWG Panel leads
12.	G	DGIWG maintains a ‘DGIWG Standards Document Suite Architecture’ database as the single source of truth

Annex A: Review Current Quality Assurance Approaches and Develop Procedures to Measure Their Effectiveness

Figure 12 lists the two main categories of flags (e.g. potential issues) identified during the completion of the architecture task: (1) version flags include version and series references and (2) titling flags include titles and title references. These flags need to be reviewed and, where necessary, mitigated by Panels in light of intent and context within the documents. This process presents an overhead on Panels and document authors. To alleviate this in the future, AUS recommends that DGIWG develops and implements a QA system that meets the needs of both content creators and implementers. Furthermore, it is recommended that a timeline is established that supports future assessment of success or otherwise of implementation.

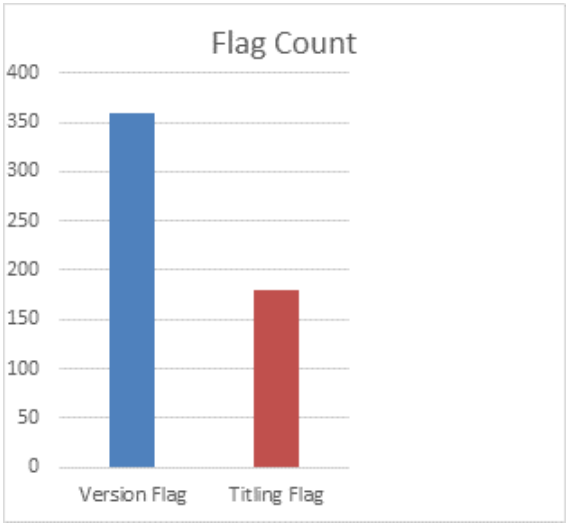
QA systems require a burden of effort. QA systems will need to be functional prior to the establishment of any conformance and compliance regime to prevent unexpected costs and implementation challenges leveraged on DGIWG standards implementers because of extant errors. Additionally, it is unreasonable for DGIWG to measure compliance against a standard that has not had the rigor of QA applied. For this reason, DGIWG may need to refer to a QA system, such as that described in ISO 9001:2015[4]. An added advantage of DGIWG complying with a QA system is that the endorsement could be used as an additional layer of reassurance to DGIWG's customers.

A successful QA system has all relevant members of a group or organisation involved in reviewing the documents that are produced at some point in time. Eventually, the QA checklist requirement becomes foreground knowledge and errors will eventually reduce at the source. The broad steps to implement a QA system are as follows:

1. Author submits the draft document and Quality Control checklist to the reviewer
2. Reviewer records comments in the Quality Control checklist and returns to the Author
3. Author applies corrections to the draft document.

Noting the time constraints on DGIWG contributors, AUS recommends that a dedicated QA reviewer is embedded in each Panel or working group. Any QA approach should aim to decentralise the QA effort; this is to prevent onerous tasking on any single individual and aims to reduce the latency coupled with workload.

Figure 12 DGIWG Flags Categories



[4] ISO 9001:2015 Quality management systems - Requirements

Contemporary Standards Development Approaches

Anecdotal evidence suggests that contemporary standards development occurs in a collaborative manner that is unconstrained and responsive. The problem-solution space is intrinsically coupled, with the accompanying standard being an organic outcome of the work. This leads to shortened development timeframes and demands tightened quality assurance approaches.

For example, OGC® has implemented the following:

1. OGC® Architecture Board - to ensure that a standard is mutually acceptable by measure of compatibility and functionality, and legitimately resides within the OGC® architecture
2. OGC® Naming Authority Policy Documents - to manage the format and repeated usage of the names of OGC® standards
3. OGC® facilitated Hackathons that draw upon the knowledge base to merge the problem-solution space with time limited challenges
4. GitHub - the software development hub being used to collaboratively solve geospatial standardisation issues whilst simultaneously developing the aforementioned standards document in HTML rather than traditional MS Word formats.

These measures are reinforced by policy to protect the integrity of the standards and the OGC® brand.

DGIWG faces different challenges to OGC®; however it is recommended that the DGIWG consider contemporary approaches, such as those endorsed by OGC®, as part of a holistic modernisation activity.

Annex B: Commence New Work Due to Address Referencing Errors

The accuracy of the DGIWG standards document suite architecture is a function of the documentation that shaped it. For this reason, it is impossible to portray a document architecture and a correction list without inaccuracy in either domain. The detection of errors within the DGIWG standards document suite was not within the original scope of the DGIWG architecture task and the method used was not designed to detect these errors, if any. However, during the process of normalising the dataset, issues were identified that warrant further investigation and mitigation by Panels.

Of the 412 normative references used in the DGIWG standards document suite architecture, 126 normative references have an associated extraction comment indicating a possible issue for review and resolution. Most extraction comments elude to version issues (e.g. references to outdated versions). This serves also as an example of the latency that exists between standards original content creators and community adaptations. For example, in the document 'DGIWG 114', ISO 639-2:2016 is listed as a normative reference. However, ISO did not actually release a 2016 version - it remained dated 1998.[5]

Additionally, AUS detected recurring issues within the normative reference lists, including the use of narratives to explain the lifecycle of a standard and footnotes that linked to further narratives (e.g. indications that a standard has been superseded). It is impractical at the community facing level to assume that the reader will have an innate understanding of the lifecycle of standards, and therefore care must be taken to ensure that implementer time is not absorbed with searching obsolete referencing whilst attempting to comply with the instructions laid out in DGIWG standards documents.

AUS recommends that DGIWG:

1. Implements a table structure for normative references lists which enforces alignment to structured, ordered and authoritative narrative information
2. Implements guidelines for the content of normative references
3. Commences new work to review and mitigate referencing errors
4. Defines and identifies 'core-standards' by risk or mathematical threshold
5. Considers reducing the development cycle of those standards considered core
6. Reviews risks associated with document upkeep latency with a view to prioritise document development.

[5] https://www.iso.org/standard/4767.html

Annex C: Development of a Companion / Embedded Metadata Set to Inform a DGIWG Standards Database

Preservation and improvement of the DGIWG standards document suite architecture should be as automated as possible. For this reason, AUS recommends DGIWG establishes a database (using the data provided) which is managed centrally and supports the workflow of standards document development across the DGIWG enterprise.

Should the DGIWG standards not be authored within the database, AUS recommends a companion metadata set should be considered. A metadata companion could be structured (.xml) or unstructured (JSON). Consider the following metadata scenario.

```
<Standard>
    <ID> DGIWG 123 </ID>
    <Architecture>
        <Title> Profile of geospatial xxx</Title>
        <Version>1.0</Version>
        <Author>Bloggs</Author>
        <Date>12Feb2019</Date>
        <Panel>IGD</Panel>
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    </Keywords>
</Standard>
```

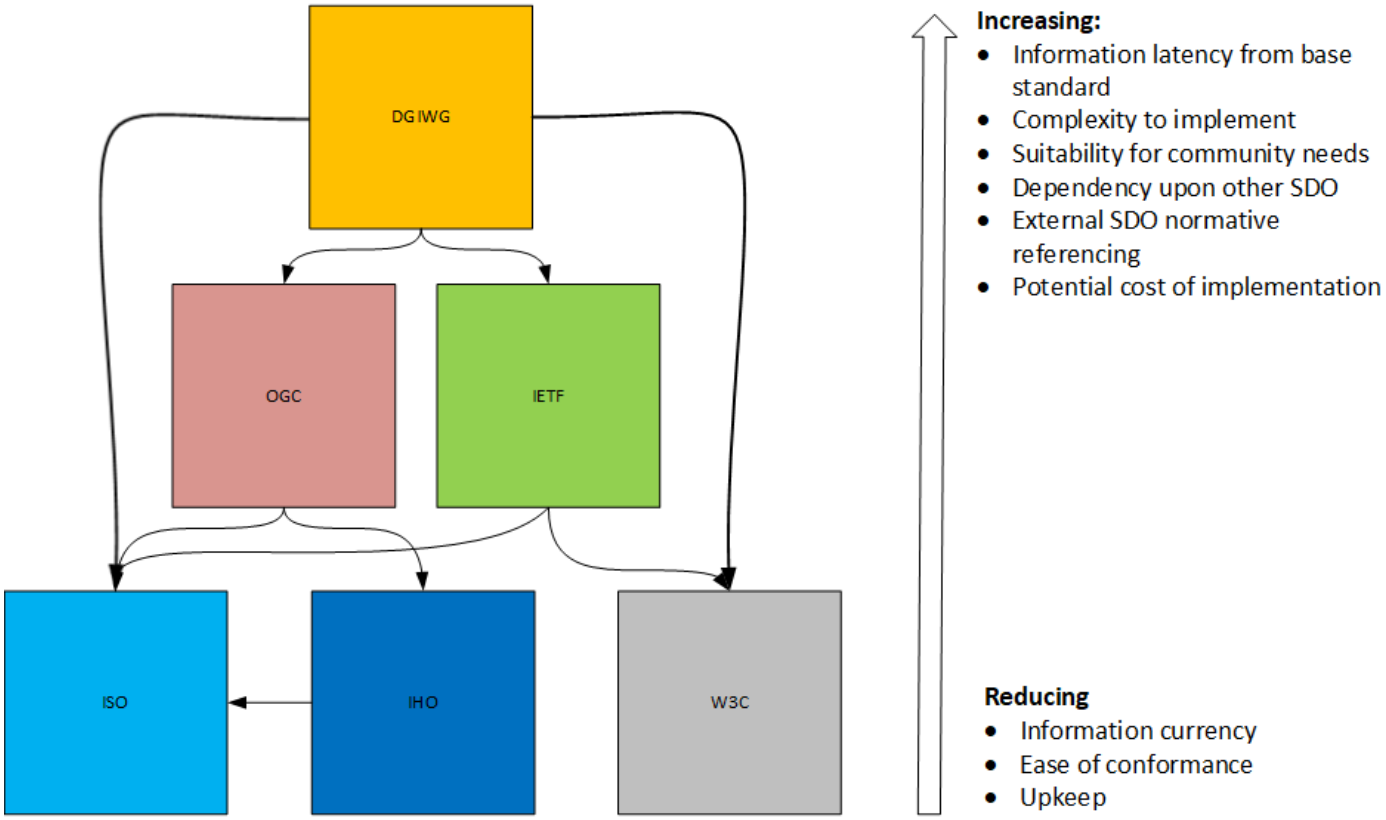
Companion metadata can be created relatively quickly yet it has a dramatic impact upon the ability to support QA. Whilst the example above mimics XML, metadata could realistically be in any format, so long as it is described and version controlled across the DGIWG document suite.

Annex D: Reduce Barriers Between Academia and Implementation

Figure 13 depicts the administrative distance between the creation of standards and their implementation. What is immediately apparent is the tier-like structure of referrals, whereby the DGIWG standard on the top tier will not be referred to by any standard below it. Also noticeable are 'bypass referrals' (e.g. DGIWG to ISO and W3C) that refer to the bottom tier. Should the normative references of 'pay walled standards' be required (e.g. ISO standards that must be purchased), implementation of a DGIWG standard could manifest as an expensive (time and financial) endeavour.

As such, AUS recommends that DGIWG ensures that the term 'normative reference' is reviewed, understood and documented and a holistic approach to standards references be developed that is applied when drafting new standards. Additionally, AUS detected that some normative reference lists within DGIWG standards are excessively long, and may actually prevent implementation. Therefore, AUS recommends that consideration be given to the true purpose of normative reference lists and the value and applicability of the standards they contain.

Figure 13 Referral Patterns



Annex E: Inform a Conformance and Compliance Regime

AUS recommends standards that are produced by DGIWG feature conformance and compliance requirements that should be considered by implementers. Given that DGIWG standards are developed for a specific audience of geospatial systems developers, engagement should be investigated to garnish stakeholder requirements and opportunities to better meet the user group needs. DGIWG conformance and compliance requirements ideally should feature as a discrete section within implementation guidelines or within the standards themselves.

The cost of enforcing conformance and compliance has to be absorbed at some point between standard creation and implementation, by DGIWG or industry respectively; there is no zero-cost option.

Figure 14 demonstrates that vast cost and time savings could potentially be realised if DGIWG endorses extant software libraries (e.g. Python OWSLib and Application Program Interfaces (APIs)) that conform to a minimum quality bench mark to a given DGIWG standard. Such an endorsement would need to be awarded at Panel level.

Figure 14 Endorsement Matrix

	Commercial Library 1	Open Source Library 2	Open Source Application Program Interface(API)
DGIWG	✓	✓	✓
ABCANZ	✗	✓	✗
GVS	✓	✓	With Modification

Standards Engagement Officers[6] (SEO) engage with their respective nations' projects and provide geospatial information advocacy and guidance.

One possible approach to reducing the conformance and compliance effort would be to provide a dedicated user group communications forum to the SEOs. A forum will assist in the uptake and development of the DGIWG standards suite, meanwhile providing an input to compliance and conformance needs in a dynamic and asynchronous manner.

Additionally, this would help to ensure that core needs of DGIWG standards continue to be applicable to the DGIWG user group and amalgamations or modifications avoided for fear of latency induced by local adaptions impacting DGIWG core needs.

[6] Standards Engagement Offices are employed by AUS to advocate, guide and record standards implementation for Defence major projects.

Term Warfare

AUS has coined the phrase ‘term warfare’ to refer to occurrences within the documents of interchanging usage of a standard reference – either as a name of a standard or profile, a data type, acronym or term. For example, consider the following usage:

DGIWG WMTS (the standard / profile)
versus
OGC WMTS (the standard)
versus
WMTS (the acronym / term)

JPEG, GML (the acronym / standard)
versus
DGIWG GMLJP2 (the profile)
versus
JPEG2000 (the acronym / standard)
versus
JPEG 2000 (the acronym / standard)
versus
GMLJP2 (the acronym / standard).

Care must be taken when declaring items that are potentially the subject of term warfare. Table 4 demonstrates a potential mechanism to deconflict the usage of like terms and abbreviations.

Table 4 Clarification of Term Usage

Type	Standard	Acronym	Term
Treatment	Square parenthesis	No markings	Italics
Example	[DGIWG WMTS]	DGIWG WMTS	*DGIWG WMTS*
Example	[OGC WMTS]	OGC WMTS	*OGC WMTS*

The importance of presentation clarity for terms is in part driven by the fear of misinterpretation by non-subject matter experts that implement the standards. Furthermore, the feature sets that are enhanced when profiling a standard could be lost, and potentially cause a risk to the implementer if the specific ‘flavour’ of the standard is not stated or understood. The declaration of flavour will also assist any conformance and compliance regime and ensure that appropriate mechanisms are in place to help shape and support understanding of what compliance looks like.

Annex F: Establish a DGIWG Quality Assurance Checklist

AUS recommends a DGIWG Quality Assurance Checklist is developed to help mitigate the common errors identified whilst undertaking the DGIWG standards document suite architecture task. Table 5 is a draft for DGIWG consideration. Similarly, to support consistency, Table 6 lists the recommended presentation style for referencing SDO standards within DGIWG documents. Any finalised checklist or referencing style will need to be absorbed into any extant DGIWG configuration management documents.

Table 5 Draft Quality Assurance Checklist

QA Type		Example	Comment
Technical			
1.	Ensure that Normative References listed are actually indispensable to the application of the standard		
2.	Ensure that where applicable the most recent version of the standard is referred to	Replace instances of ISO 19999:2000 where ISO 19999:2019 exists	
Text			
3.	Acronyms expanded at first appearance	Defence Geospatial Information Working Group (DGIWG)	
4.	Presentation of links: Link points to correct location *<Plain description of webpage>: xxx.xxx.xx*	DGIWG Homepage: www.dgiwg.org	
5.	Presentation of email: *<Plain description of recipient>: xxx@xxxx.xxx*	Joe Bloggs: Joe.blogs@dgiwg.org	
6.	Standards Development Organisations correctly declared Check that capitalised text reflects that intended	DGIWG vs DGWIG	

QA Type		Example	Comment
7.	Normative References checked for currency. Links provided as applicable <*Standard Development Organisation*>, <*Registration Number and Version*>, <*Description*>, <*Link*>	DGIWG, DGIWG 124, Defence Profile of OGC® Web Map Tile Service,1.0, https://portal.dgiwg.org/files/?artifact_id=68271&format=pdf	
8.	Language – English (UK)	Defense (US) vs Defence (UK)	
Images			
9.	Image origin correctly attributed	(Source: Defence Media) (Source: Supplied - AHO)	
10.	300dpi or better		

Table 6 Presentation Formats for Standards Title References

Referenced Documents Specimen		
Standards Development Organisation (SDO)	**Format Variants**	**Example**
DGIWG	DGIWG“ - “Identifier Part Version	DGIWG - 123-1
OGC	OGC Identifier “r” Version	OGC 123r45
ISO	ISO(“/”Cosponsor or Technical Specification) Identifier “-“Part “:” Version	ISO/TS 19115-3:2005
IHO	S-Identifier “Ed” Version	S-57 Ed 109.5

Annex G: Provide a DGIWG Standards Document Suite Architecture Dataset to DGIWG Panel Leads

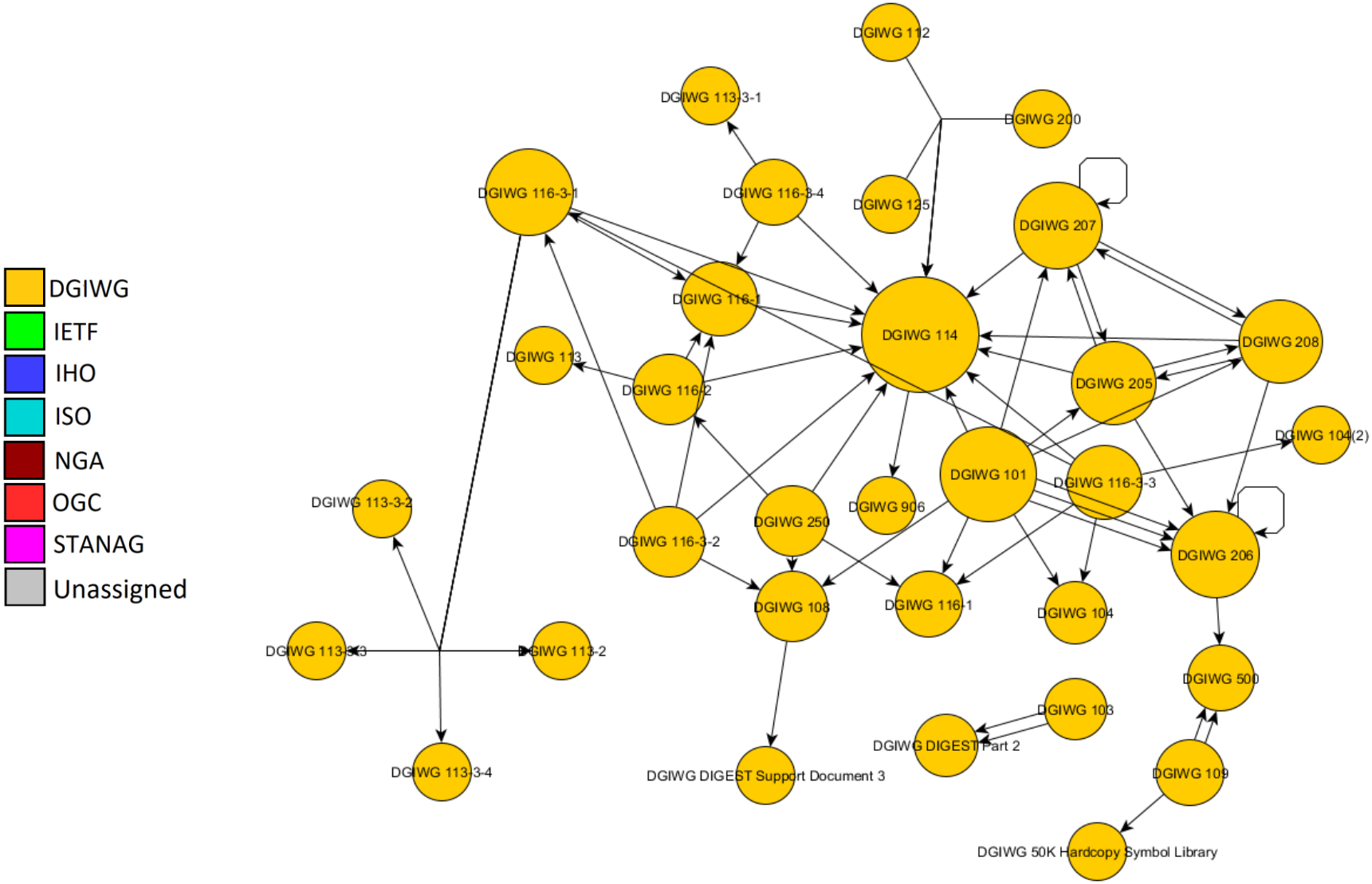
Note: This annex is contained within the delivered dataset and is exclusive to DGIWG.

Node and Edge Diagrams

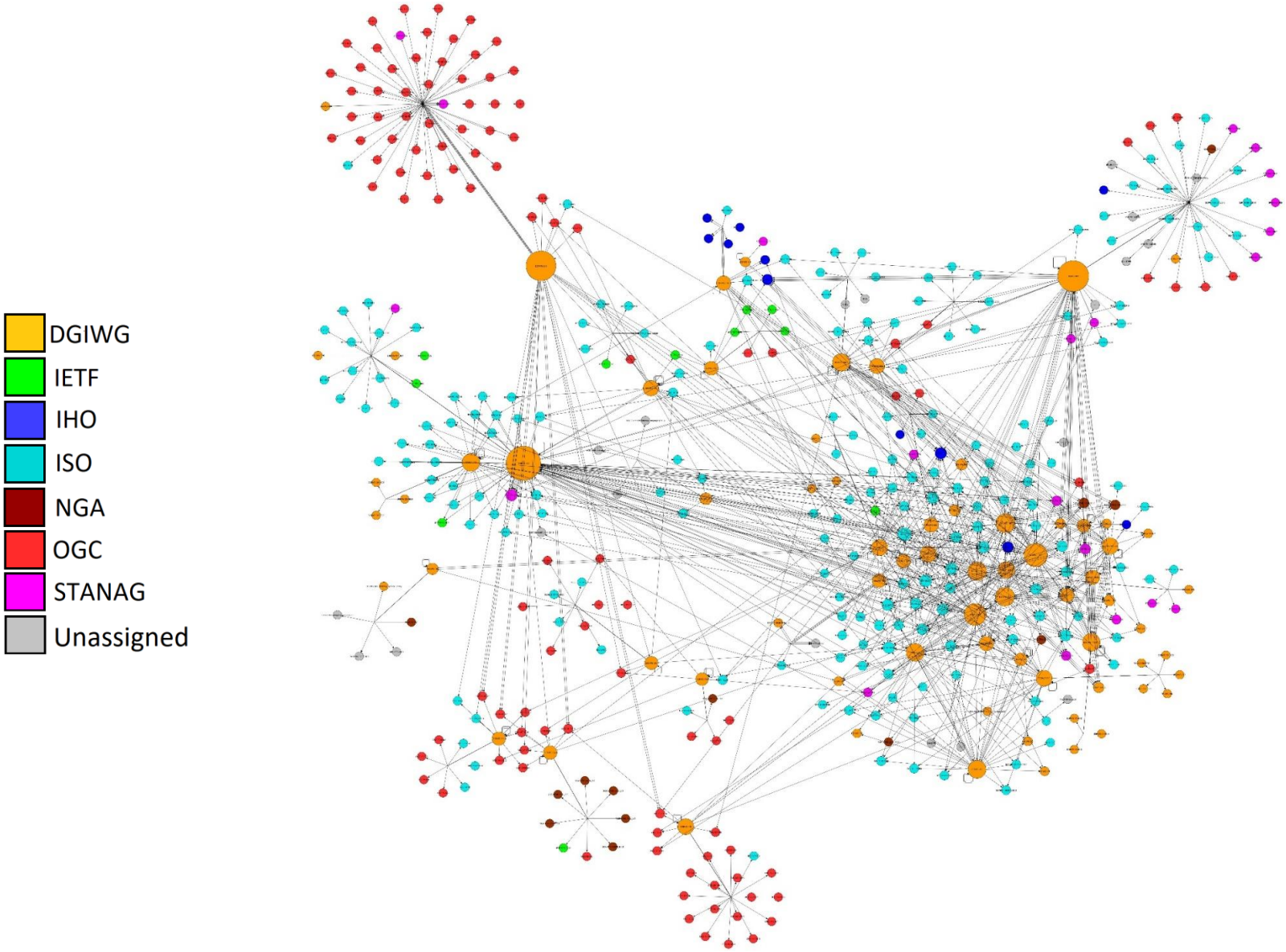
The node and edge diagrams for the documents within the DGIWG Standards document suite are depicted on the following pages.

DGIWG First Order Architecture

Interconnection of DGIWG to DGIWG normative references

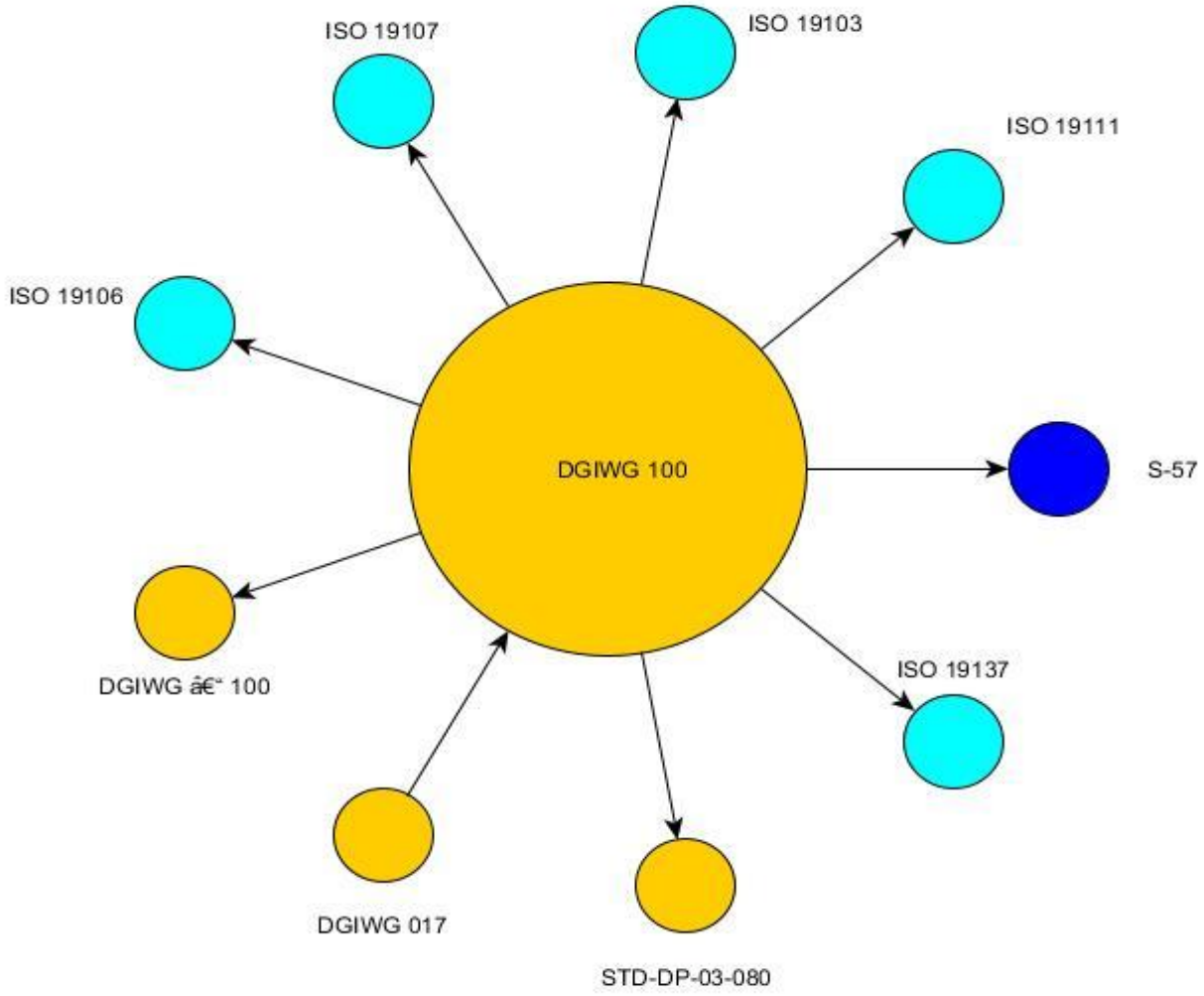


All DGIWG Relationships



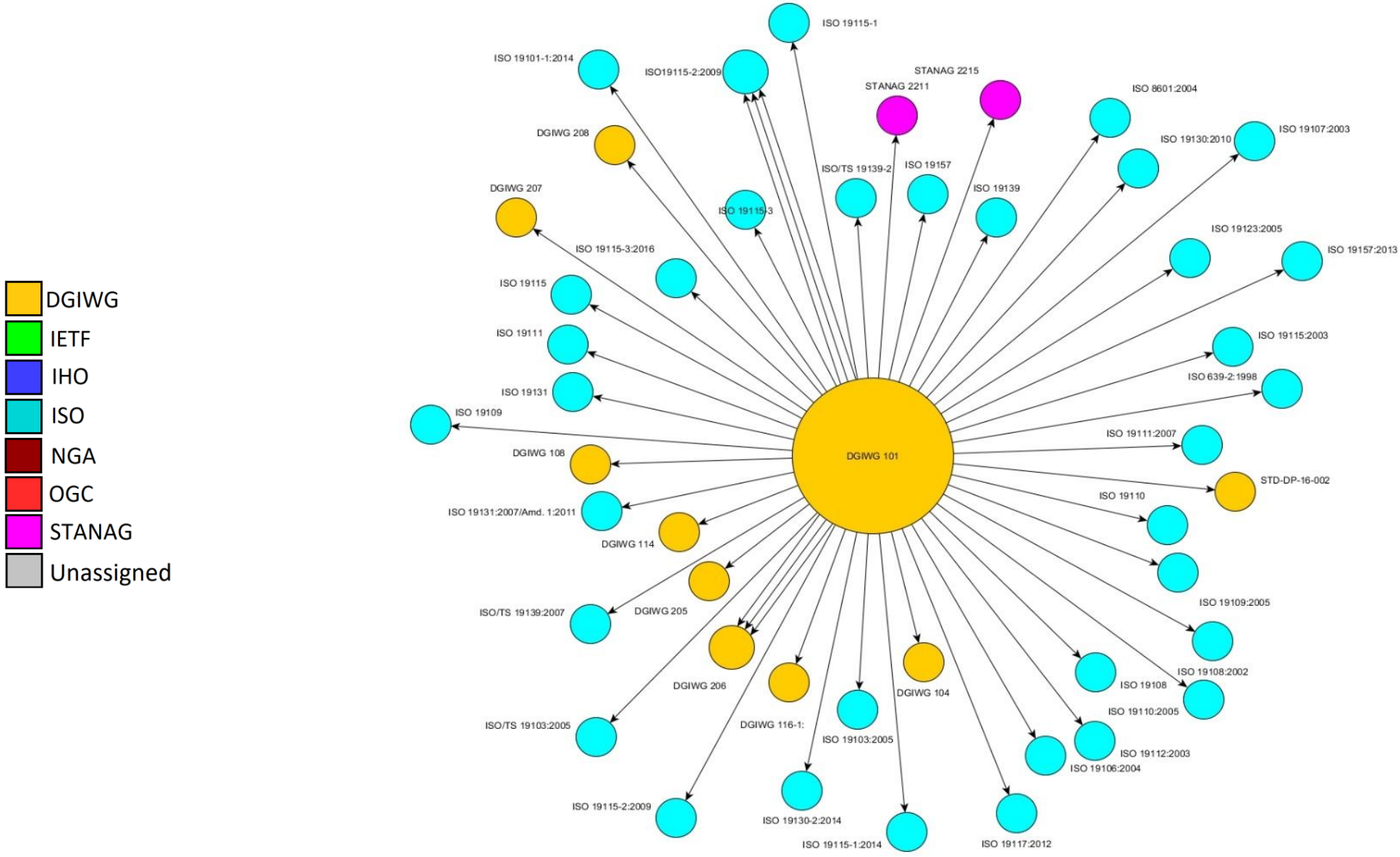
DGIWG 100

DGIWG 2D Spatial Schema Profile



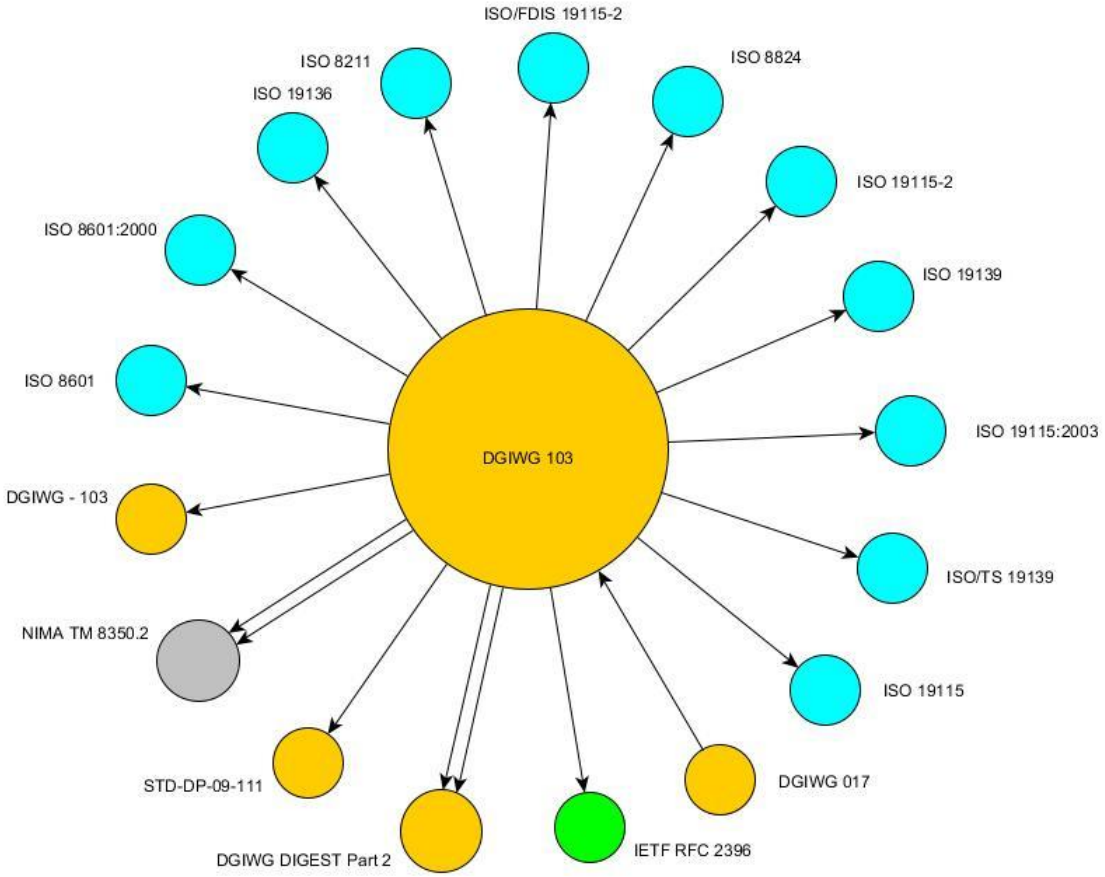
DGIWG 101

Profile of ISO 19131 - Geographic Information - Data Product Specification



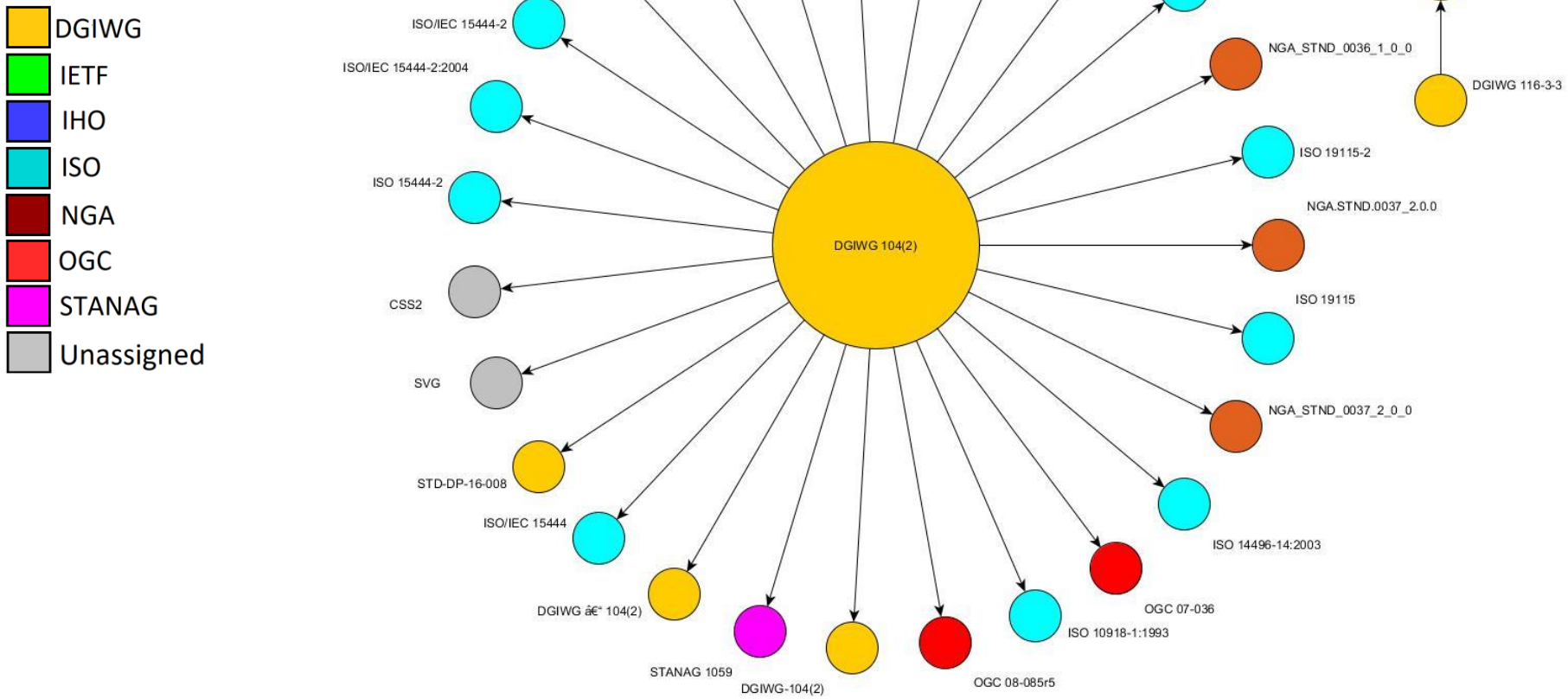
DGIWG 103

Digital Geographic Information Exchange Standard (DIGEST) Metadata Profile of ISO 19115 and ISO 19139



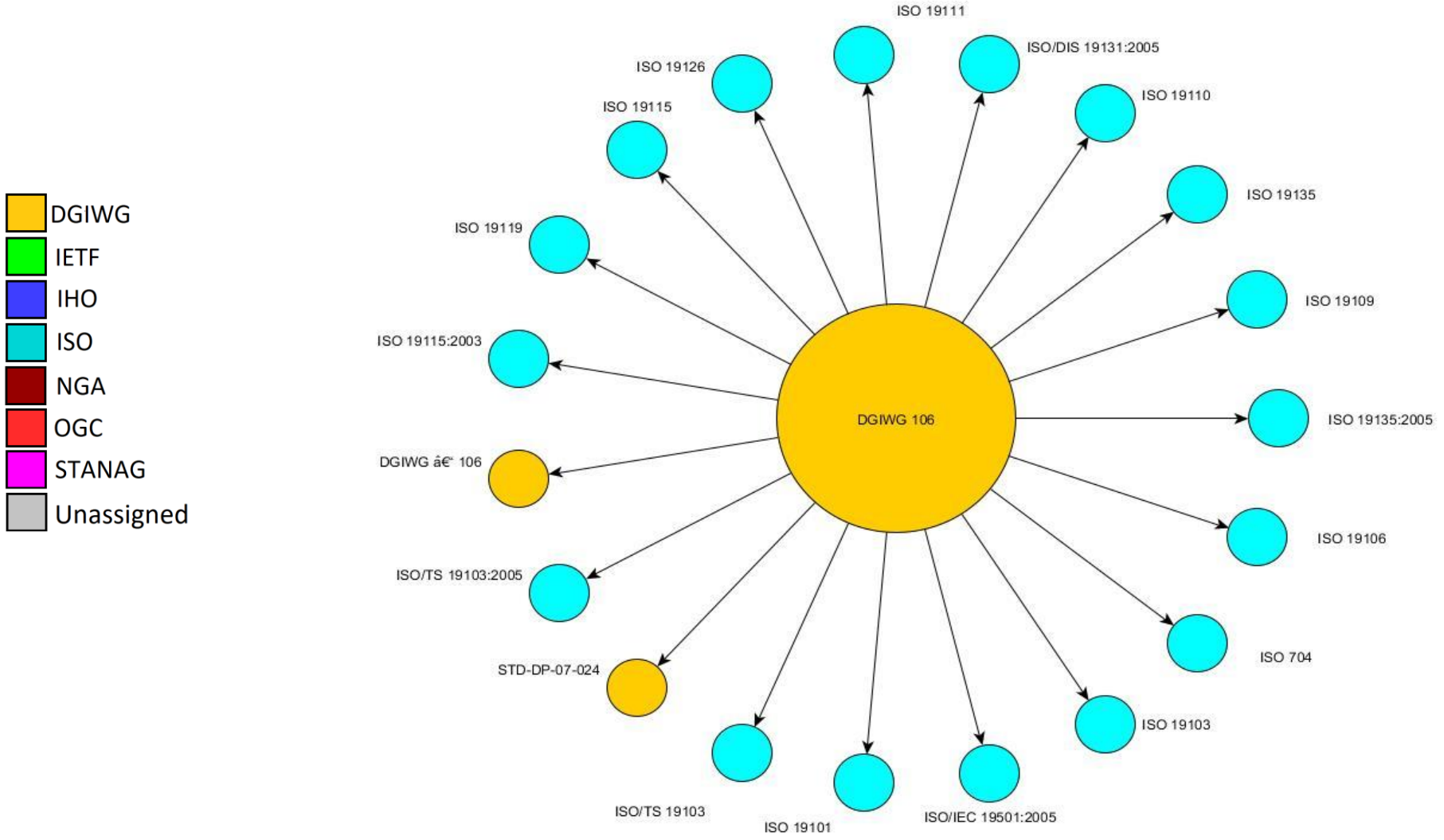
DGIWG 104 and 104(2)

DGIWG Profile of JPEG2000 for Georeferenced Imagery



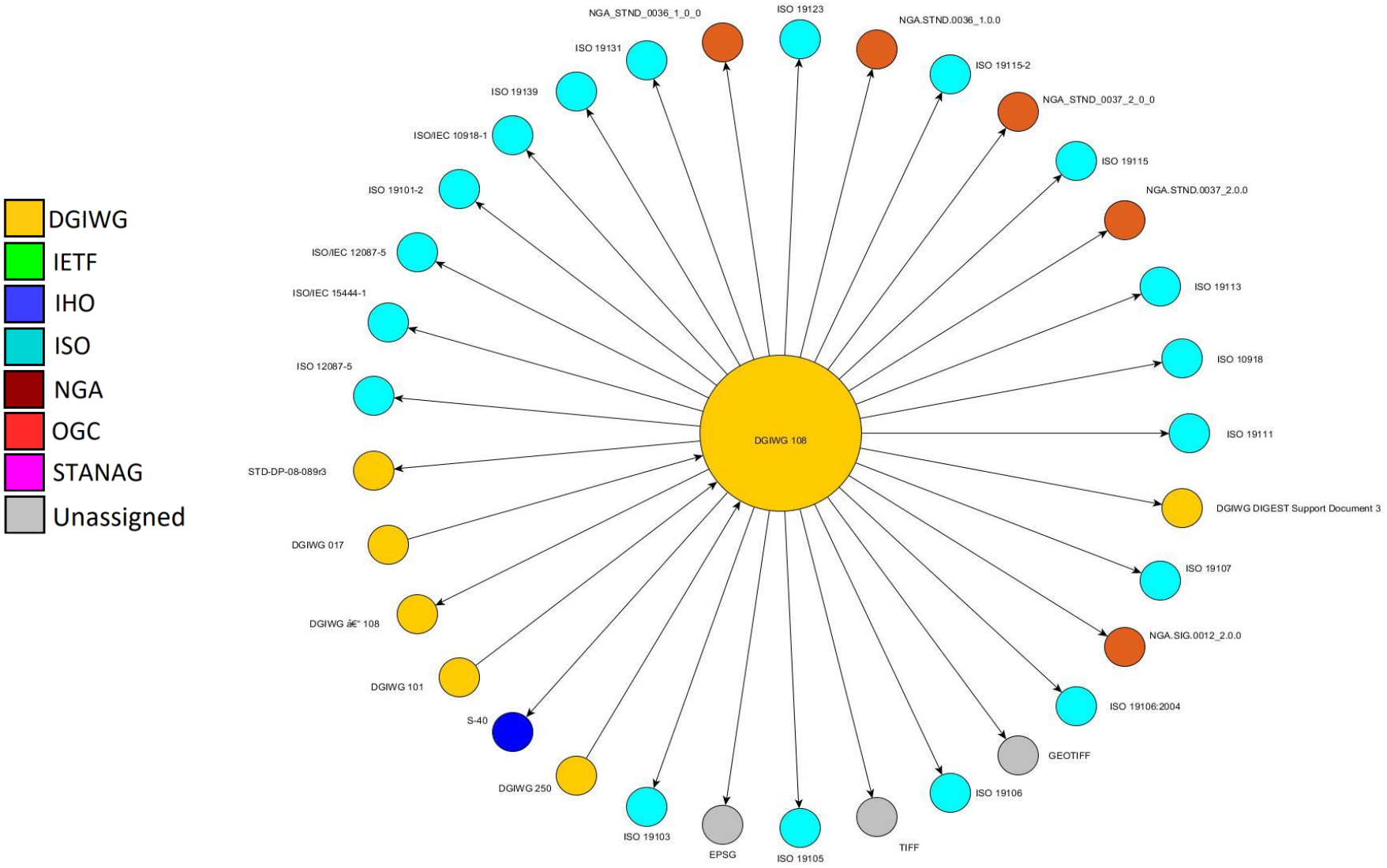
DGIWG 106

Technical Specification for the DGIWG Terminology Register



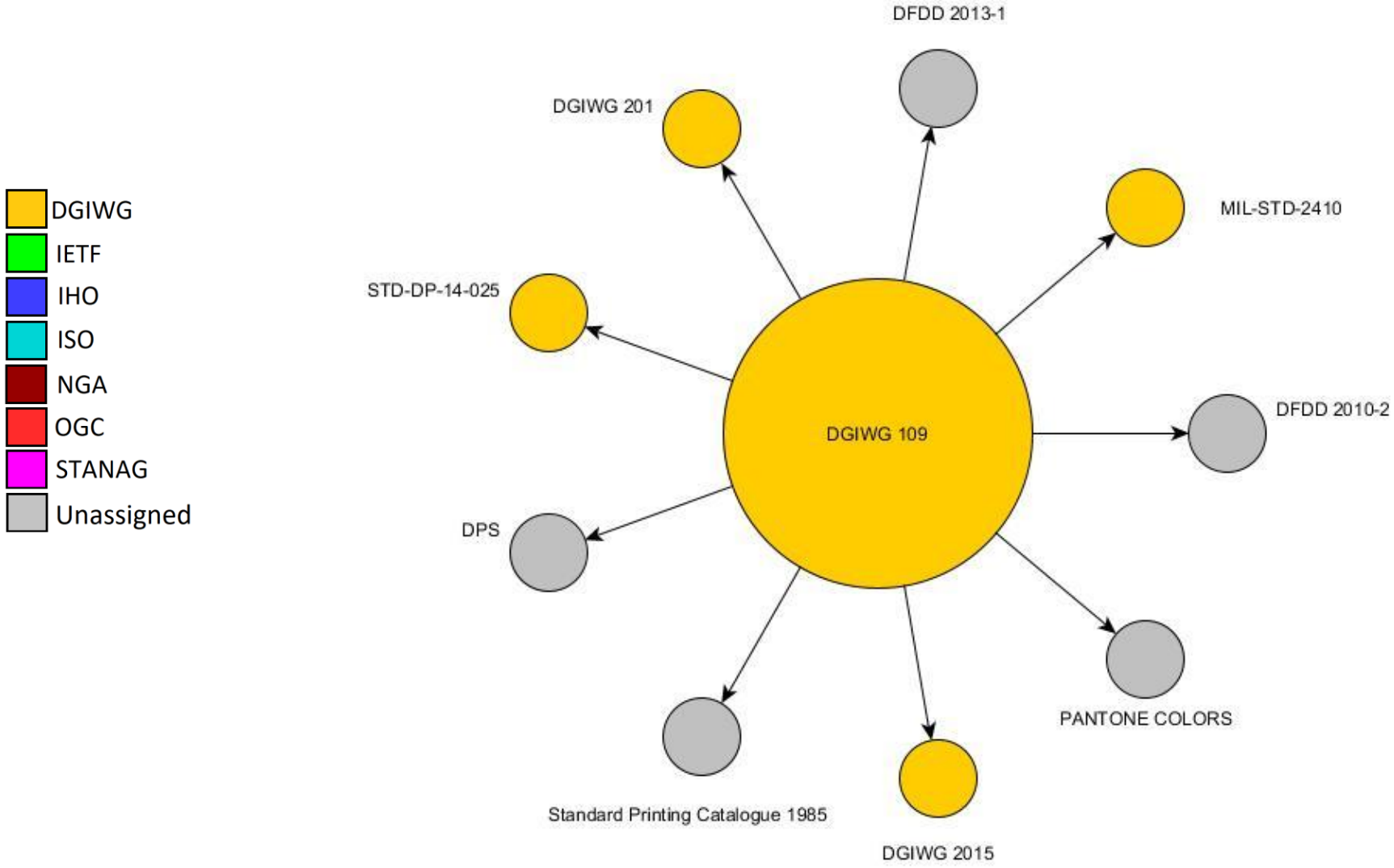
DGIWG 108

GeoTIFF Profile for Georeferenced Imagery



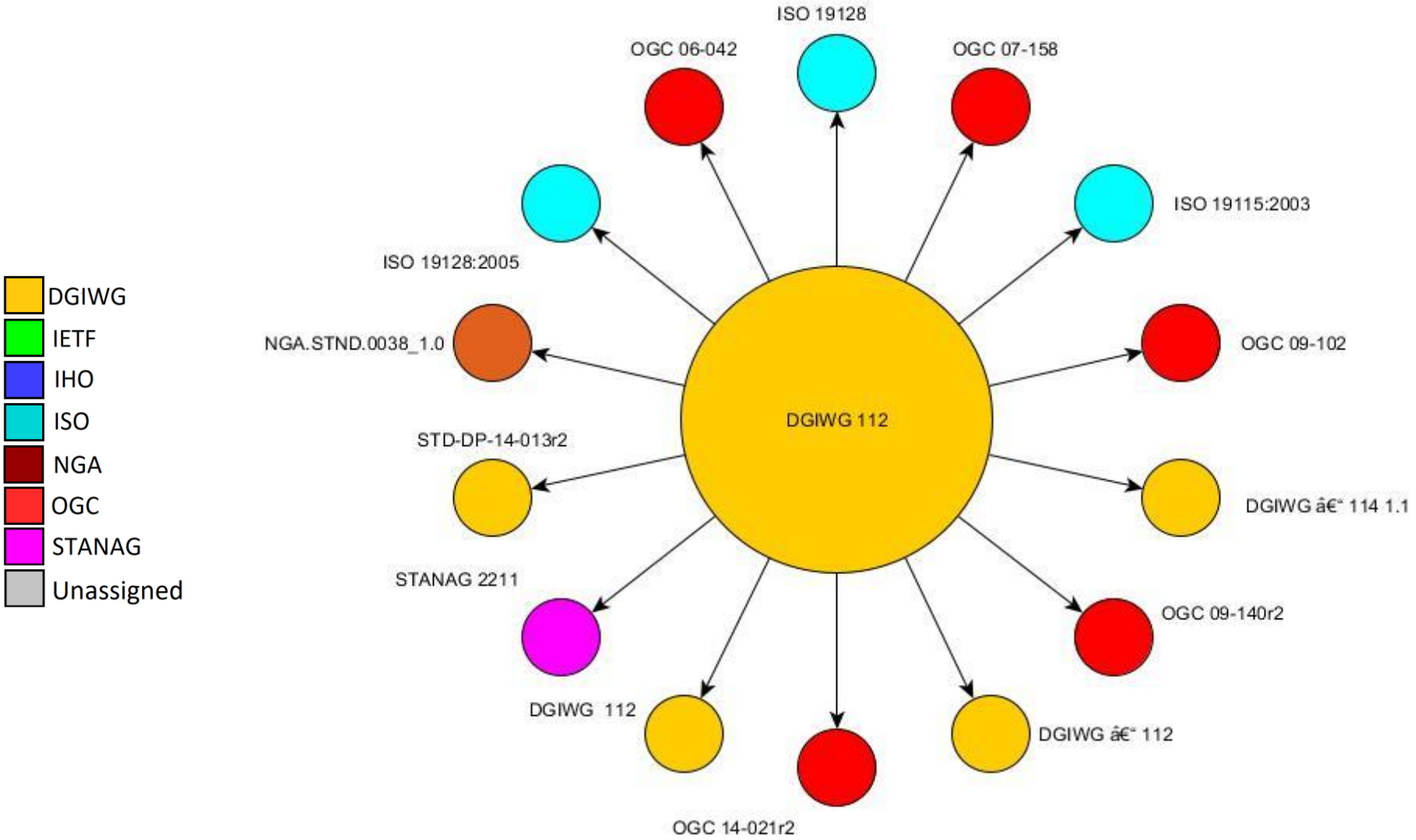
DGIWG 109

Portrayal Standard for Multinational Geospatial Co-production Program (MGCP) Data



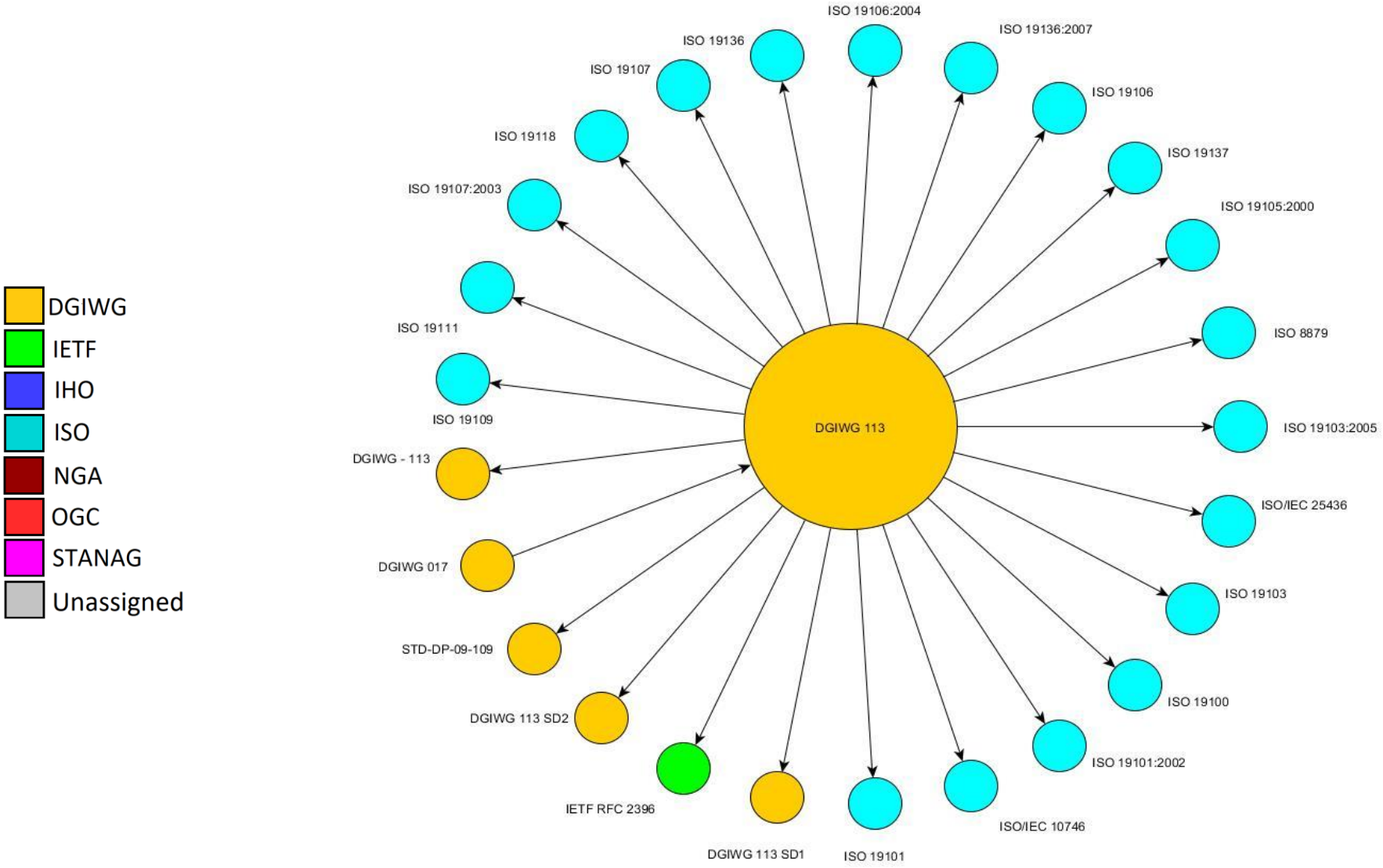
DGIWG 112

Defence Profile of OGC® Web Map Service 1.3 Revision



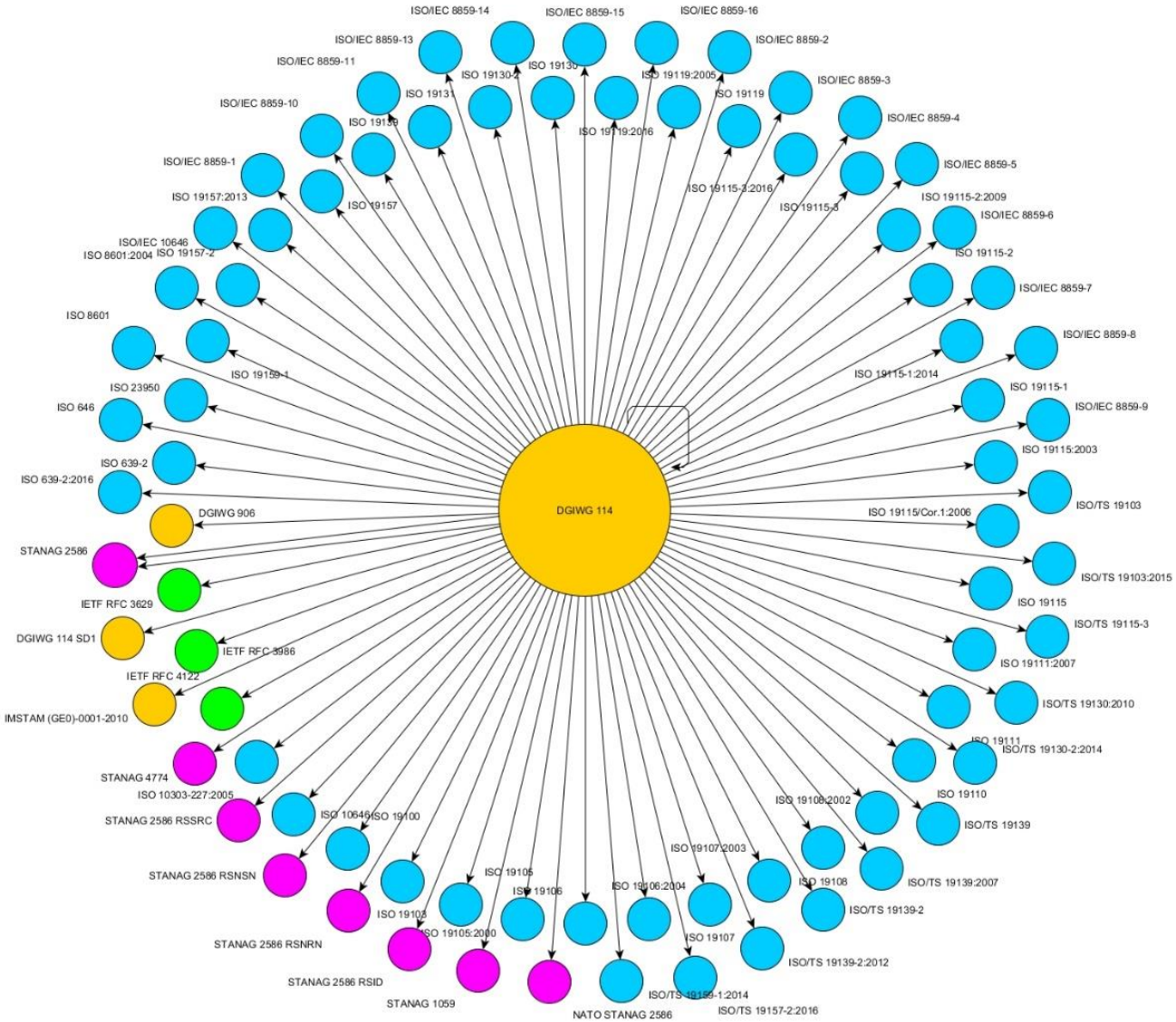
DGIWG 113

DGIWG Profiles of ISO 19107 and GML Realisation



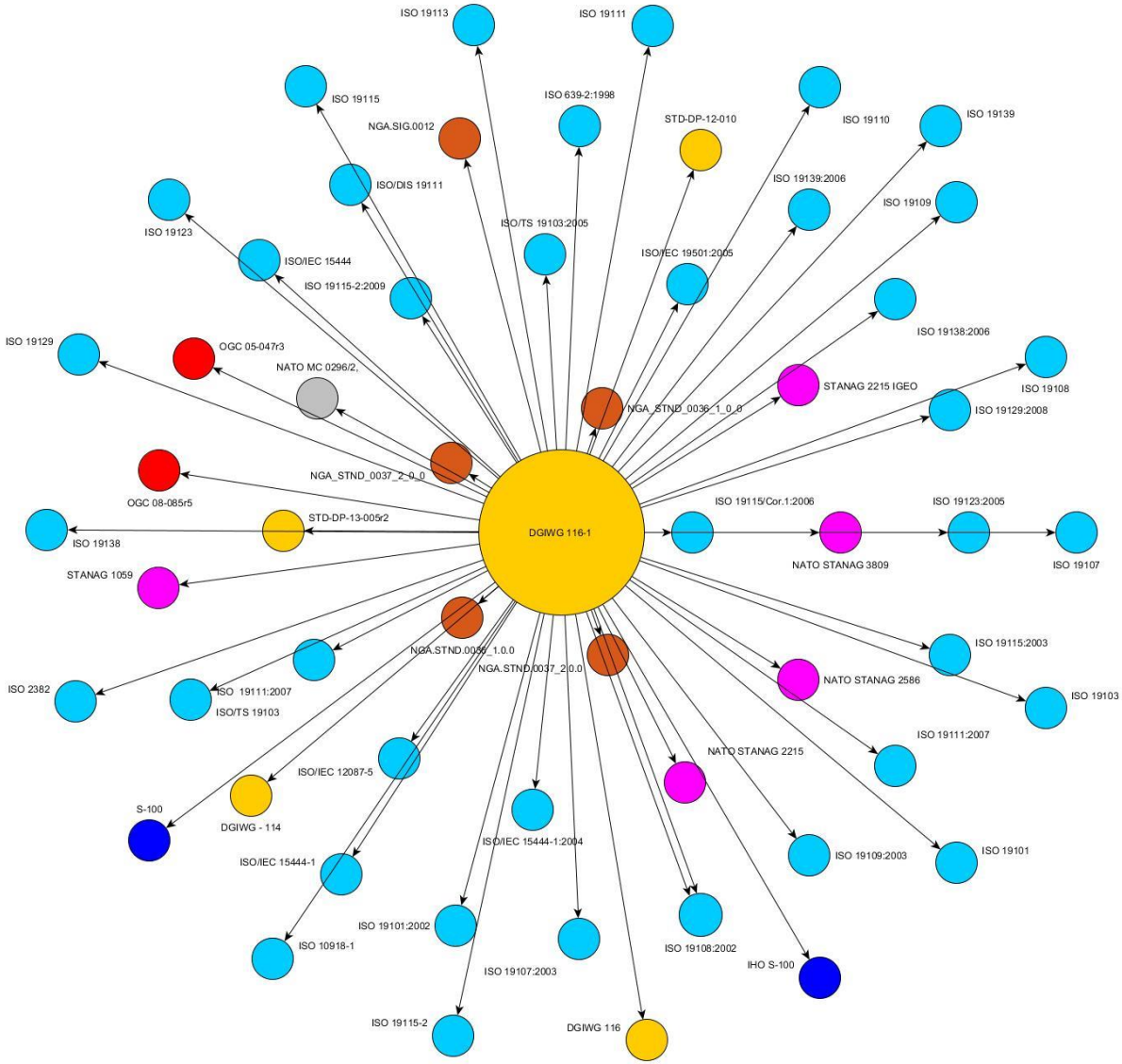
DGIWG 114

DGIWG Metadata Foundation



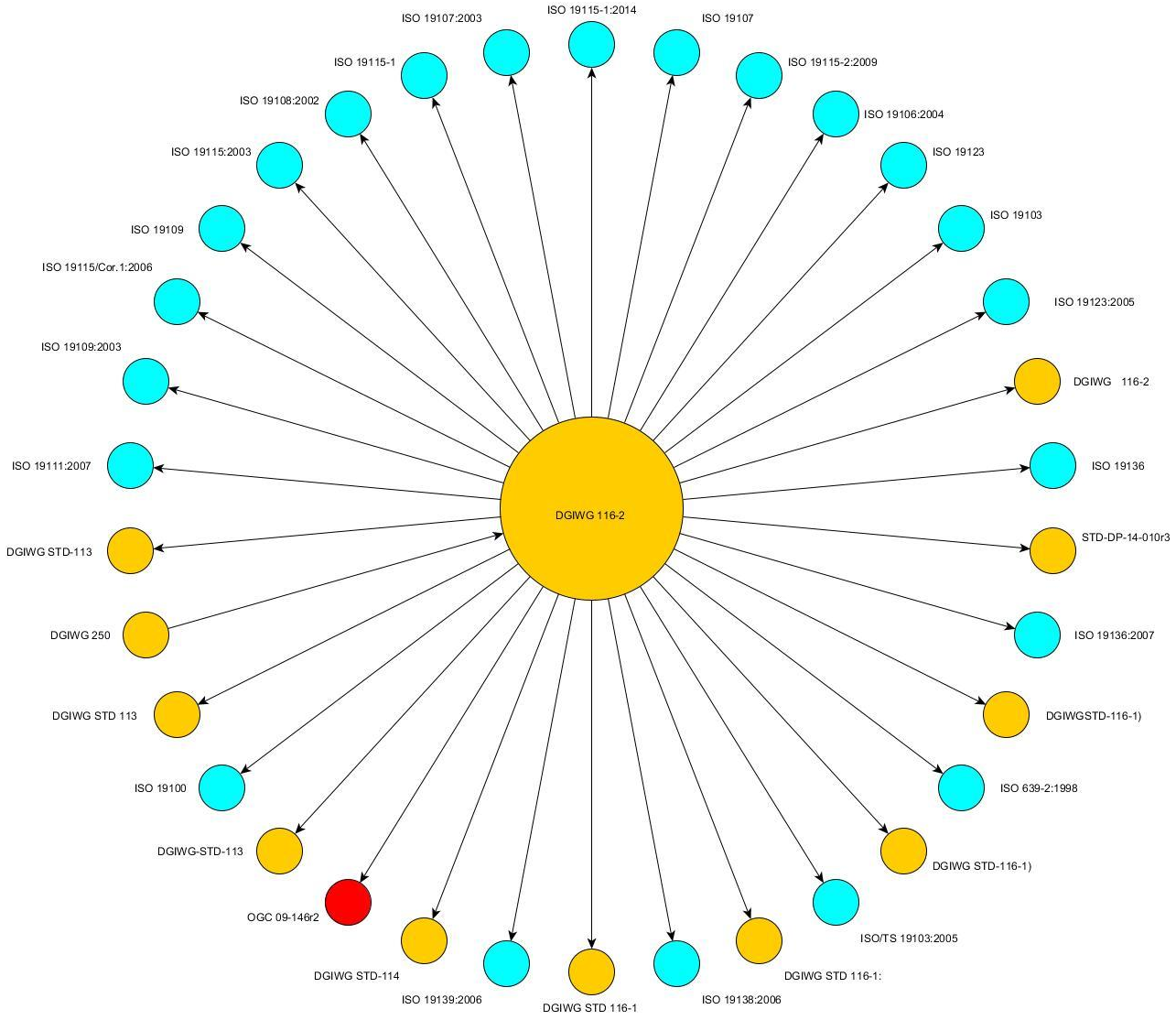
DGIWG 116-1

Elevation Surface Model (ESM) Standardised Profile



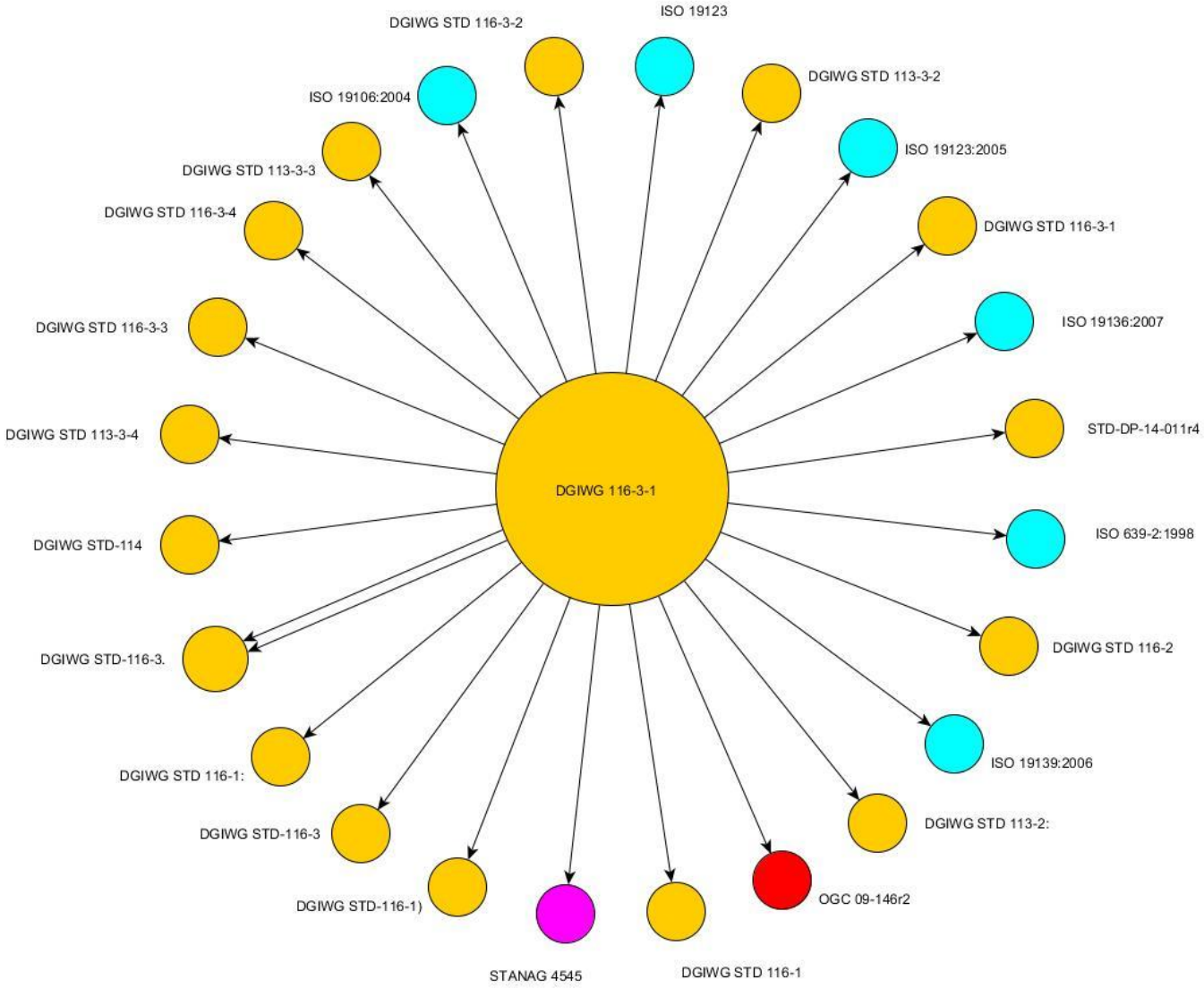
DGIWG 116-2

Elevation Surface Model (ESM) - 116-2: GML Application Schema



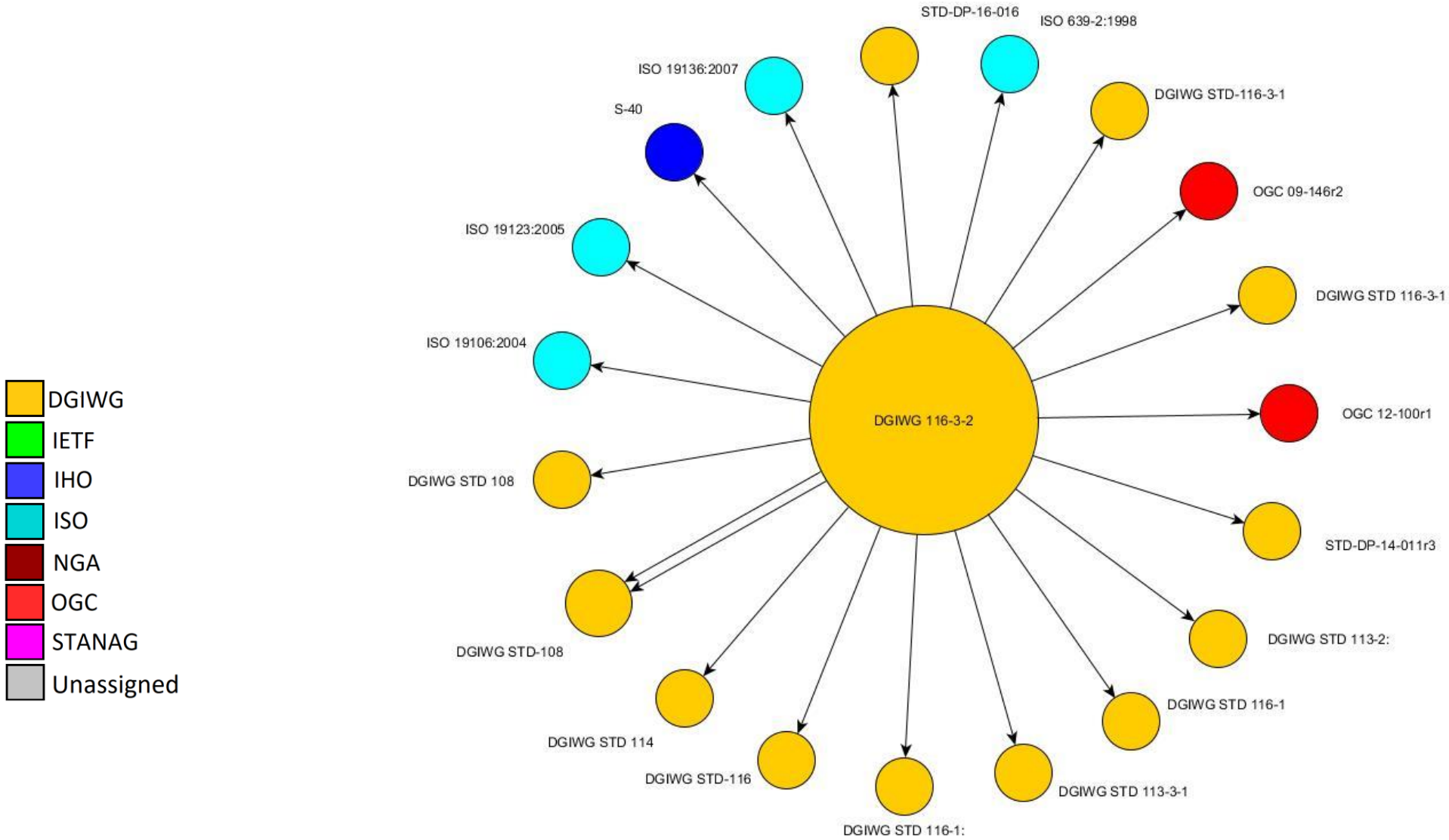
DGIWG 116-3-1

Elevation Surface Model (ESM) - Encoding Rules - Part 1: Core



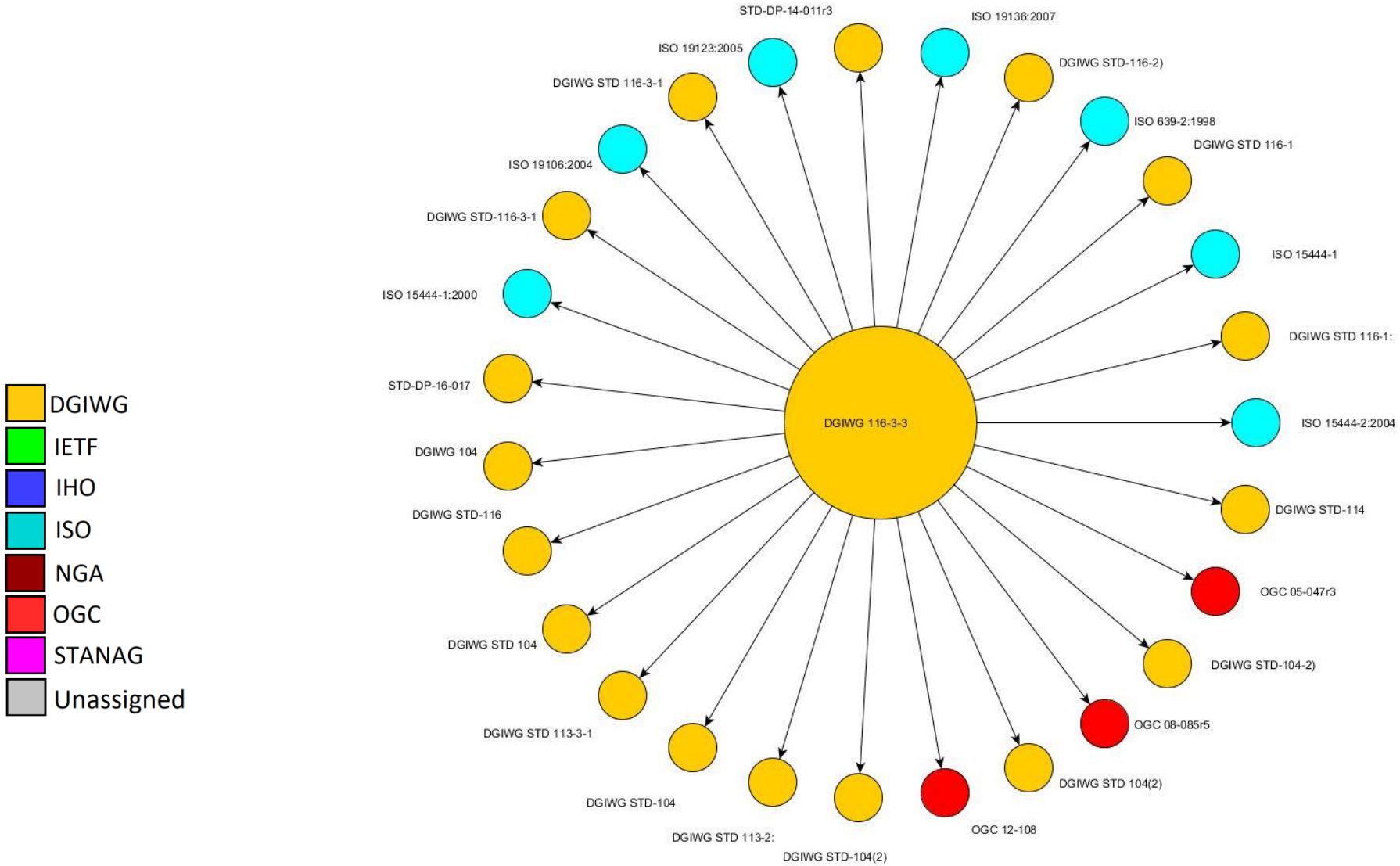
DGIWG 116-3-2

Elevation Surface Model (ESM) - Encoding Rules - Part 2: GeoTIFF



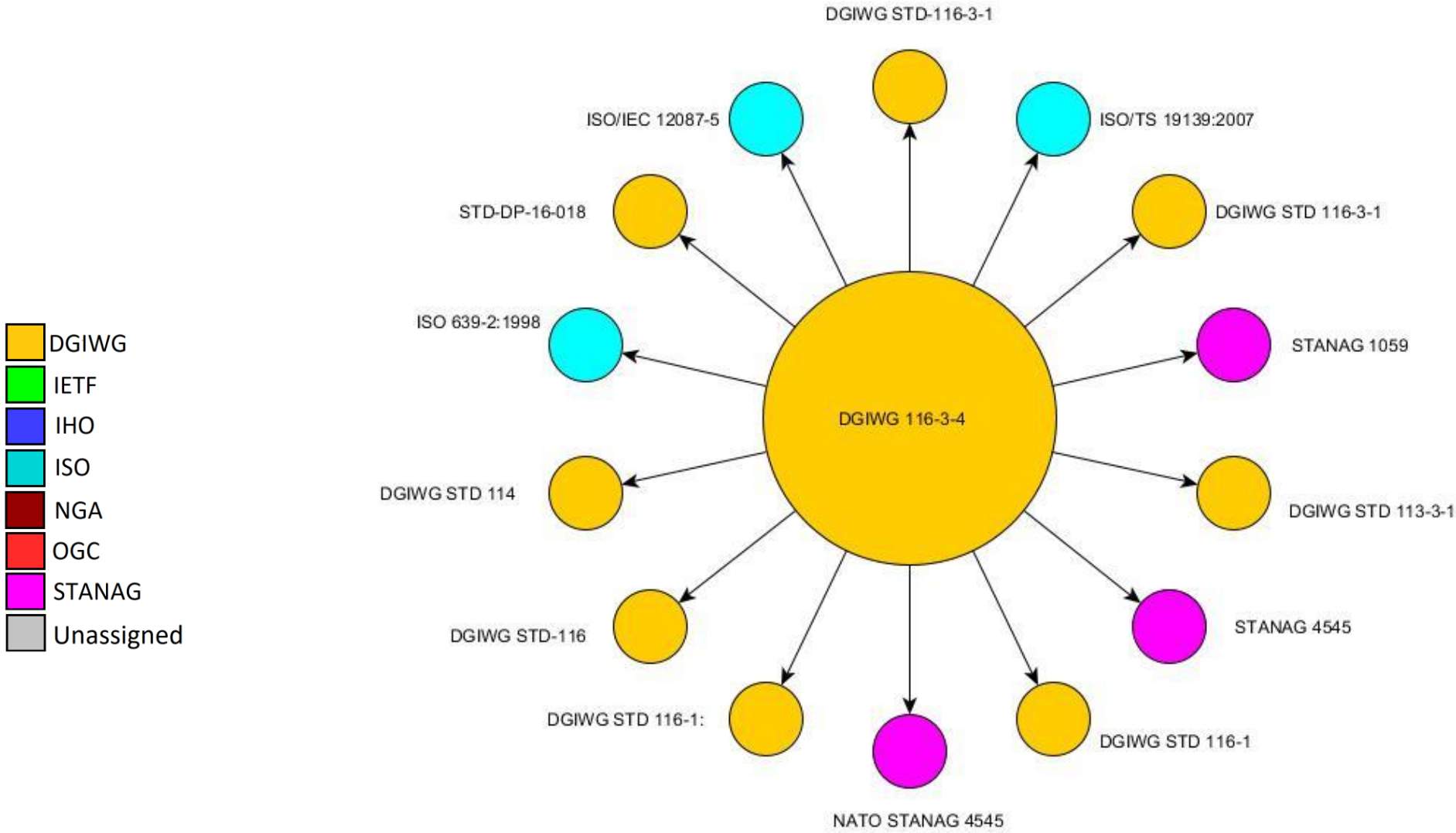
DGIWG 116-3-3

Elevation Surface Model (ESM) - Encoding Rules - Part 3: GMLJP2



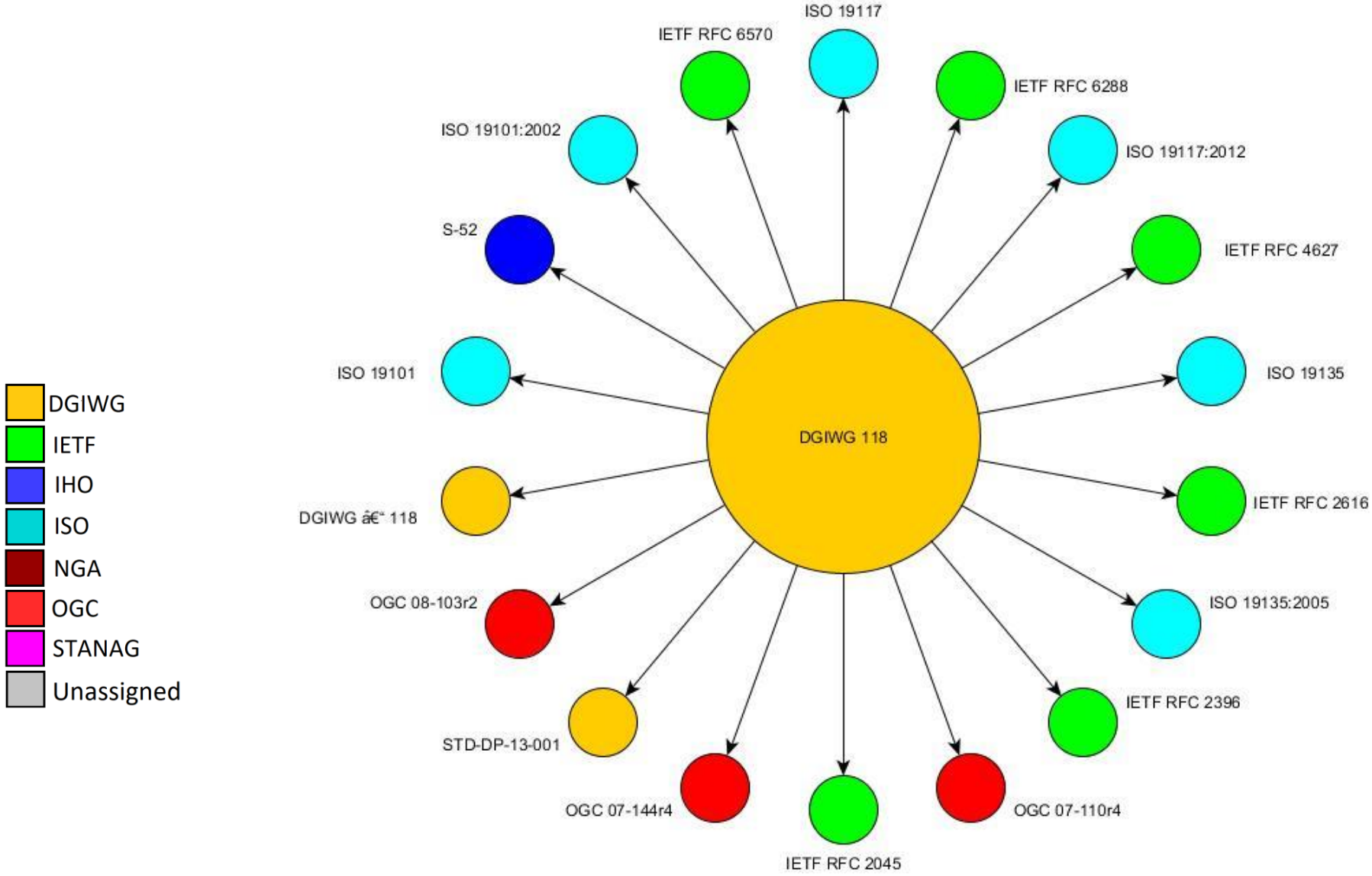
DGIWG 116-3-4

Elevation Surface Model (ESM) - Encoding Rules - Part 4: NATO Secondary Image Format (NSIF)



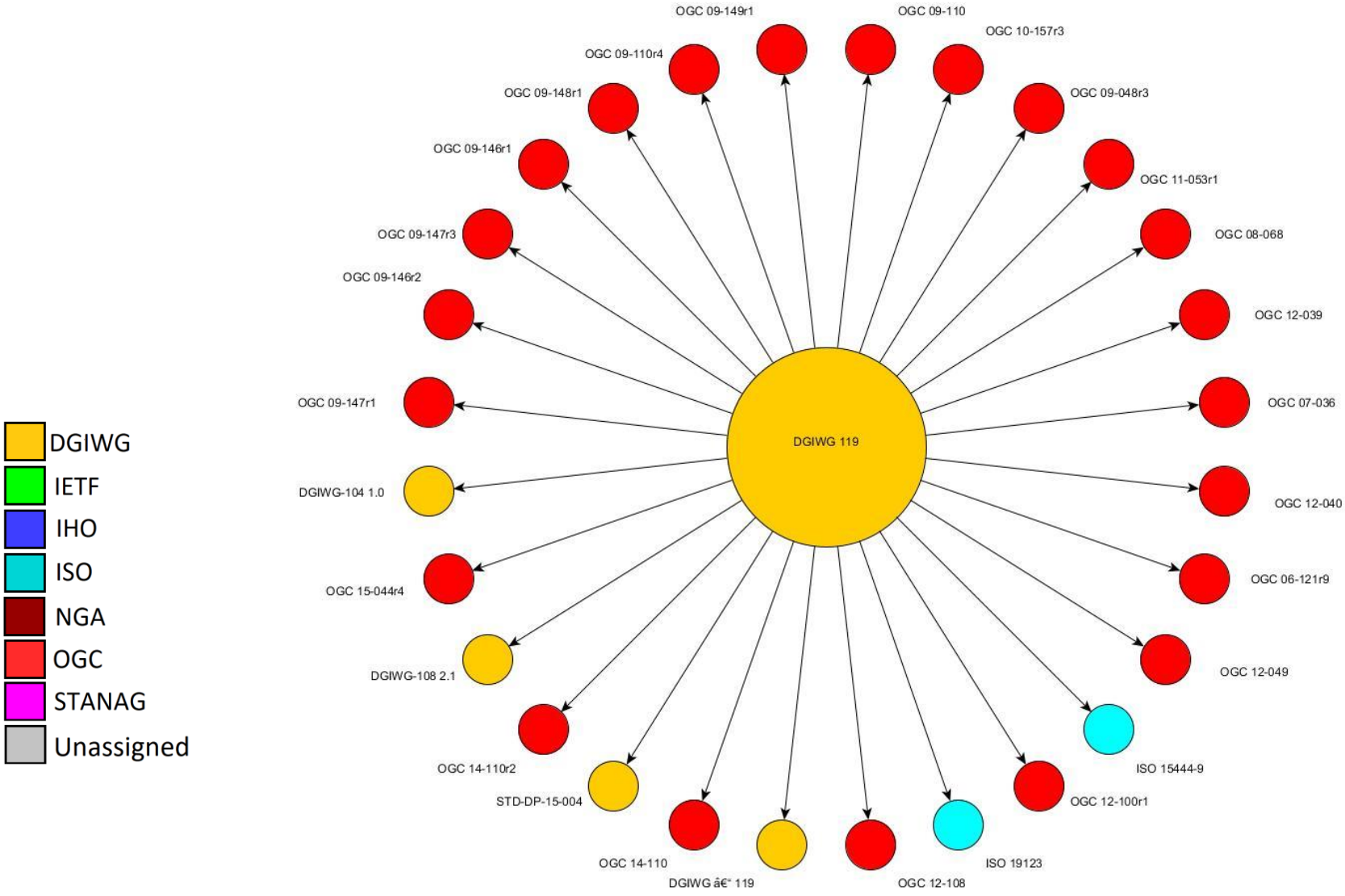
DGIWG 118

Portrayal Registry Service Interface Specification



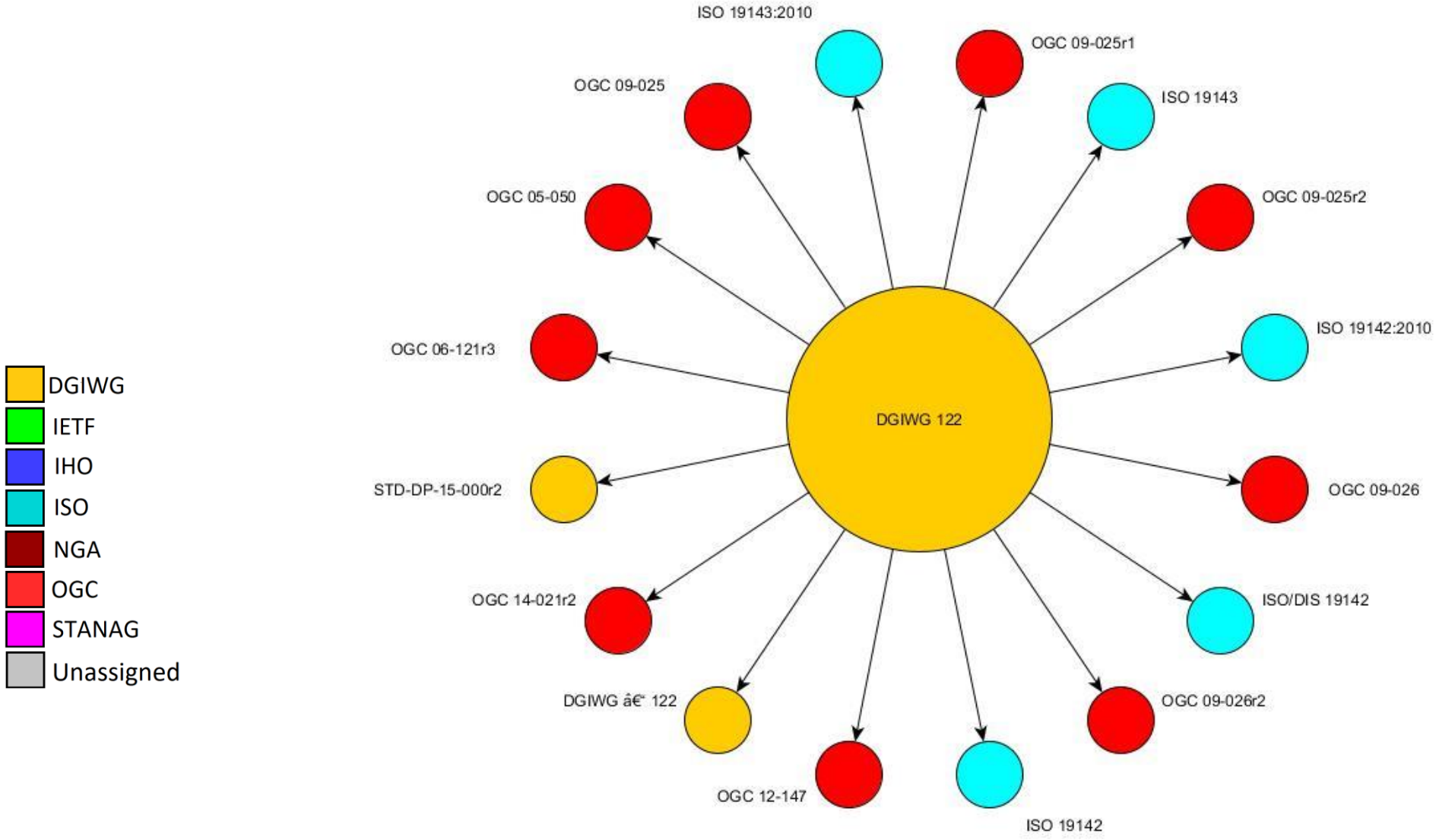
DGIWG 119

Defence Profile of OGC® Web Coverage Service 2.0



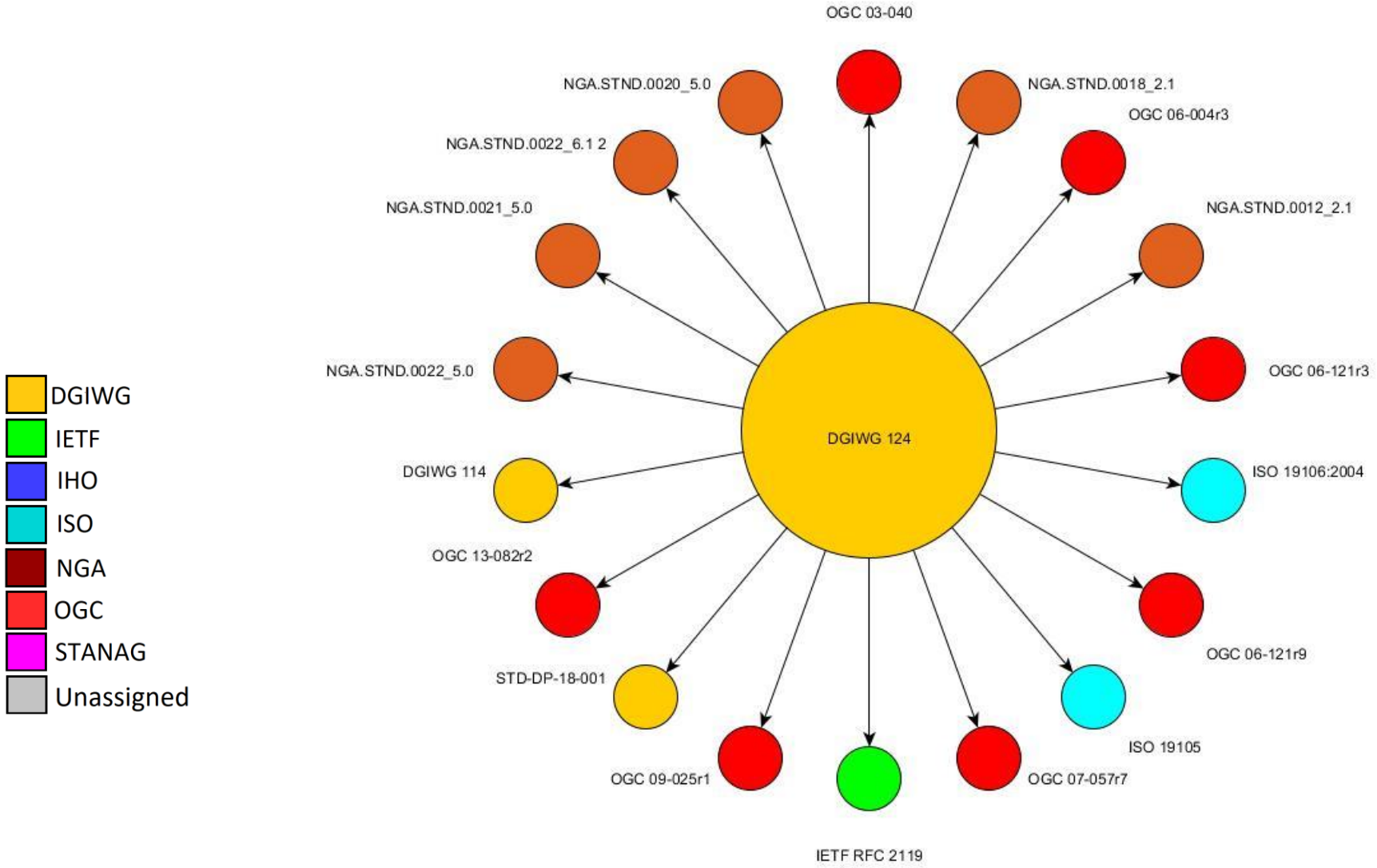
DGIWG 122

DGIWG Web Feature Service (WFS) Profile



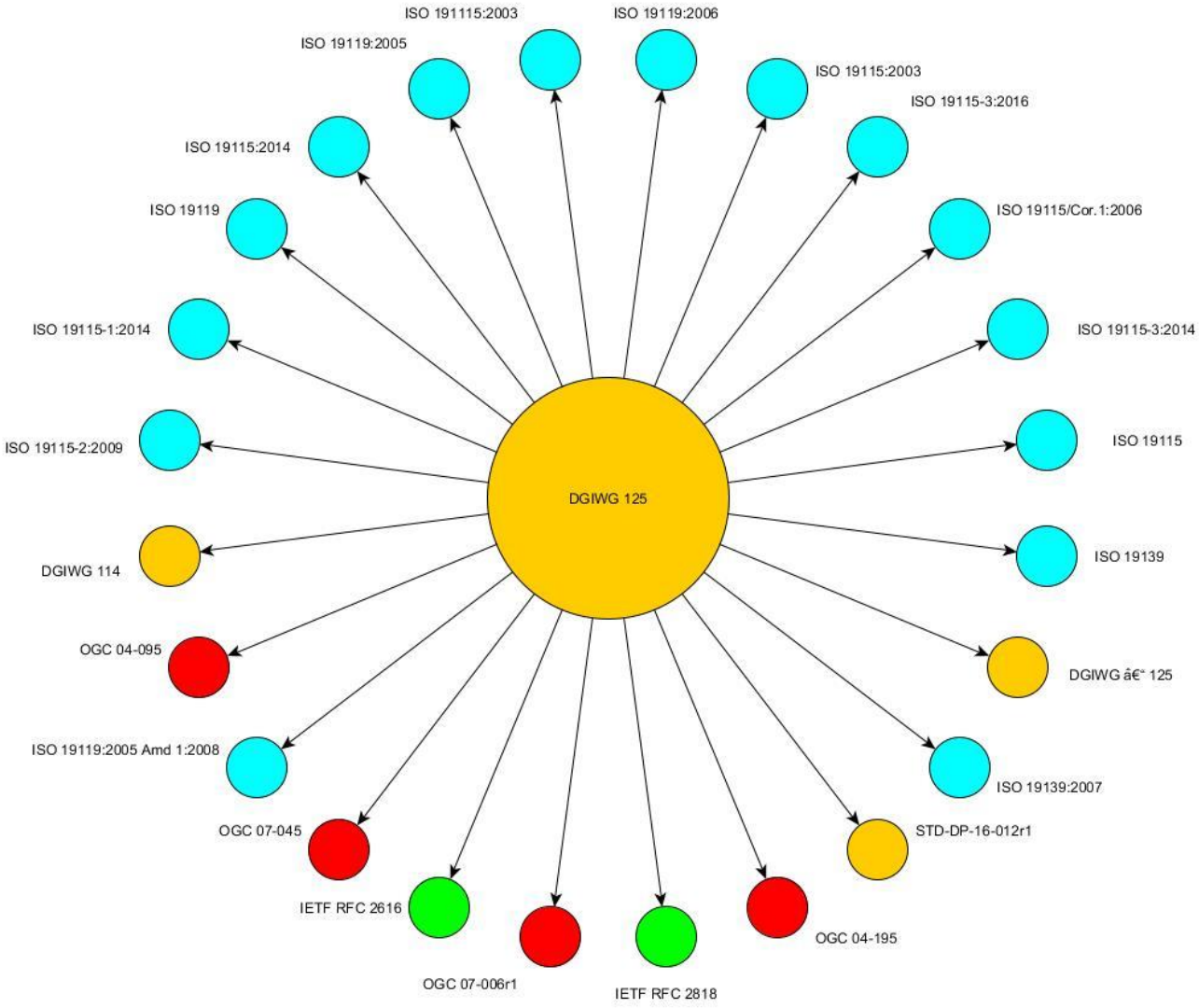
DGIWG 124

Defence Profile of OGC® Web Map Tile Service 1.0



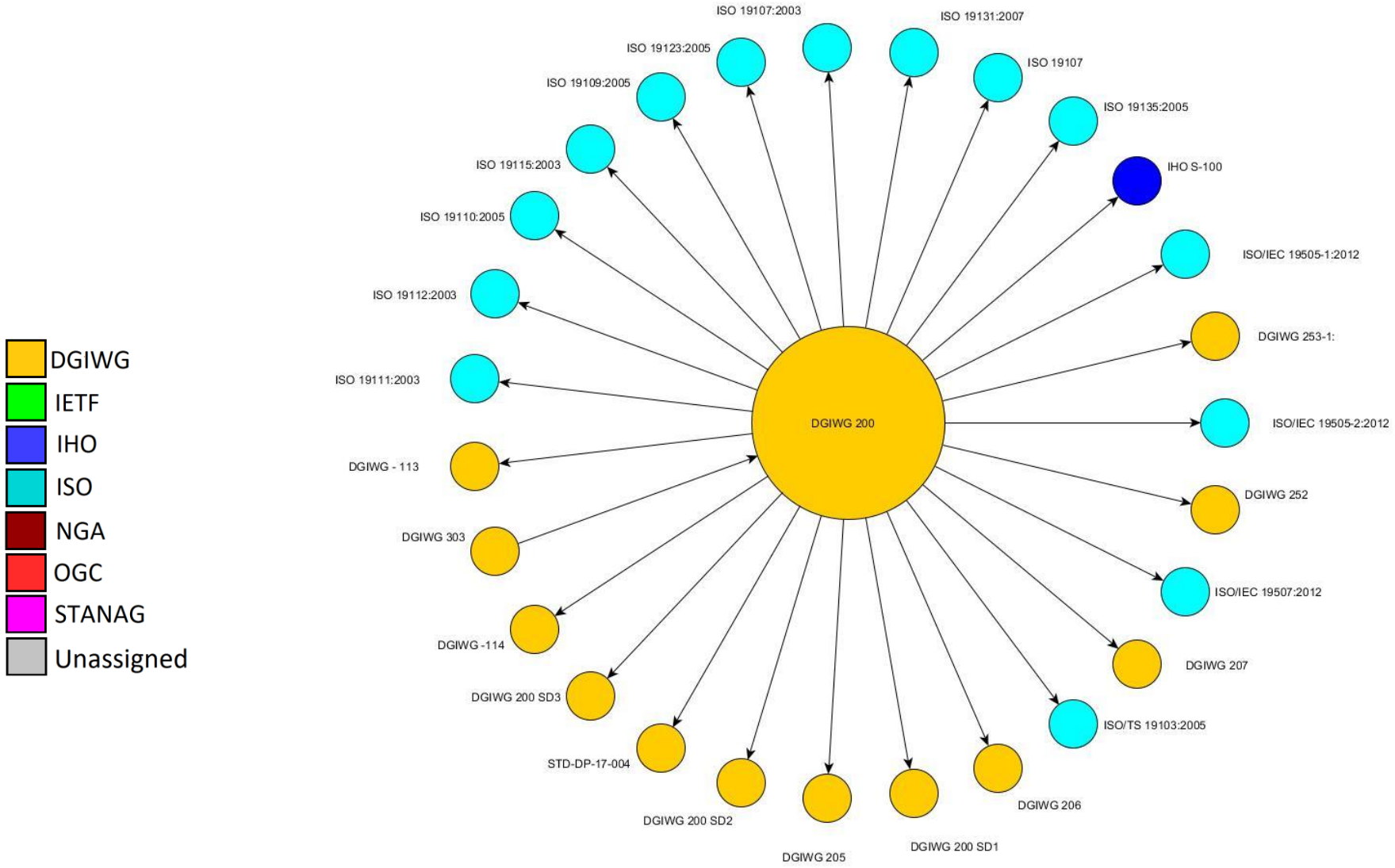
DGIWG 125

Defence Profile of OGC® Catalogue Service for the Web 2.0



DGIWG 200

Defence Geospatial Information Framework (DGIF) - Overview

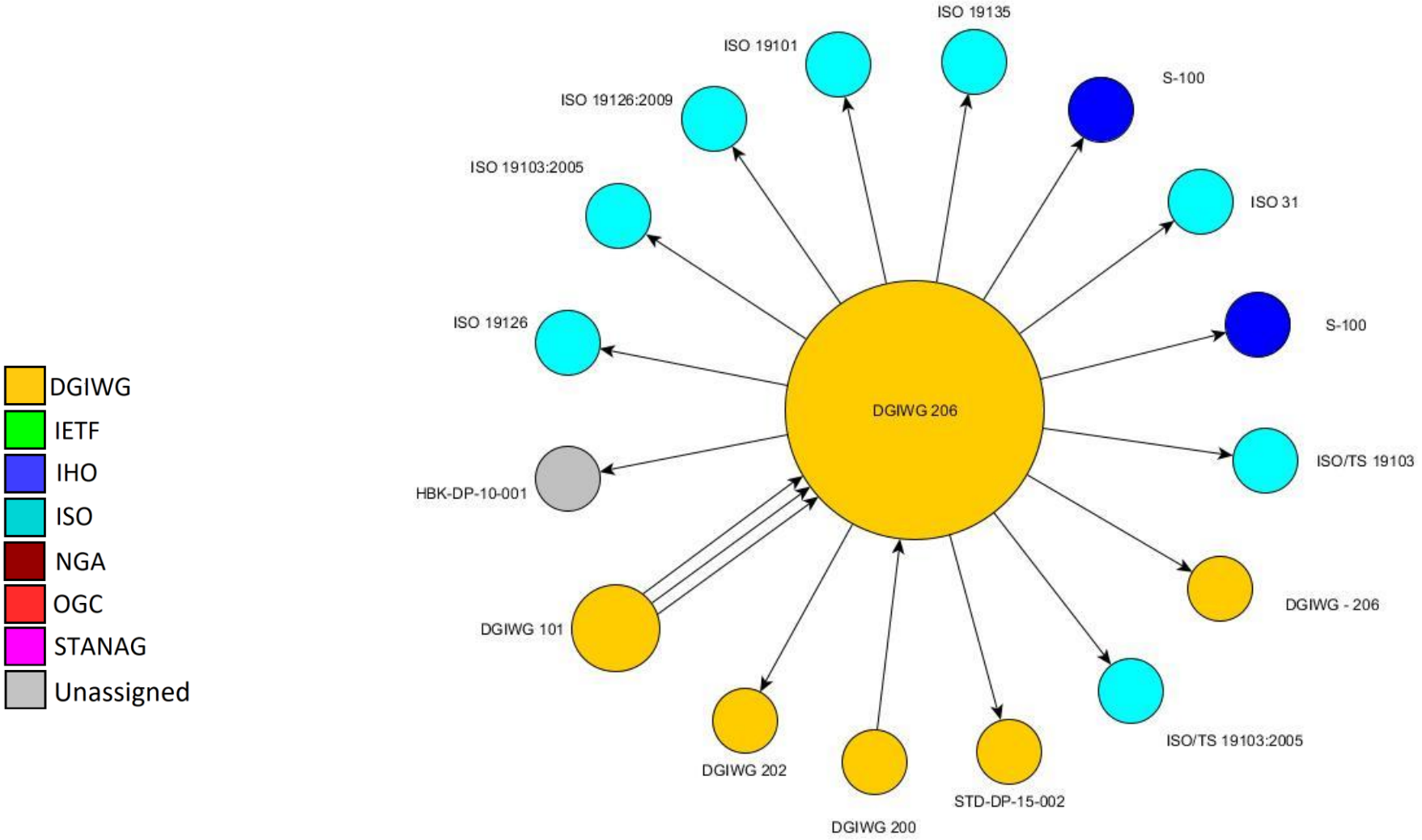


DGIWG 205

Defence Geospatial Information Model (DGIM)

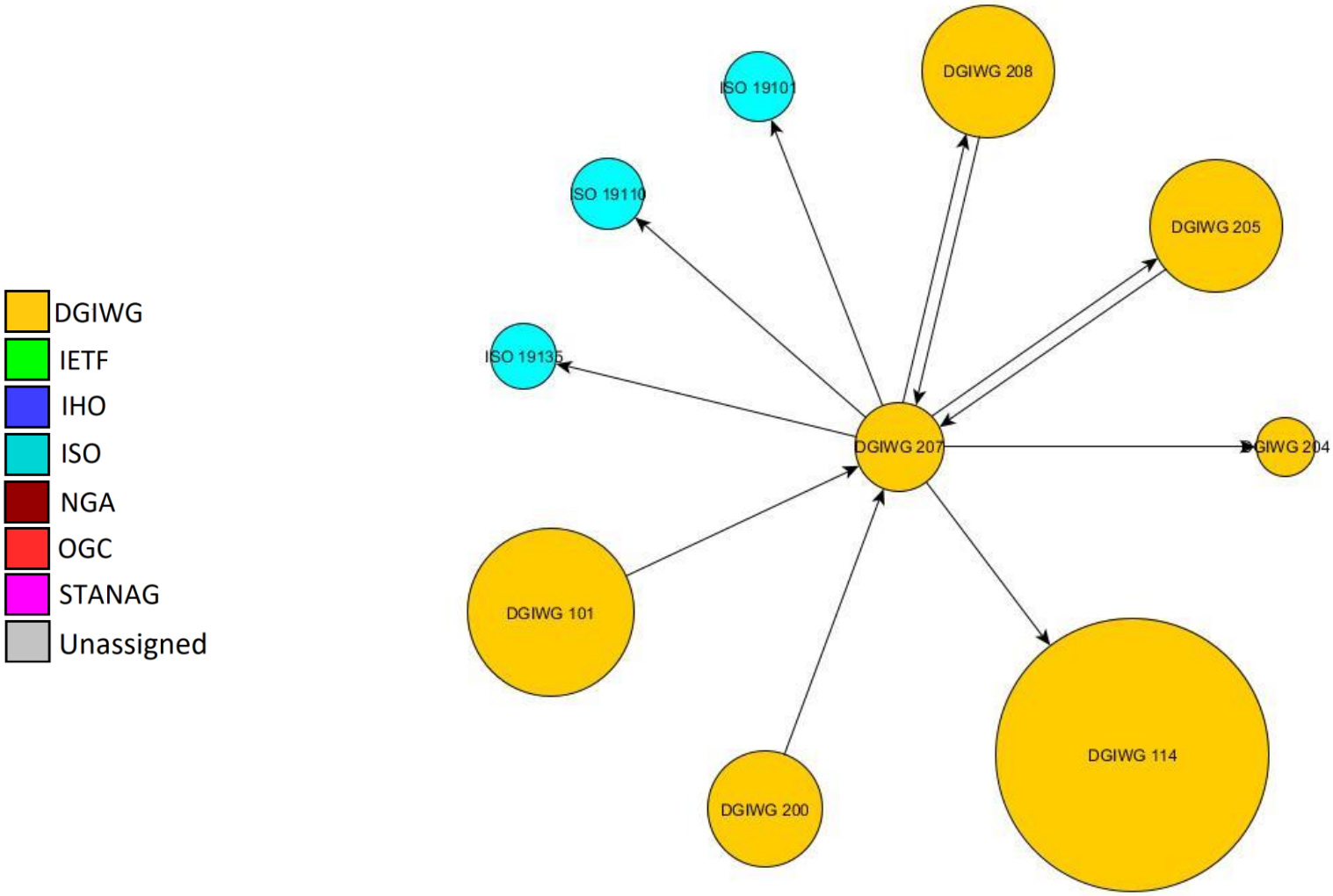
DGIWG 206

Defence Geospatial Feature Concept Dictionary (DGFCD) Description and Content



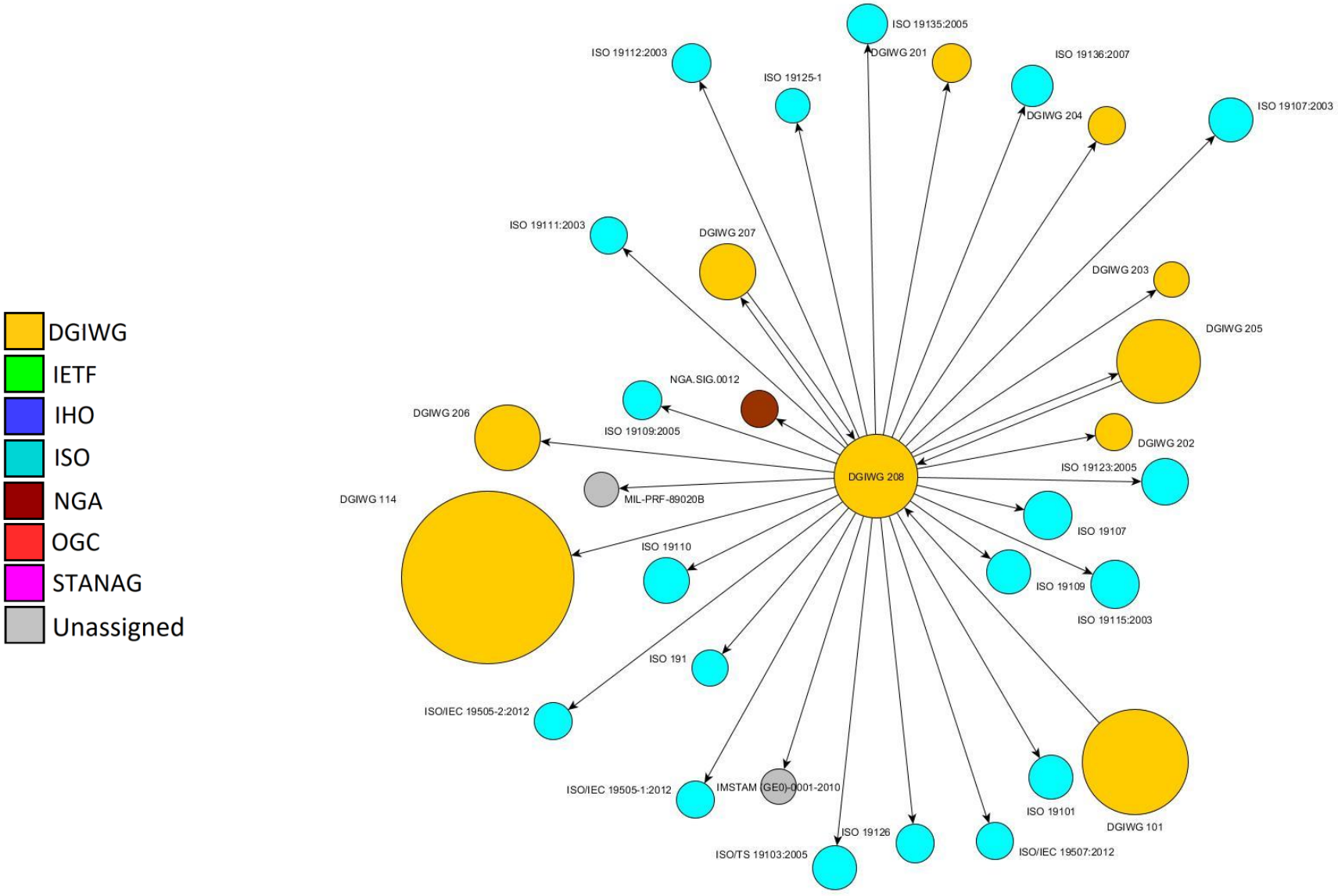
DGIWG 207

Defence Geospatial Real World Object Index (DGRWI)



DGIWG 208

Defence Geospatial Information Framework Encoding Specification - Part 1: GML

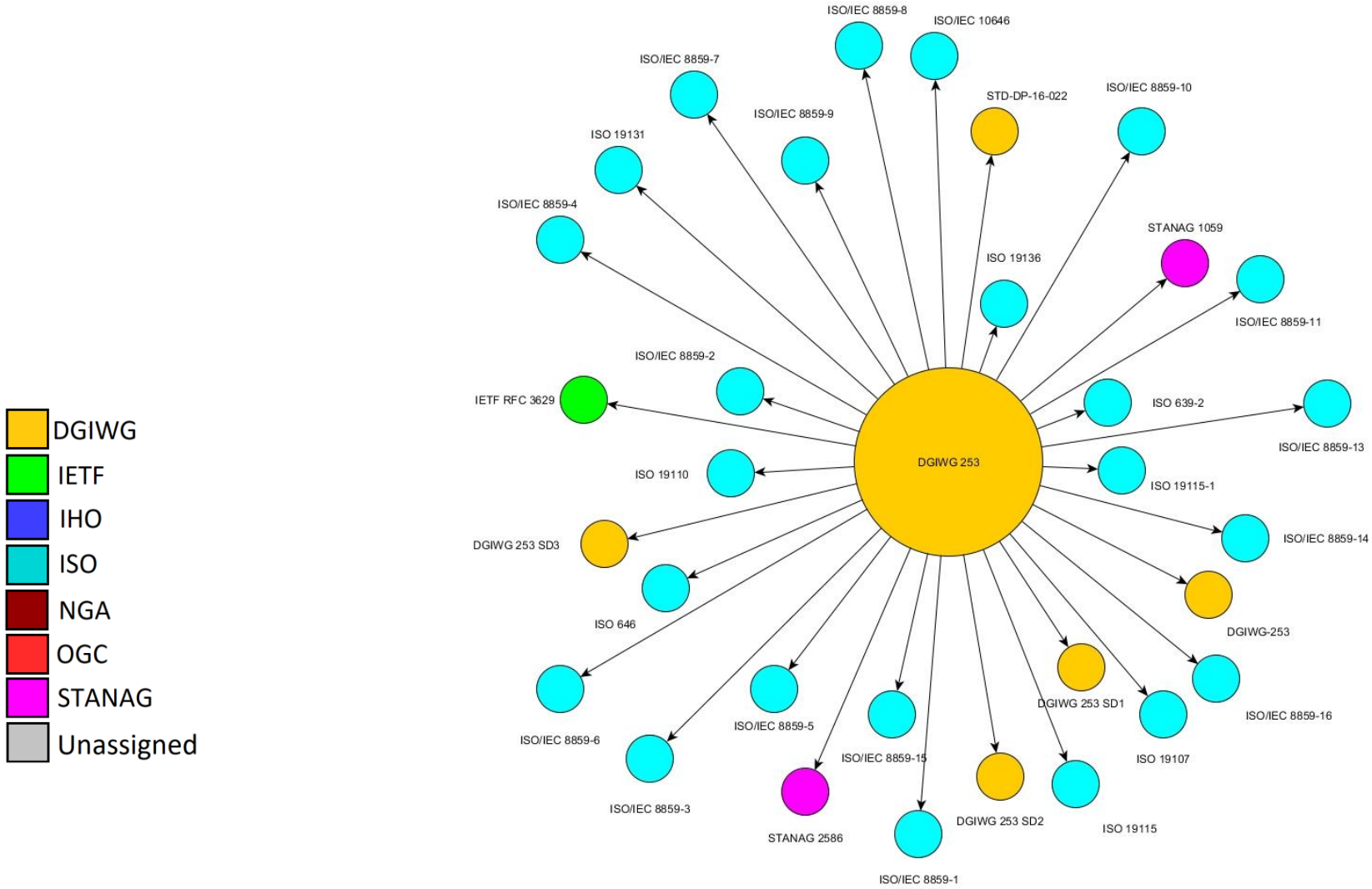


DGIWG 250

Defence Gridded Elevation Data (DGED) Product Implementation Profile

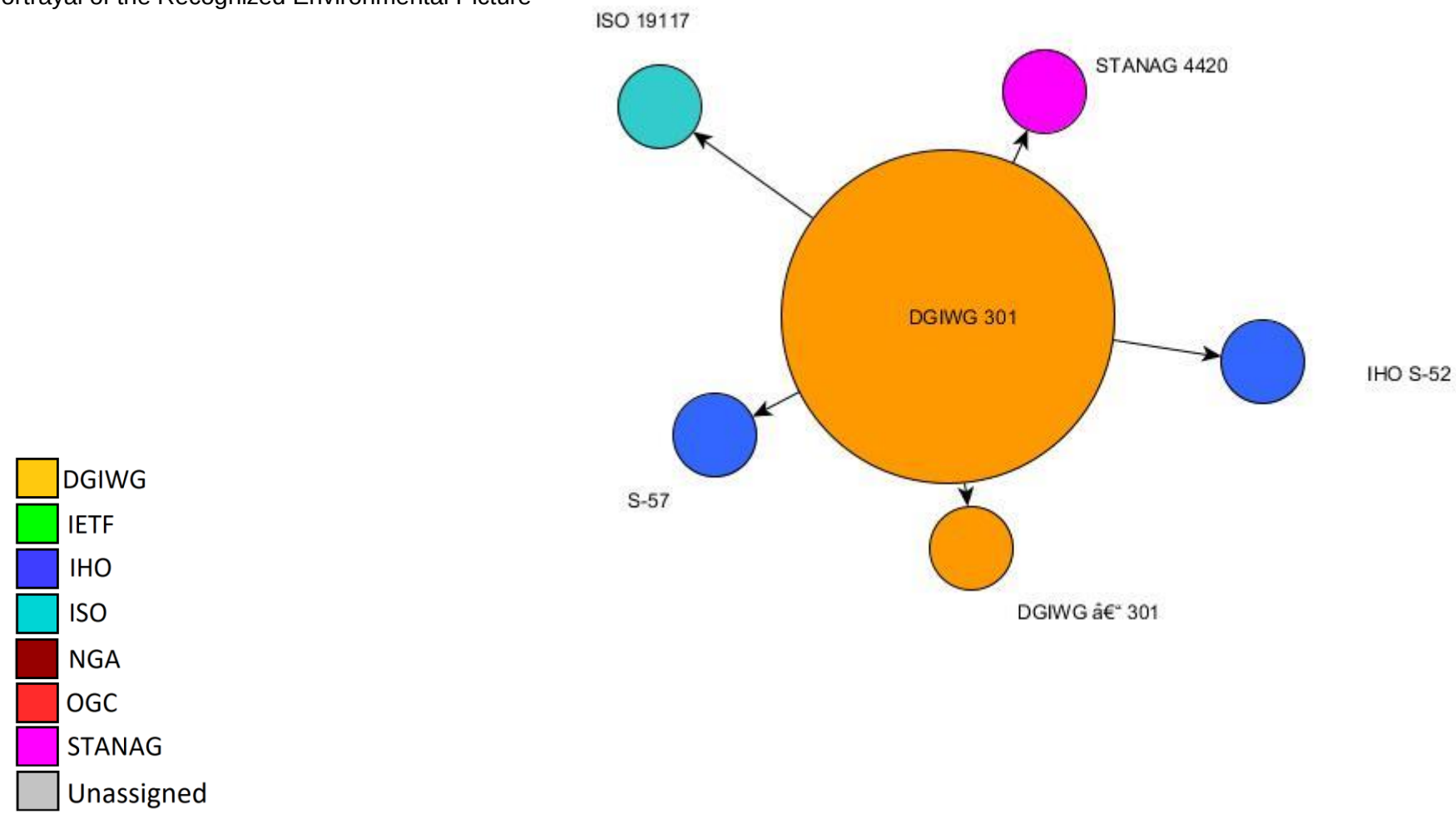
DGIWG 253

Defence Topographic Exchange (DTOX) Data Product Specification (DPS)



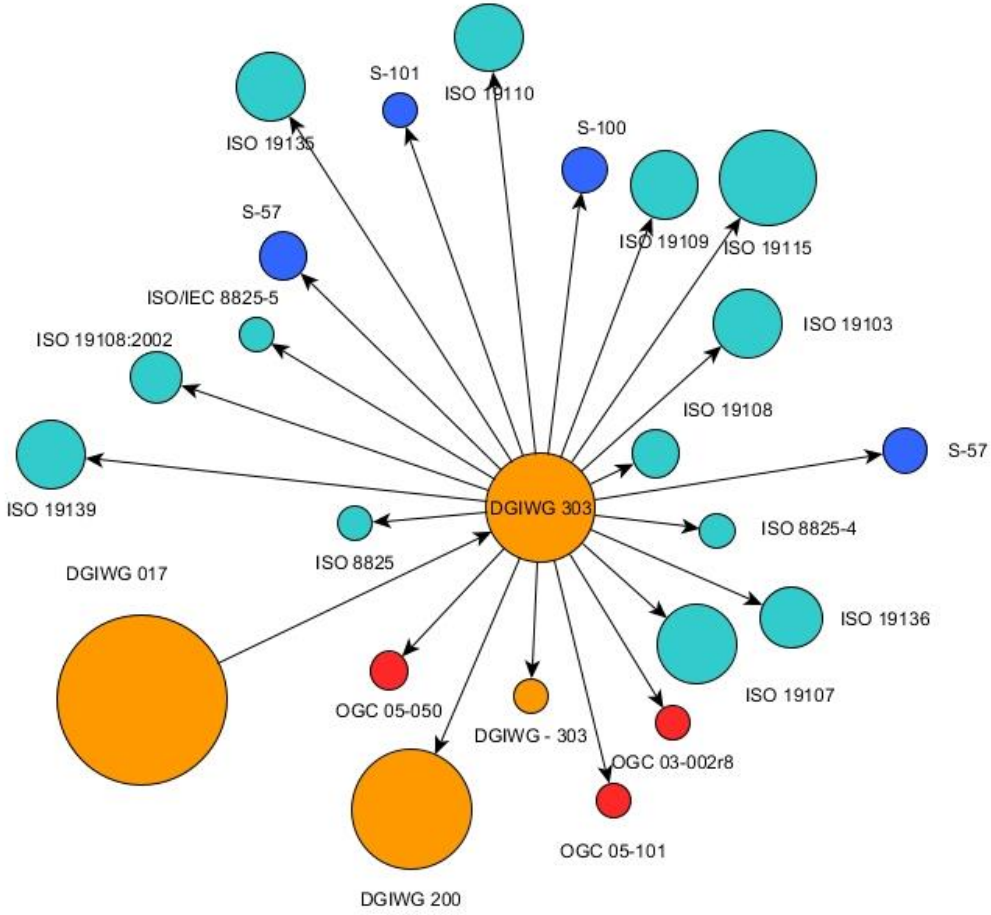
DGIWG 301

Portrayal of the Recognized Environmental Picture



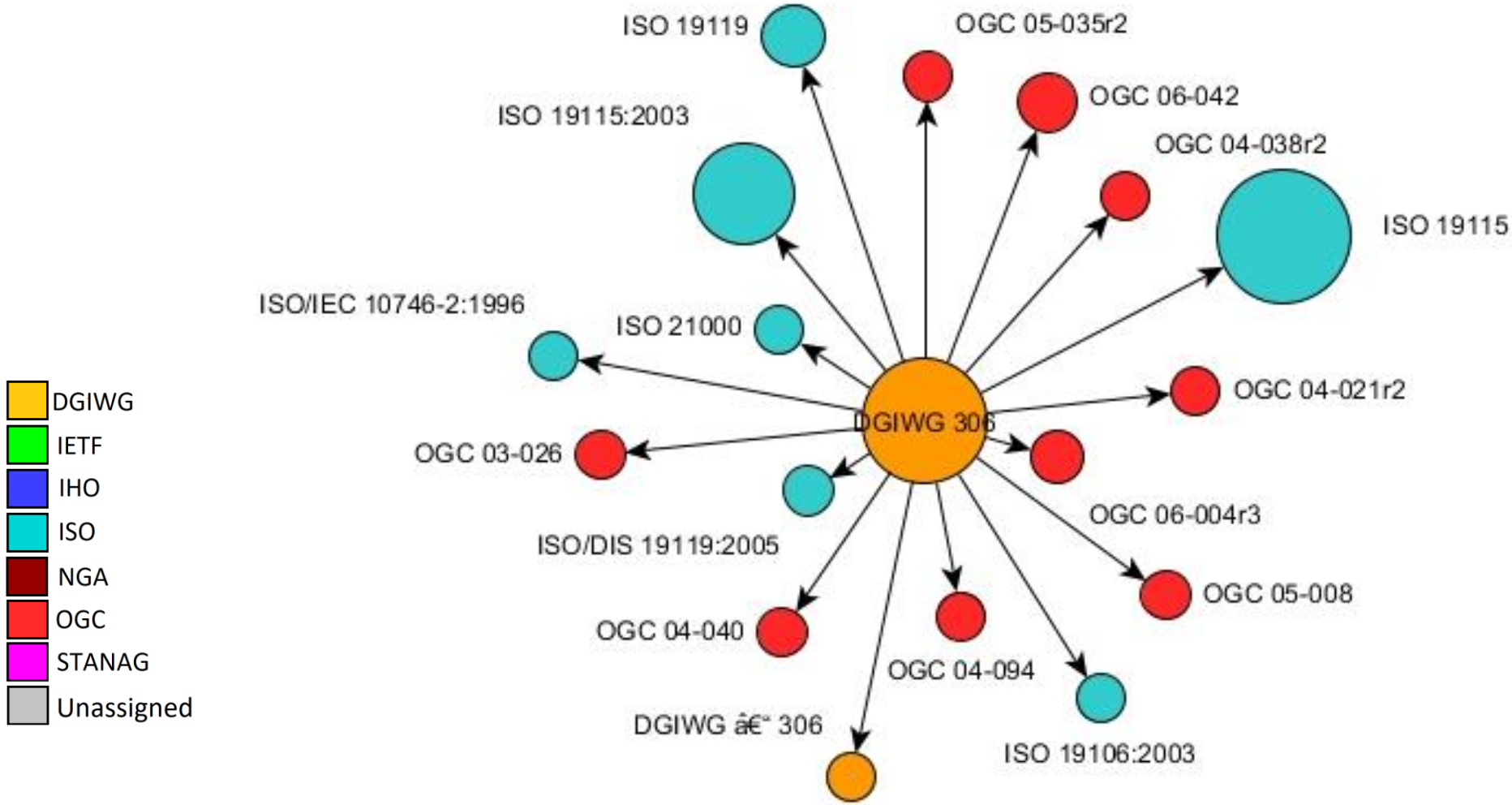
DGIWG 303

Geography Mark-up Language (GML) Application Schema for the Multinational Geospatial Co-production Program (MGCP)



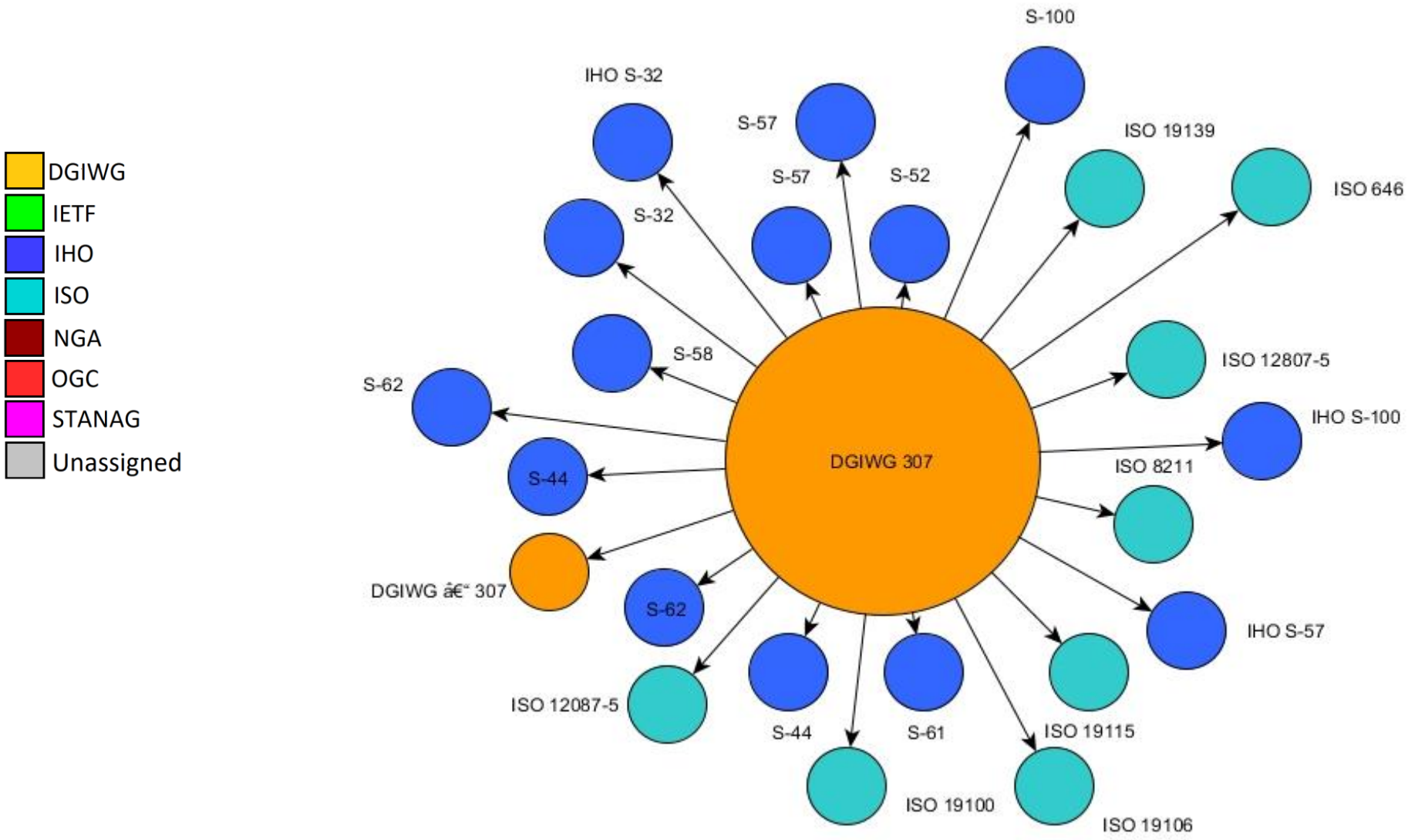
DGIWG 306

DGIWG Service Architecture



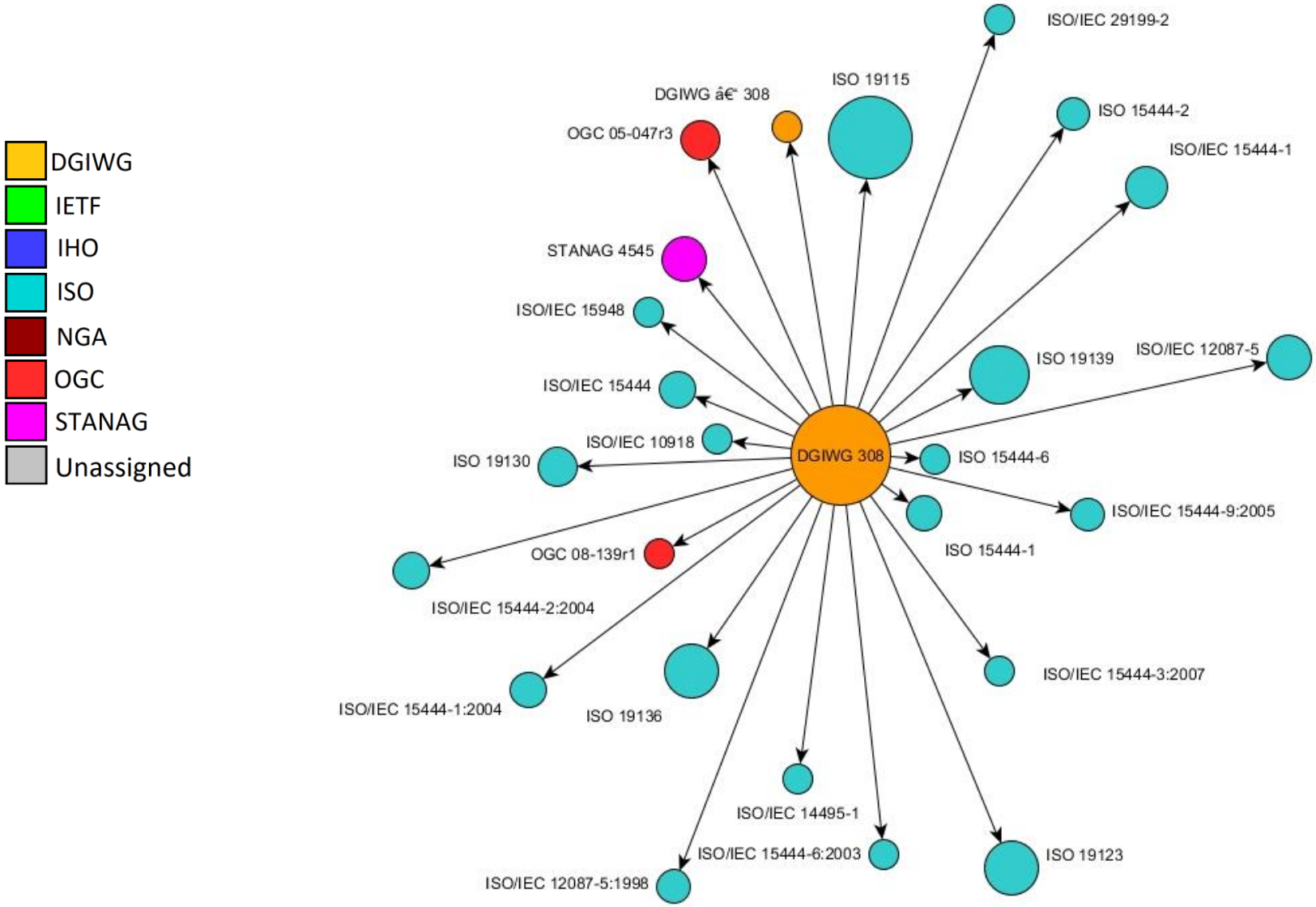
DGIWG 307

Harmonisation of Hydrographic Information Technical Report



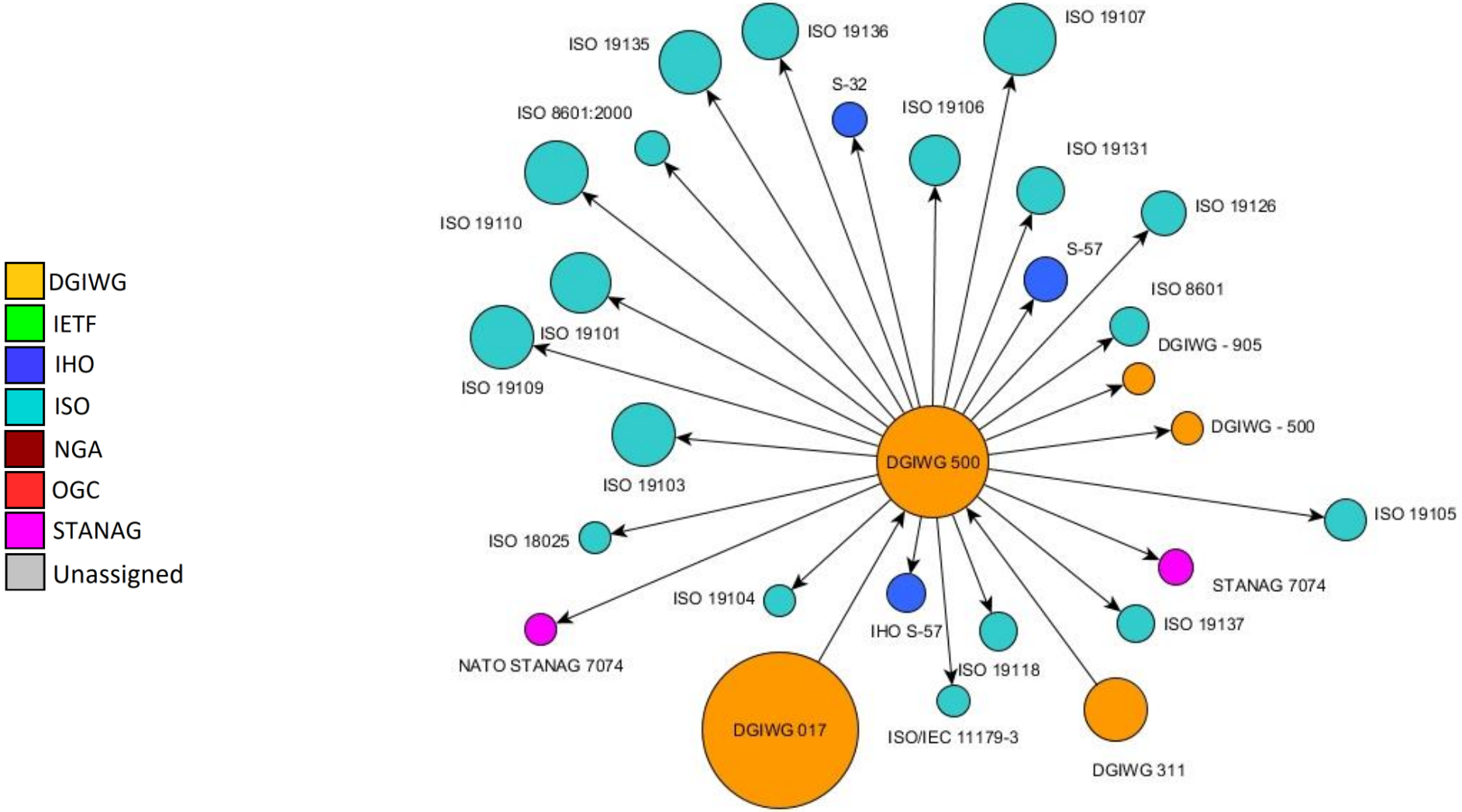
DGIWG 308

DGIWG JPEG 2000 (JP2K) Scoping Study Report



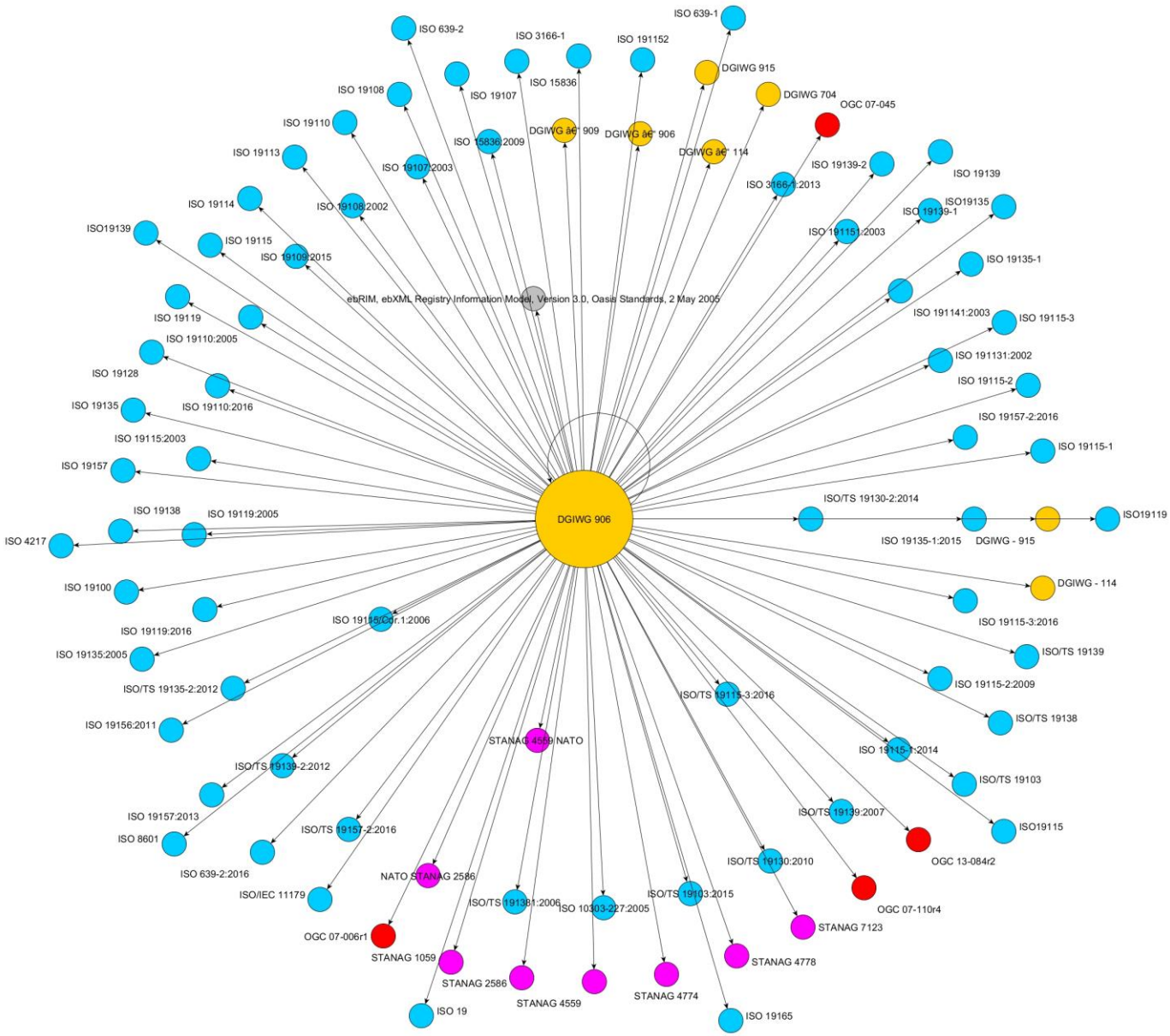
DGIWG 500

Implementation Guide to the DGIWG Feature Data Dictionary



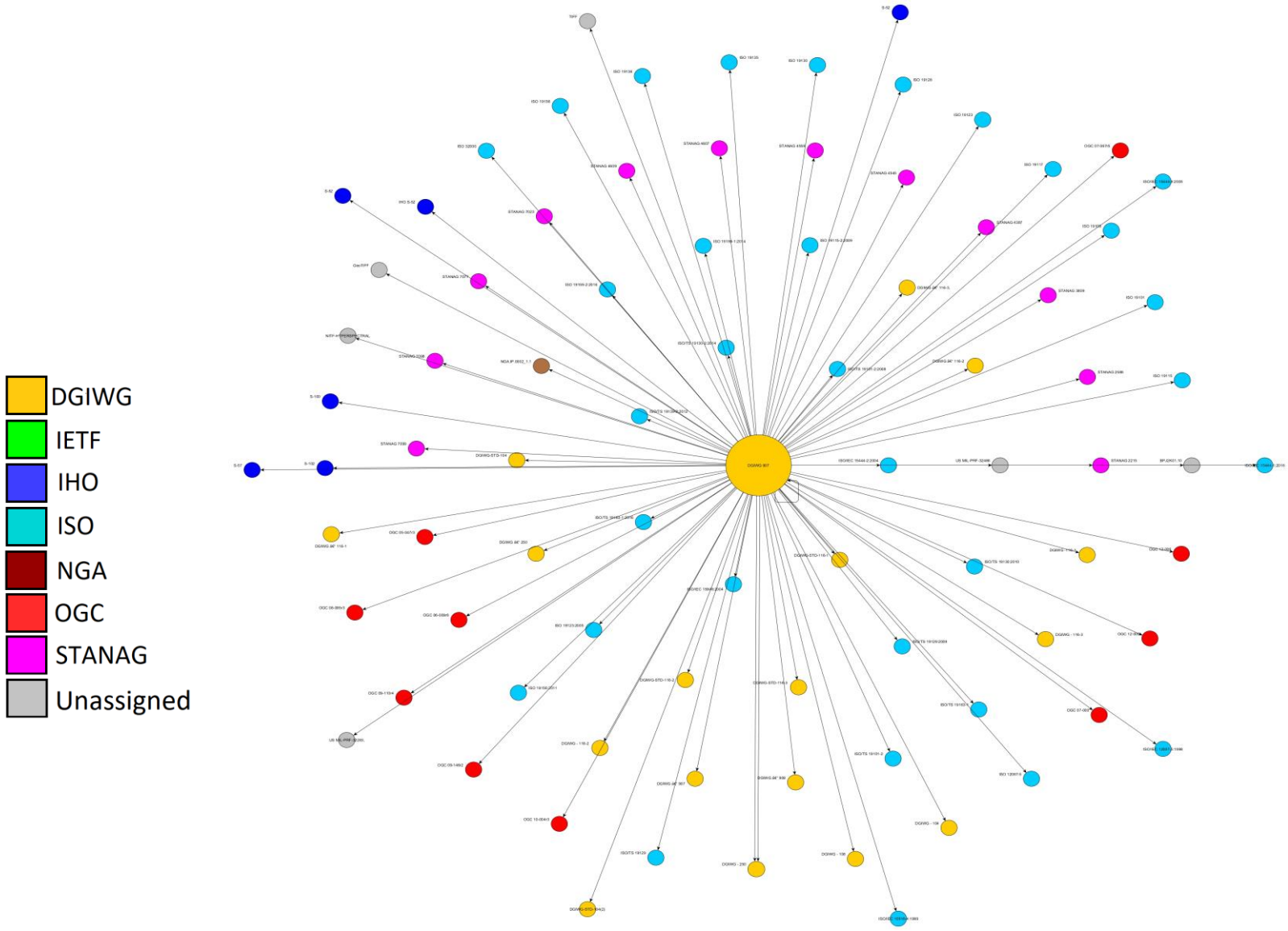
DGIWG 906

DGIWG Metadata Roadmap



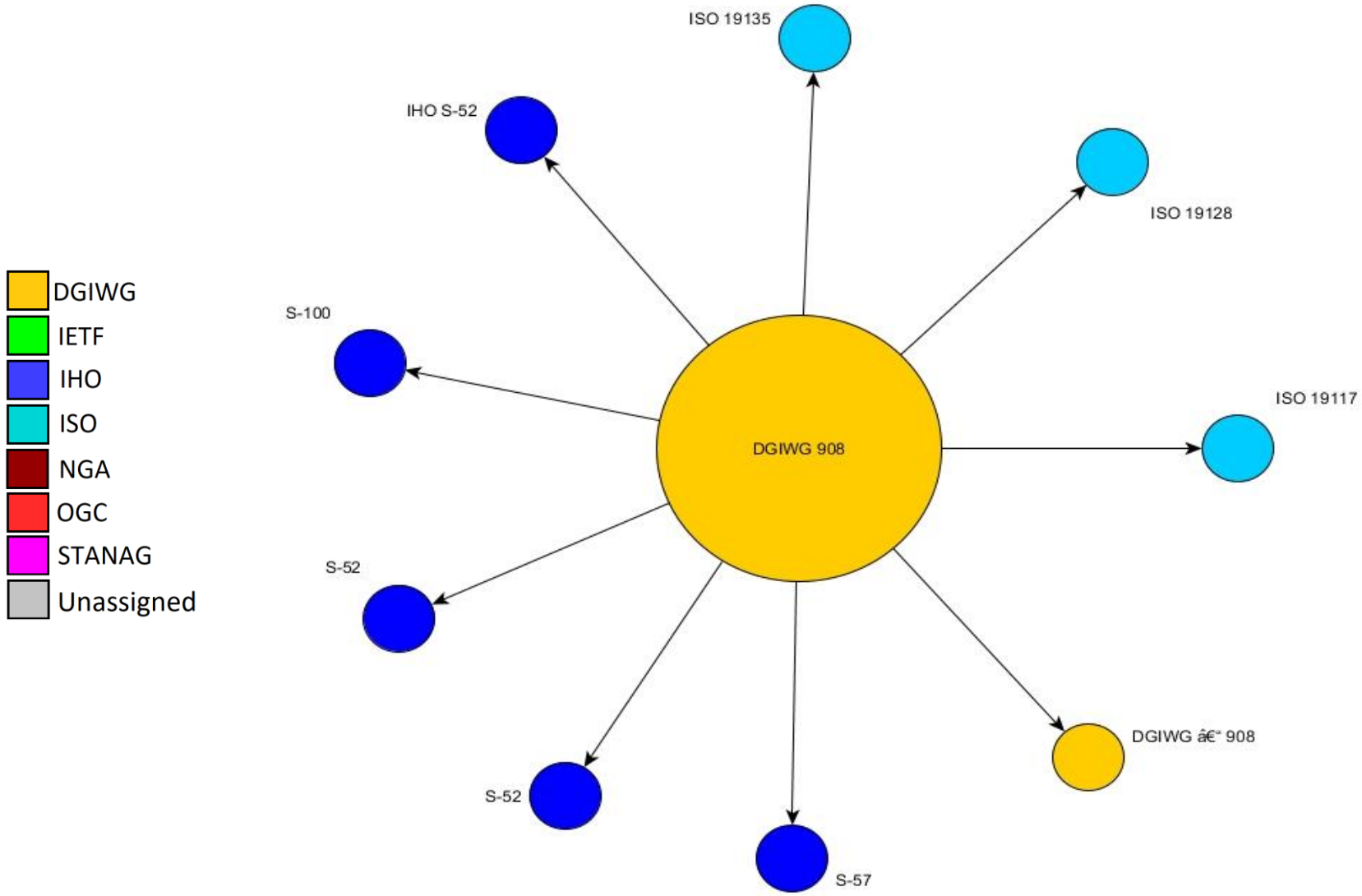
DGIWG 907

DGIWG Imagery and Gridded Data Roadmap



DGIWG 908

DGIWG Portrayal Roadmap



DGIWG 909

DGIWG Web Services Roadmap

- DGIWG
- IETF
- IHO
- ISO
- NGA
- OGC
- STANAG
- Unassigned