

Akoma Ntoso for Making FAO Resolutions Accessible

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Abstract. Akoma Ntoso is an international legal XML standard, whose technical specifications are now approved by the OASIS body. The standard has been developed to model legislative, parliamentary, and judicial documents using Semantic Web design principles. However, other types of normative and regulatory documents can benefit from being represented in Akoma Ntoso, making it possible to formally describe their structure, their components (e.g., attachments), their references to and from other documents, the semantic annotation of some peculiar parts of regulatory language (e.g., actions, purposes), the workflow of the creation process, and modifications over time. This Chapter presents a legal analysis of FAO Resolutions and how to apply Akoma Ntoso to interoperate with other UN documents (e.g., resolutions of the UN General Assembly). We also present the identifier naming convention for managing multilingual interconnection between documents (e.g., the UN manages six official languages). Finally, we present the ALLOT ontology application for improving semantic annotation in light of Linked Open Data. The combination of Akoma Ntoso and the ALLOT ontology makes it possible to enhance searching capacity and presentation accessibility.

Keywords. LegalXML, Akoma Ntoso, Semantic Web, ontology

1. Introduction

The Food and Agriculture Organization (FAO) of the United Nations is a technical agency of the United Nations that leads international efforts to eradicate hunger and malnutrition. FAO's governance¹ is composed of governing (such as the Conference and the Council) and statutory bodies. The Conference is the organization's body and meets once in every two years in regular session in which each Member Nation and Associate Member are represented. The biennial Conference approves resolutions in plenary sessions. Resolutions approved by the Conference are qualified as soft law (they are not binding on members) but belong in the space of the international law framework. Also, European institutions refer to FAO resolutions when they annex conventions. Thus, for example, Resolution 12/97 FAO, which includes the International Plant Protection Convention, is cited in European Council Decision 2004/597/EC². The UN General Assembly cites FAO resolutions³, as well as domestic law. The UN, as well as FAO, translates all

¹FAO Basic Texts, <http://www.fao.org/3/k8024e/k8024e.pdf>.

²<https://eur-lex.europa.eu/eli/dec/2004/597/oj>.

³<https://undocs.org/A/RES/72/72> "69. Takes note of resolution 9/2017, entitled "Observance of the International Day for the Fight against Illegal, Unreported and Unregulated Fishing", adopted by the Conference of the Food and Agriculture Organization of the United Nations at its fortieth session.

the documents in six official languages: English, French, Spanish, Arabic, Chinese, and Russian.

Resolutions adopted by the Conference are inserted in the Conference Reports (Figure 1).

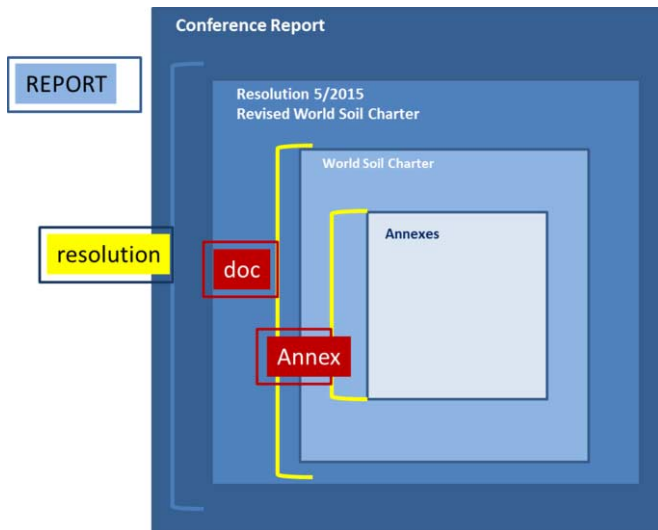


Figure 1. Modelling of a resolution within a Conference report

In the FAO portal resolutions are accessible using a separate list of web pages⁴ published in HTML; the navigation system redirects to the Conference Report of the specific session where a given resolution is included. This organization of digital material has different problems: (1) end users have to browse a long page of Conference reports, including several resolutions, and can therefore lose track of their position while navigating; (2) the information system does not provide a tool for searching in the collection of resolutions, nor does it provide filters or channels (e.g., date, topic, keyword) for accessing the relevant material; (3) citations are not linked and navigable, so end users can't browse to another resolution cited in the Conference report; (4) switching between languages is managed at general level and not at document level; (5) there is no use of Semantic web classifications and tags; (6) it is not possible to download specific navigation results (e.g., a specific resolution in PDF or XML) – it is only possible to save the entire HTML.

End users in the current version of the front-office information system are not supported in navigation, and they need to know in advance which session the resolution was voted in. The back-office does not include an indexing system capable of effectively searching documents, aggregating them, and presenting them as a downloadable bulk. Finally, only the HTML format is available, and it is edited and formatted in different heterogeneous ways according to the historical period.

⁴<http://www.fao.org/unfao/govbodies/gsbhome/conference/resolutions/2017/en/>.

2. The AKN4UN Project

Akoma Ntoso [3] is an international XML standard approved by the OASIS standardization body. Even if Akoma Ntoso was designed for parliamentary, legislative, and judicial documents, it is also suited for soft-law documents like UN and FAO resolutions. The High-Level Committee on Management (HLCM), part of the UN System Chief Executives Board for Coordination, has set up a Working Group on Document Standards, and in April 2017 it adopted Akoma Ntoso as its document format⁵. This made it possible to define specific guidelines and customize the AKN schema for a UN scenario, and in particular for resolutions⁶. The AKN4UN documentation and schemas are the output of this analysis⁷.

3. Akoma Ntoso for FAO Resolutions

3.1. Objectives

The FAO scenario was the first application of the AKN4UN strategic general plan. The aim of the FAO pilot project was to evaluate the use of Akoma Ntoso for FAO's documentation by improving back-office and front-office accessibility to resolutions. Using Akoma Ntoso the following objectives were achieved:

1. to switch documents from HTML to XML;
2. to use Semantic Web techniques to improve searching (e.g., using ontologies);
3. to interoperate with the different UN departments by way of citations;
4. to interchange the documents between different offices and members;
5. to simplify a document's lifecycle over the course of its drafting and management;
6. to track modifications over time, and track workflow;
7. to manage multilingualism;
8. to visualize document to improve transparency and accessibility with graph analysis of citations;
9. to make it possible to download search results in different formats (e.g., XML or PDF);
10. to design responsive interface for improving user experience.

3.2. Methodology

Co-design principles were applied as a basic methodology throughout the project, with periodical sessions in which requirements were analysed and defined, the tool was tested, and the metadata analysed. The analysis was the result of a deep legal, linguistic, and documental analysis of the requirements carried out with the main stakeholders of the FAO departments.

⁵<https://www.unsystem.org/CEBPublicFiles/CEB-2017-3-HLCM33-Summay%20of%20Conclusions-FINAL.pdf>.

⁶<https://unsceb-hlcm.github.io/>.

⁷textitGuidelines for the Mark-up of UN Normative, Parliamentary and Judicial Documents, High-Level Committee of Management, United Nations, <https://unsceb-hlcm.github.io/>.

The FAO staff marked up all the resolutions using the LIME web editor⁸, customized for the FAO environment. Three members of the FAO staff received in-depth training, and they marked up 1,254 documents including the organization's Constitution. This makes it possible to establish a gold standard, deeply enriched with metadata and semantic annotation placed into the text coming from experts. The training was done by University of Bologna following the analysis done with FAO stakeholders.

The results are now available in a web portal for internal use, and thanks to XML Akoma Ntoso techniques, they include all the previously defined features. The functionalities make it possible to pursue all the previously mentioned objectives.

4. Digitalizing Resolutions, Eliciting Knowledge

After the stakeholder focus groups were formed and the interdisciplinary analysis was complete, we customized the LIME Editor to parse Microsoft Word documents of the original source of FAO resolutions. We used Regex and heuristics to maximize automatic markup and permit human experts to focus their time and expertise on the semantic part of the text's qualification. This made it possible to automatically detect the relevant parts of the text: preface, preamble, body, conclusions, annexes, references. We also used taxonomies and vocabularies for marking up words within sentences (e.g., *decides*, *noting*) and some relevant qualifications like SDG (Sustainable Development Goals).

Particular attention was devoted to marking up roles (e.g., Chair), persons, entities. Thanks to the ALLOT ontology [1], these annotations are stored in the <references> block of the Akoma Ntoso XML serialization, and the IRI to the appropriate ontology class is stored in the attribute @href.

The ALLOT⁹ ontology is part of UNDO¹⁰ (United Nations Document Ontology) [2], which makes it possible to specify context parameters through the TimeContextValue ontology¹¹. Akoma Ntoso has seventeen Top Level Classes representing the basic pillars of reality: time, person, organization, concept, object, event, location, process, role, term, quantity, definition, entity. Thanks to UNDO, each of them is connected with values (e.g., a role), time (e.g., the period of time when a person occupies a role), and context (e.g., FAO). This makes it possible to carry out specific queries like *give me the documents during the time that Mr. XXX acted in the role of YYY, and not as ZZZ*. Figure 2 shows how the allot:Role class is a subclass of Value, which is related to tvc:withValue and tvc: atTime, capable of tracking time parameters. This mechanism makes it possible to attribute a role to some conditions, including a particular jurisdiction, as well as competences and powers that are valid in given time intervals.

5. Semantic Web Searches

The experts also qualified the parts of speech (PoS) using Akoma Ntoso term tags. Each term is connected with a type of action suggested by the sentence: for example, *decides*,

⁸<http://bach.cirsfid.unibo.it/lime-fao/>.

⁹<https://w3id.org/akn/ontology/allot>.

¹⁰<https://unsceb-hlcm.github.io/onto-undo/>.

¹¹<http://www.essepuntato.it/2012/04/tvc>.

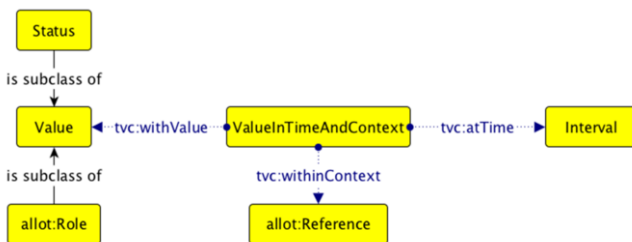


Figure 2. A TVC ontology pattern

authorises, or requests for operative sentences or noting, having taken into consideration, or In recognition of for preambular sentences. Using manual markup, we coordinated tokens of each term and we created a harmonized closed vocabulary of actions. We elected the best English token as a representative label for the class. All existing variants, including alternatives in the six official languages, are grouped under the main label. For example, *havingInMind* is a class that groups the following actions: *Having in mind* and *Having further in mind* and, in Spanish, the variant *Teniendo presente*. This is a method for creating a linguistic vocabulary starting from the terms present in the text so as to create concepts.

The same mechanism is applied to the document’s purposes. Each resolution has a main purpose (e.g., food security and strategy). The experts marked up the text using the Akoma Ntoso inline element <docPurpose>. The attribution @refersTo is automatically detected in the text and trimmed (e.g., foodsecuritystrategypurpose). The different linguistic variants are harmonized with the main purpose categories that are expressed in the TLCConcept in the <reference> block (Figure 3).

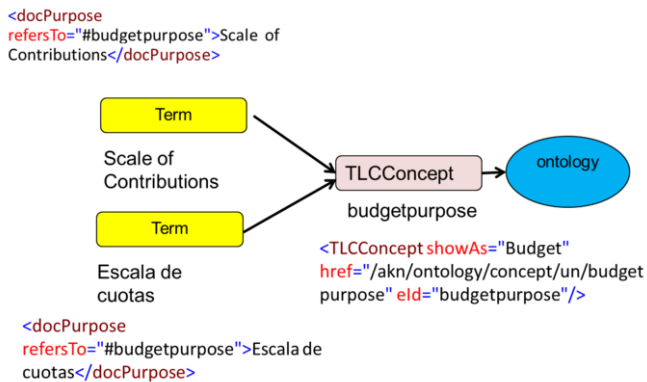


Figure 3. The term, concept, ontology mechanism in Akoma Ntoso for FAO resolutions

Using roles, persons, organizations, purposes, and actions, we provide the end user with a very effective search tool. All these filters can be combined with structural elements (e.g., resolution number, date of adoption), temporal parameters (e.g., time interval for a search), and full-text retrieval in the text or in its content. Using the option ‘search all in the same paragraph’, the end user can restrict a search to requirements in the same provision.

Additionally, the auto-compose widget is used to support end users who do not have advance knowledge of the query they need to make. The search panel in Figure 4 enables end users to easily make very complex queries, exploiting Semantic Web annotation and the XML structure. For example, it is possible to make the following query: *Give me all resolutions that introduce amendments into Constitutions, but only in the time interval from 2007 to 2018.*

Figure 4. Search channels

Finally we used the Sustainable Development Goals Interface Ontology (SDGIO)¹² to automatically classify resolutions when the text clearly mentions goals or the targets, as in this text fragment below: “Noting that camelids constitute the main means of subsistence for millions of poor families who live in the most hostile ecosystems on the planet, and contribute to the fight against hunger (SDG 2), the reduction of extreme poverty (SDG 1), the empowerment of women (SDG 5), and the sustainable use of terrestrial ecosystems (SDG 15)”.

This also applies to subgoals called targets: “Sustainable Development Goals (SDGs), particularly Target 2.5, related to genetic diversity”.

¹²<https://github.com/SDG-InterfaceOntology/sdgio>.

6. References and Navigation

The navigation of normative citations uses the Akoma Ntoso naming convention based on the FRBR ontology. Each citation is serialized by parsers and transformed into canonical IRIs. In dealing with cases where the collection does not contain a corresponding document in the required language, we implemented cross-language navigation: in such cases, navigation automatically redirects the end user to the English version. Finally, we have point-in-time navigation. If a reference is connected to multiple versions, the portal presents all the admissible versions possible. In Figure 5 we can see that Article VI of the Constitution points to any version prior to the date when the current resolution was adopted (2007). End users can choose the best option according to their requirements.



Figure 5. Point-in-time navigation of references

7. Information Interchange

The use of Akoma Ntoso in FAO, and also in the UN General Assembly in New York, makes it possible to develop a model for information interchange. One of the best examples is with citations from a UN-New York resolution to FAO resolutions. In Figure 6 we can see the link to Resolution 1496 of the UN General Assembly and Resolution 832 of the UN Economic and Social Council:

Having considered [Resolution 1496 \(XV\)](#) of the United Nations General Assembly and [Resolution 832 \(XXXII\)](#) of the United Nations Economic and Social Council,

Figure 6. Citations to the UN General Assembly managed using the Akoma Ntoso naming convention

Following is an AKN XML fragment. The AKN resolver¹³ can deference navigation to the appropriate portal according to the authority parameter (unga for the United Nations General Assembly, unecosoc for the United Nations Economic and Social Council):

¹³<http://akresolver.cs.unibo.it/>.

```
<ref href="/akn/un/statement/deliberation/unga/1960-10-27/15-1496/!main"
      eId="ref_1">Resolution 1496 (XV)</ref>
<ref href="/akn/un/statement/deliberation/unecosoc/1960-08-02/32-832/!main"
      eId="ref_2">Resolution 832 (XXXII)</ref>
```

8. Modifications

Textual modifications are marked up in the text using the specific metadata `<mod>` in order to track each annotation in the text, also using `<ins>` to apply redline tracing. These modifications make it possible to follow the way resolutions evolve over time and to highlight these changes to decisionmakers.

End users wanting to see modifications can do so using a tab pop-up that recaps the information of the textual changes. Figures 7 and 8 show how Akoma Ntoso information can be used in the interface to make for good user experience.

Resolution 13/85

AMENDMENT OF THE SPANISH TEXT OF RULES XII.9(a) AND XII.17 OF THE GENERAL RULES OF ORGANIZATION

THE CONFERENCE,

Noting that the Spanish text of Rule XII.9(a) GRO contains the expression "por aclamación", which does not correspond to the expressions used in the English and French texts ("by clear general consent" and "par consentement général manifeste", respectively),

Noting further that the Spanish text of [Rule XII.17](#) GRO also contains the expression "por aclamación", which does not correspond to the expression used in the English and French texts ("by general consent" and "par consentement général", respectively),

Considering the recommendation of the Committee on Constitutional and Legal Matters endorsed by the Council at its Eighty-sixth Session,

Considering further that it would be appropriate to amend the Spanish texts of Rule XII.9(a) and Rule XII.17 GRO in order to harmonize them with the other language versions,

Decides that the Spanish texts of [Rule XII.9\(a\)](#) and [Rule XII.17 GRO](#) be amended as follows:

Rule XII.9 (a)

2 modifications

El nombramiento de Presidente del Consejo y de Director General, la admisión de nuevos Estados Miembros y de Miembros Asociados y la elección de los Miembros del Consejo se decidirán por votación secreta. Las demás elecciones se decidirán igualmente por votación secreta, con la salvedad de que cuando no baya más candidatos que vacantes el Presidente podrá proponer a la Conferencia o al Consejo que el nombramiento se lleve a cabo por [aclamación] evidente consenso general.

Rule XII.17

Figure 7. Modification made to the Spanish version only

9. Multilingualism

FAO's six official languages create a challenging environment in the form of multilingualism. The identifier naming convention for Akoma Ntoso elements makes it possible to synchronise the different linguistic variants and to develop special tools to help experts translate the text and not have to mark up the document anew. The Akoma Ntoso ID set is composed of a pair: eId (expression identifier) and wId (work identifier). In the Arabic version, the items in a list are lettered using specific Arabic alphabetical symbol. In order to synchronize them with the other alphabets, we use wId tracking the English master copy, and eId is the local language ID (Figure 9). This synchronization makes it possible

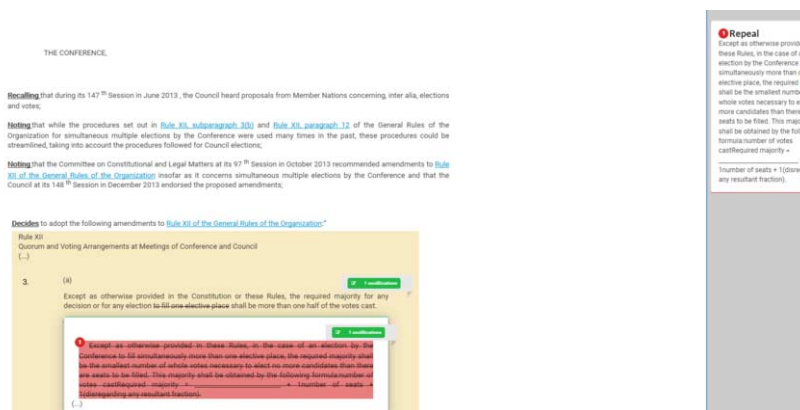


Figure 8. A repeal within a resolution is modelled using the metadata relative to the deleted text

to manage cross-referencing links from one language to another; it enables browser citation during navigation; it also makes it possible to automatically detect the correct local eId from the text by following the local alphabet of the current language; and it enables multilingual searching (e.g., give me all points with eId="list_1__point_"):

```
<list eId="list_1"><point eId="list_1__point_1" wId="list_1__point_a">
  <num>(1)</num><content eId="list_1__point_a__content">
```

Additionally, specific metadata are included in the XML AKN in order to connect the master copy with a translated version:

```
<FRBRtranslation fromLanguage="eng" by="#translator" authoritative="true"
  href="/akn/un/statement/resolution/FAO/2011-07-02/13-2011/eng@/!main"/>
```

Chinese and Russian variants use Latin letters to itemize list entries, and the problem of synchronization does not arise.

10. Visualizing Normative References

The Akoma Ntoso XML standard makes it easy to produce a network for analysing cross-references across all collections of resolutions. For this reason each resolution is enriched with a graph that shows the inbound and outbound links. Figure 9 shows how Resolution 9/2009 is connected with: blue points are references that cite the current resolution, yellow points are citation included in the text of the current resolution (Figure 10).

11. Conclusions

AKN4UN defined a general framework and guidelines for applying the Akoma Ntoso XML standard to UN documents. In particular a deep analysis was carried out to model the resolutions of UN agencies. FAO was the first UN agency that produced a proof of

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| <p>(1) 1- يقرّ رئيس السيد لوك غيو (Luc Guyau) رئيساً مستقلاً للمجلس حتى الدورة الثامنة والثلاثين للمؤتمر (يونيو/حزيران 2013)؛</p> <p>(2) 2- يقرّ أن تكون شروط التعيين في منصب الرئيس المستقل للمجلس، على النحو التالي:</p> <p>(أ) يتكوّن على رئيس المجلس أن يكون موجوداً في روما في جميع دورات المجلس والمؤتمر ولجنة المالية ولجنة البرنامج ويُقرّض فيه، في العادة، التواجد لمدة تتراوح من ستة إلى ثمانية أشهر في روما سنوياً؛</p> <p>(ب) يدفع لرئيس المجلس بدل سنوي قدره 23 800 دولار أمريكي؛</p> <p>(ج) يدفع لرئيس المجلس بدل مجتهد يومي يعادل 140 في المائة من بدل الإعاشة اليومي العادي المعمول به عندما يكون في روما أو عندما يكون مسافراً في مهام تتعلق بأداء منصبه؛</p> <p>(د) تغطّي المنظمة نفقات سفر الرئيس عندما يسافر لتأدية مهام منصبه؛</p> <p>(هـ) يحصل لرئيس المجلس عند أداء مهام منصبه، سواء في روما أو عند السفر، على حماية صحّيّة وتأمين طبي وفقاً للبند 343 من الجزء السابع من دليل إجراءات المنظمة؛</p> <p>(و) تقدم لرئيس المجلس خدمات السكرتارية لمساعدته على أداء مهام وظيفته؛</p> <p>(ز) تتاح للرئيس، بناء على طلبه، خدمات الترجمة الفوريّة رهناً بتوافر الموارد؛</p> <p>(ح) تتاح للرئيس، المكاتب والمعدات التي يحتاج في أداء مهام منصبه؛</p> <p>(ط) تقدم لرئيس المجلس المساعدة في الانضلاع بالإجراءات الإداريّة الضروريّة للحصول على الأوراق التي تقتضيها إقامته في روما وسفره لأداء مهام وظيفته.</p> <p>(3) 3- يقرّ أن يكون تنفيذ المطالب المنصوص عليها في هذا القرار بالاتفاق بين رئيس المجلس ومنظمة الأغذية والزراعة.</p> |
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Figure 9. Resolution 13/2011, with a list of points marked using Arabic letters

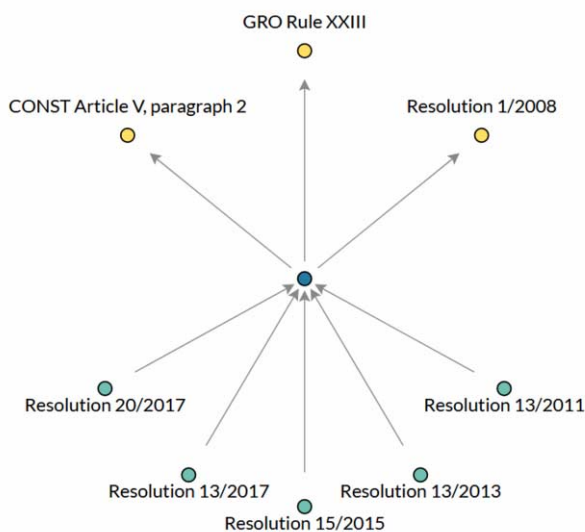


Figure 10. Diagram showing references made to and from Resolution 9/2009

concept is closer to a professional product and ready to go into production. The results of this proof of concept show that the Akoma Ntoso standard is robust in noncanonical legislative domains as well. The irregular structure of some resolutions put Akoma Ntoso under stress, and so we worked out special solutions like using the <crossHeading> element to isolate an odd preambular sentence embedded in the body of the provision. The best enrichment was done using ontologies and Semantic Web annotations to enhance the ability to express the knowledge included in resolutions and to permit specific, effec-

tive searching. Also, thanks to the Akoma Ntoso naming convention for IDs and IRIs, the system proved capable of managing multilingualism and dynamic cross-reference navigation between versions of documents at different times and between variants in different languages.

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