Open architecture for multilingual parallel texts

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1. Abstract

Multilingual parallel texts (abbreviated to parallel texts) are linguistic versions of the same content (“translations”); e.g., the Maastricht Treaty in English and Spanish are parallel texts. This document is about creating an open architecture for the whole Authoring, Translation and Publishing Chain (ATP-chain) for the processing of parallel texts.

2. Summary

2.1. Next steps

The next steps should be:

- Administrative organisation: create a coordinating organisation and approach the existing organisations that might cooperate; e.g., IETF, LISA, OASIS, W3C.

- Public discussion: with an emailing list (or similar) to reach a rough consensus, in particular on aspects such as the required specifications. Organise the necessary meeting(s).

- Tools: implement some tools. This might be done simultaneously with the public discussion to better illustrate the approach and support the discussion.

2.2. Best approaches

To obtain the best quality, speed and the lowest possible cost (QSC) in the production of parallel texts, one should aim for:

- Generating all the linguistic versions ready for publication, from linguistic resources. Probably one of the best approaches.

- Seamless ATP-chain implementations.

- Authoring: Computer-aided authoring (CAA) tools with a controlled authoring environment; it should deliver source texts prepared for translation.

- Translation: Computer-aided translation (CAT) tools to allow translators to focus only in translating and unburden translators from auxiliary tasks such as formatting. These tools should have functionalities such as side-by-side editor and the re-use of previous translations.


The open architecture (i.e., based on open standards) must allow the proper interoperability of programs from different software producers. It must be possible to implement client tools that give the impression to the users (e.g., authors, translators) of interfacing with one seamless system. These client applications might be interacting (through open standards) with many application servers that might be from different software producers; hence the complexity can be hidden from the users.
This open architecture must be designed for using Internet technologies. It should be viewed like an extension of the intranet/Internet to achieve wider interoperability with unrelated systems such as an internal financial management system or external record management system (“archiving”); office automation systems are mostly based on intranet/Internet technologies.

3. Rationale

3.1. Approach
This document combines:

- A primer for open architecture, parallel texts and related fields.
- A proposal for an open architecture for parallel texts encompassing the whole ATP-chain.
- An approach to attain these objectives.

The document is addressed to a mixed audience: parallel texts are at a crossroad of several fields (no pun intended). Some concepts might be self-evident to people familiar with one field and new to people in another field; hence, the style of re-stating the evident. The intention is to allow as wide an audience as possible to participate in a consensus process, with common terminology.

To start with, some concepts are simplified and unexplained, though they should be sufficiently clear by the context: they are explained later in the document and the gory details in the references. This is the principle of “lie, if it helps”:

“Another noteworthy characteristic of this manual is that it doesn’t always tell the truth.”
Don Knuth, The TEX book.

3.2. Quality, speed, cost (QSC)
These are three dimensions used to measure the production of parallel texts: one should aim to have the best QSC; i.e., high quality, high speed and as low a cost as possible.

3.3. Objective
The objective, mission statement and scope is:

“The production of parallel texts with the best QSC”

It is crucial to consider the whole process in order to have the best QSC in the production of parallel texts; and not only to optimize one phase, such as translation. One must be able to construct multi-vendor seamless systems that could evolve for an indefinite period. The components from the different software producers must be able to achieve interoperability.

3.4. Strategy
The strategy is to use open standards. In a parable: a standard is a recipe and a program is a meal. A cook might have a secret recipe that he only is willing to prepare and serve in his restaurant: his interest lays in maximising his profit by using his monopoly on this exquisite meal; the interest of the eater lays in having an open recipe, so he can prepare it or ask any number of cooks to prepare it.

The programs (“meal”) could be proprietary or open source; but standards (“recipe”) such as formats and protocols, must be open. A strategy based on closed standards creates many inconveniences for the clients. For example, it makes clients captive (“you can only have this meal
in my restaurant”); hence it is very painful and costly to change to a new product as all users, potentially thousands of them, would have to be trained for the new product.

3.5. Private specification and open standard

One might create a private specification for a private system. But one should look around to check if the private needs are really private or generic. With little or no additional effort and cost, it is possible to write a private specification as a proper (open or closed) standard.

Designing a private specification as a proper standard would make the resulting work more solid, independently if the result is published or not, as one has to look at the private needs from a more formal perspective. One has to use and interoperate with existing standards; indeed, one has to avoid re-inventing the wheel and one has to produce a new standard only if there is a genuine gap in standards.

Through this exercise, one might discover off-the-shelf programs that fulfil the private needs with parametrisation or minor modifications. Otherwise, it might be implemented in-house or outsourced; in both cases the task should be easier by having a proper standard. If the market is sufficiently horizontal and the standard open, there are good chances that software producers would implement several competing systems according to the new open standard.

There are some cases when one wants to keep the private needs private. For example, when the advantages of a firm depend on owning private software. But in general, particularly in the case of non-software firms, one is better off by collaborating in the creation of open standards. Software firms might try to create a monopoly, but today general awareness makes it difficult (not impossible) to corner a new market sector with monopoly practices: it is a different matter with already established monopolies.

3.6. Present

In this field, present products and initiatives concentrate on one of the phases (e.g., translation), perhaps adding as a second thought some aspects of the others (e.g., authoring). But the proper thing to do is to consider the three phases together.

For example, for computer-aided translation (CAT), there are no comprehensive standards. Programs from different vendors are incompatible; this means that clients are forced to buy a suite from one vendor. Initiatives such as Translation Memory eXchange [TMX] are a step in the right direction, though insufficient as they only cover one out of many aspects; i.e., one needs specifications to cover the whole ATP-chain.

4. Scenarios and examples

4.1. Generation of parallel texts

This is creating parallel texts programmatically ready for all the required languages and formats; e.g., a text in all the required languages camera ready and web ready. Generating parallel texts should be considered at least when there are tight phase binding and high reusability. In general, humans are better at translating and machines at auxiliary tasks. This is one of the best methods to create parallel texts with a very good QSC (quality, speed, cost).

With this approach, it could be considered that the three phases of the ATP-chain are nearly woven into one. The main conceptual components for the generation of parallel texts are:
• **Linguistic table**: a data structure where each *linguistic records* contains one parallel texts (each field contains a *linguistic segment*), plus at least a *record identifier*.

• **Document template**: specification with record identifiers.

• **Program**: it generates all the linguistic versions by replacing the record identifiers in the document template by the corresponding linguistic segment from the linguistic table.

This is a simple idealised model; in practice, there would be many linguistic tables, templates and programs. The table would usually be filled with human translated segments that could be used many times over. A demonstration is the *Generation of Multilingual Parallel Texts with XML [PARTEXT]*.

The conceptual approach is similar to the *Darwin Information Typing Architecture [DITA]*: *topics* (“units of information”) are combined by *maps* (“documents”). A topic is a very large *segment* and hence it has a very high *semantic safety*. Indeed, one could visualize a DITA-like approach to generating parallel texts. In this document, *topic* refers to the general conceptual approach; DITA or others.

4.2. Continuous publication

It is a publication with **minimal** changes in comparison to the previous version. One should apply *generation of parallel texts*. A *multilingual content management system* (MCMS) is a good example; it might be designed as a very integrated ATP-chain system.

Web sites are the shop windows of organisations and visitors expect them to be up to date. The construction and maintenance of multilingual web sites is particularly tricky. It is quite different from the more traditional parallel texts. For example, blatant errors must be **corrected immediately**. If an error appears in four pages and the site is in twenty-three languages (the number of official languages in the European Union [ISG]), it means changing ninety-two pages. In addition, most translation departments are geared to the translation of documents and not for short segments; hence, the whole business soon becomes a nightmare.

4.3. Periodic publication

It is a publication with a **significant** content from the previous version. One should apply *generation of parallel texts*. An example of this type of publication is the European Union Budget [EUB, SEIBUD, TEC]. A *generic generator for parallel texts* adaptable to the generation of different publications (as opposed to an application for one single publication) should be developed. Also, one can apply *periodic publications pre-processing*.

4.4. Seamless Legislative System

In a simplistic way, for countries (and political entities) with several languages, the *final products* of the legislative process are multilingual laws; i.e., parallel texts. Different parts are under the control of different authorities. Though such a system would continue to be composed of independent sub-systems, users in each authority should have the feeling of using **one seamless** system.

There should be an **overall malleable architecture**: the requirements and technology change within months. The sub-systems must follow common *specifications* to achieve **interoperability**. Each phase should take a few months and it should deliver **concrete benefits**. One should avoid a big bang of an over-specified monolithic system: “*Trust me, I will come back in a couple of years with your wonderful system*”. Reality is often different: five years late, over-budget and buggy.
Let's assume the following scenario with these imaginary programs that could come from different software producers; they achieve **interoperability** by using a common format: a *Multilingual Electronic Dossier* [MED].

### 4.4.1 Computer-aided law drafting (CALD)

This is an **integrated authoring system** that assists with the drafting of new laws, with facilities such as:

- **Controlled templates** for creating the new laws.

- **Connections to multilingual normative memories** [CA] to find appropriate (mandatory, recommended or verified) segments that have already been translated into other languages. Hence, no translation would be required for these segments. This could be particularly useful to non-native speakers of the drafting language.

- **Topic** to maximize reusability.

- **Authorship checker** that can give overall feedback to improve the text and facilitate translation and publication. Analogous to a spelling checker.

- **Background documentation module** to manage relevant pre-studies for this new law and similar background documents, which can be included in the MED or just linked to an external server.

- **Administrative module** to manage metadata, workflow (e.g., translation request) and packaging all the components (source document, background documents, metadata, etc) into one MED to forward for translation.

### 4.4.2 Translation pre-processing

Upon arrival for translation, *translation memories data* and additional background documents specific to the newly drafted law will be added automatically to the MED. These come from *linguistic databases* such as Euramis.

*Periodic publications pre-processing* is more sophisticated: one has to process the present version of the source language, the previous versions of the source and translated languages, and the linguistic database.

### 4.4.3 Computer-aided translation (CAT)

This is an **integrated** application for translators. It has an inbuilt **parallel text editor** that shows the source and a target text side by side; for easy identification, each segment is numbered and it has visual clues. This application could connect to servers to verify the translation quality on demand, "look over the shoulder" to other ongoing translations, connect servers such as Wikipedia, etc; e.g., the Spanish translator could look at the ongoing work of the French translator, both translating from English. This should be one of the first implemented tools (see *First Tools*).

### 4.4.4 Computer-aided publishing (CAP)

It is a program that produces automatically the publications in all the languages and formats required. Producing *HyperText Markup Language* [HTML] can be done automatically. Producing high quality typography can be done almost automatically, but it usually requires human intervention; e.g., human indicated refinements following badness feedback in TeX [TEX].
4.5. Textual interpretation

Textual interpretation is transforming (same language or translation; in real-time or afterward) any natural language form (e.g., speech, sign-language, text, etc) to text. For example, transforming a Spanish speech into an English text projected into a large screen in a room in real-time; there are two transformations: the interpretation (“translation”) from Spanish to English and the form from speech to text.

The main types of textual interpretations are:

- **Scribe**: in real-time, transforming speech to text in the same language. Even without interpretation, this greatly improves the understanding of non-native speakers; e.g., scribe in some ICANN meetings [ICANN].

- **Interpretation**: in real-time, transforming speech from a language to text in different language(s). Similar to traditional interpretation.

- **Consecutive**: in near real-time, transforming text from a language to text in different language(s). Similar to consecutive interpretation.

- **Translation**: afterward, transforming text from a language to text in different language(s). Similar to traditional translation.

For each type of textual interpretation, the most common natural language form input is indicated, although the input could be in any natural language form. Indeed, there are also variations such as:

- **Pivot form**: using an intermediary natural language form; e.g., for interpretation, first scribe (to text) and immediately interpret (to text) to the target language(s).

- **Pivot language**: using an intermediary language; e.g., from French speech to English text and from English text to Spanish text, so the pivot language in this case is English.

- **Interaction**: for example, a Spanish reader of an English text could request the simultaneous textual interpretation of one English sentence.

- **Summary**: as in translation, there could be a summary of the source language and a translation of this summary into several languages.

Textual interpretation depends on chat techniques such as Extensible Messaging and Presence Protocol [XMPP]; this protocol has a draft extension for Language Translation [XEP-LT], though it probably needs more work.

One might have a textual interpretation hub (i.e., far from the meeting room) that provides a service to many meetings. For many meetings this approach is sufficient. A textual interpreter is a new type of professional that requires a new mixture of skills.

5. Policy

The main considerations are policy factors and not technical factors. Even minor policy decisions can have far greater impact than big technical advances; e.g., the simple decision of not translating a whole category of documents is more significant than a wonderful new electronic dictionary. Policy addresses aspects such as:
• **Accounting**: measuring the **total** cost and **partial** costs, to apportion the costs properly.
• **Constraints**: what to enforce in each phase to have a better whole.
• **Entirety**: what is produced; e.g., full translation or only a summary.
• **QSC (quality, cost, speed)**: e.g., human or machine translation; printout or proper typography.

### 5.1. Accounting

One should have proper accounting for the total and for each phase of the ATP-chain. To apportion the costs properly, one has to identify the **phase's boundaries**.

For example, translation is to perceive (usually reading) a text in a language and expressing it (usually writing) in another language; all the rest is either authoring or publishing. Translating a badly written source text in an awkward file format must carry additional cost to the authoring phase; i.e., the translation phase must not pay for the sloppiness of the authoring phase. Formatting (for the web or other) or typography is publishing.

### 5.2. Constraints

Constraints refer to the limitations in each phase of the ATP-chain in order to facilitate the overall process with the objective of obtaining the **best** QSC (quality, speed, cost).

One might require that documents (e.g., 500 pages) must have a summary (e.g., 5 pages) that might be used for *summary* translations; indeed, the author is the best person to make the summary. If the source document does not contain a summary, it must be produced in the source language (by a human or a machine [SB]) **before** translating. Hence: the task of summarising is done only **once**; it would be the **same** summary for all linguistic versions.

*Translation starts with authoring*: a source text **prepared** (written, structured, formatted, etc.) with translation in mind is far easier and more economical to translate. The main aspects are:

• **Linguistic**: the language style itself; e.g., simple grammar.
• **Structure**: the document structure, including *metadata*; one can view it as the *content model*.
• **Format**: the file format, including *content and presentation*.

Indeed, one can use a topic approach.

### 5.3. Entirety

This is the policy decision on what has to be produced (and when), particularly in the translation and publication phases. For example:

• **Suspended translation**: translate only when certain conditions are fulfilled; hopefully never.
• **Summary translation**: translate only a 5 pages summary out of 500 pages.
• **Electronic publishing**: decide that the statutory final publication is electronic. Other non-statutory parties could be allowed to sell the paper version, under certain conditions.

Stating the obvious: translation has a **cost** and the lowest translation cost is achieved by **not translating**. The cost in 2005 was about 511 million euros [SR] for the European Parliament, the European Council and the European Commission; i.e., excluding all the other European institutions and bodies.
5.4. QSC (quality, speed, cost)
This refers to the quality and speed required in total and for each phase of the ATP-chain (authoring, translation, publishing): usually, the more quality and speed are required, the higher the cost (QSC). For example, human or machine translation (translation quality); the final text is required in 24 hours (total speed); printout or proper typography (publishing quality). In brief:

\[ \text{quality + speed} = \text{cost} \]

6. IT architecture
The intention is the interoperability among programs from different producers and the strategy is open standards. The approach should be seen as extending the Internet technologies to cover new application domains; hence, one shall follow the architectural practices [ARCH1, ARCH2, ART] of organisations such as the Internet Engineering Task Force [IETF], and the World Wide Web Consortium [W3C].

It is based on the application layer, like email [SMTP, POP] or the web Hypertext Transfer Protocol [HTTP]. And around the components: identifier (e.g., URI), format (e.g., HTML), and protocol (e.g., HTTP).

One should specify the open standards (e.g., format, protocol), and not the details of a particular program implementation, that could be of different richness. For example, there is no specification on how a browser should look like or which functionalities it should contain: some browsers are just command line and others are highly graphical with a myriad of features; however, browsers must follow the relevant specifications such as HTTP. When designing IT systems, one has to be:

- **Humble**: most of IT projects end in disaster [MC, NPfIT1, NPfIT2, VC].
- **Bifocal**: look simultaneously at short-term pressing needs and long-term strategy (“plan big, start small”).
- **Defensive**: parallel texts systems might have to interoperate with other future or legacy information systems; e.g., versioning system or long-term archival system [LTANS, DOCPRE].

The client tools should emulate the email clients and browsers: one has a wide choice and they are well separated from the servers.

7. First tools
These are the first tools that should be implemented. One might start in the middle phase (translation) with computer-aided translation (CAT) tools. There should by at least two independent implementations (an IETF practice) of CAT tools with the following characteristics:

- **Parallel texts editor**: it must be included.
- **Formats of the parallel texts**: implement the easiest of the suitable formats (e.g., HTML, RTF, plain text).
- **Format of the translation memories**: it must be TMX.
It would be desirable to have a web-based CAT tool. A Linux, Apache, MySQL and PHP [LAMP] approach or similar should be considered, though it could also be implemented as one self-contained implementation; e.g., CVStrac [TRAC] contains in one binary file the web server, database, wiki, repository browser, etc. Web-based has advantages such as: no binaries in the client computers; it should be easier to create a cooperating system as the data is already on a server. With binaries in the client computer, one would need a server for the common data. It should also be explored using the newer web approaches such as Prism [PRISM].

It should be possible to implement the CAT tools by modifying open source editors and wordprocessors. For example, Abiword, NVU, OpenOffice, etc [AB, NVU, OO]. The CAT tools could be partial implementations: the objective is to have as soon as possible tools to illustrate and validate the general approach. Though, the implementations should be modular enough to allow adding new functionalities later; e.g., a translation quality checker (inbuilt or server-based).

Hence, one should avoid all unnecessary complications: the format(s) of the parallel texts must be the easiest to implement as per the existing source code. For example, for HTML it might be NVU, and for OpenDocument Format [ODF] (RTF or plain text) it might be Abiword or OpenOffice.

Another useful tool easy to implement would be a MED validator: a checker [LINT] and generator of the main index file from the MED content.

One has to encourage commercial software producers to develop high quality interoperable tools: some might be full suites; others specialised modules.

8. Authoring, Translation and Publishing Chain (ATP-chain)

These are the three phases in the production of parallel texts. Traditionally, authors just concentrate on authoring, translators on translating and publishers on publishing. But the ATP-chain has to be considered as a whole and one has to seek the best QSC (quality, speed, cost) of the production of parallel texts. For example, one might consider increasing the quality in the authoring phase in order to facilitate translation and to attain a better global QSC.

The ATP-chain must be seen as bi-directional; i.e., translators should be able to request authors to modify the source text to facilitate translation, and the same goes for publishers (making request to authors and translators). Each of these phases contain smaller steps. For example, the creation of summaries or the identification of segments is part of authoring; record management (“archiving”) [MoReq, LTANS, DOCPRE, RM] is part of publishing.

8.1. Phase binding

It is the degree to which the phases of the ATP-chain can be integrated for the production of parallel texts. Often, phases cannot be integrated for administrative reasons, though technically it could be possible. The two extremes in a continuum (i.e., some cases fall in between) are loose and tight.

8.2. Loose phase binding

The interoperability is complex. Interfaces are required to connect the phases; e.g., an electronic dossier (container format). This is the more general case. The traditional relation between the author, translator and publisher is loose.

8.3. Tight phase binding

The phases could be integrated even to form a monolithic system. An example is multilingual content management system (MCMS) for web sites.
9. File formats

The file format largely conditions linguistic tools.

9.1. Content and presentation

Ideally, content and presentation should be separated. Among others it facilitates: the identification of the plain text and hence the processing along the ATP-chain; and the generation of multiple presentations of the same text.

In addition to presentations such as content for a web site, there should be presentations for aspects such as the automatic harvesting of segments for inclusion in linguistic databases (e.g., Euramis) and for record management.

XML is a good example of content technique and Cascading Style Sheets [CSS] of presentation. The Rich Text Format [RTF] is a good example of a format without separation of content and presentation.

9.2. Classification

For the issues at hand, text formats are classified as:

- **Plain text**: it just contains natural language.
- **Formatting-based**: it contains natural language and additional presentation information; e.g., RTF. Tricky to parse (“chop”) for content.
- **Markup-based**: it contains natural language and additional content (structural) information; e.g., XML. Straightforward to parse.

10. Data structures for natural language

10.1. Linguistic segment

Abbreviated to segment. It is a unit of language representation. It can be a fixed language representation (paragraph, sentence, term, etc) or meta-language representation (a grammatical construction, machine translation coding, etc). More general, a segment is a discrete linguistic unit whose meaning is created by the program processing it. Segment corresponds roughly to translation unit variant in TMX, (tuv element), linguistic object in Euramis, chunk, etc.

Segment as defined here must be usable for translation memory (“exact strings”), machine translation (“grammatical representations”) and other natural language techniques. A parable is regular expressions (the grep command in Unix): it encompasses literal strings (“exact strings”) and more advanced pattern expressions.

Similarly to Extensible Markup Language [XML] elements, segments can contain other segments; e.g., a paragraph would probably be composed of several sentences.

10.2. Data types

10.2.1 Monolingual data

In addition to the segment (the basic component), the two main types of monolingual data are:
• **Text**: continuous natural language text, usually in one file. One seeks to **identify** the segments within the text. An illustration is a narrative document.

• **List**: discrete segments. They do not form a continuous discourse. An illustration is a monolingual dictionary.

### 10.2.2 Multilingual parallel data

Two or more **linguistic versions** ("translations") of the same content combined to form parallel data. The main classes are:

• **Parallel texts**: two or more files, each with a different linguistic version. An illustration is two narrative documents that are translations of each other; e.g., one in English and the other in Spanish. One seeks to **align** the identified segments in each linguistic version. This is the partner of monolingual **text** above.

• **Linguistic table**: two or more synchronised lists as **linguistic records**, each in a different linguistic version. An illustration is a bilingual (or n-lingual) dictionary. This is the partner of monolingual **list** above.

### 10.2.3 Language neutral data

It does not contain natural language. For example, the same data can be included in any linguistic version: an annex where the headers are labelled with number, which are explained in another section. This is also called **no linguistic content**. As much as possible of the data should be prepared as language neutral as it is a very effective and **economical** approach.

### 10.3. Multilingual file

According to the moment of processing, there are the following main types:

• **During preparation**: it makes life difficult.

• **Final publication**: e.g., for example printing side-by-side two monolingual texts. One can view it as a form of presentation. Not problematic.

During the preparation, there are the following types:

• A **very mixed** multilingual file has a significant amount of text in several languages; e.g., the *panache* documents of the European Parliament.

• A **serial** multilingual file is usually bilingual and it has the main text in one language (e.g., Spanish) and one or several sections (e.g., annex with lots of numbers) in a second language (e.g., English) with limited amount of natural text. The cost of translating is low, but the publishing cost (typography) is high.

### 10.4. Monolingual text

#### 10.4.1 Indicator versus markup

The characteristics are:
• **Indicators** are characters part of the natural language text. They are used to guess the segment boundaries in the text; e.g., *dot* is used to guess the end of a sentence.

• **Markups** are characters not part of the natural language text. Hence, no guessing here; one knows for certain where the segment ends.

Separator is a type of simple markup that indicates just the boundaries between segments, but it does not carry structural information; i.e., it does not create a tree as in XML. The text is considered a flat string with separators; this text might be a file or just content of an XML element. This is particularly useful for *sentence segments* and *sub-sentence segments* and it greatly improves parsing. Separators might be just one character not used in the natural language, by definition.

10.4.2 **Programmatic segmentation**

Abbreviated to *segmentation*. It is identifying segments in a text with a computer program. The two main types of algorithms are:

• **String:** it uses *string analysis* and relies on indicators and markups. The algorithms are simpler and they are usually language independent; the same algorithm can be used for many languages [TB].

• **Grammatical:** it uses *grammatical analysis*. The algorithms are more complicated and they are language dependent: different algorithms must be used for different languages.

Most algorithms are mono-text; i.e., they do not take advantage from parallel texts. Segmentation algorithms using parallel texts should be better, particularly for string analysis. But even grammatical analysis should benefit, particularly among closely related languages.

10.4.3 **Manual segmentation**

It is identifying segments in a text by a human. This is rare, except when the text has to be processed by human for other purposes and identifying segments cost practically nothing; indeed, identifying segments might help the human with his main task. Manual segmentation is realistic when well-adapted tools are available; e.g., the tools suggest the segmentation and the human can easily accept or modify the suggestion.

The trivial example is manual segmentation at the moment of authoring; indeed, as with the summaries, the best person to segment is the author. Other examples are at the moment of translation, translation revision or proof reading for publication. Sometimes, this high quality manual segmentation is unintentionally produced and discarded; e.g., a translator might have to identify segments to use a tool and once the translation is completed this valuable manual segmentation is cleaned out and not kept for later processing such as inclusion in a linguistic database.

The term *manual segmentation* should not be abbreviated: *segmentation* on its own refers to *programmatic segmentation*.

10.4.4 **Segment size**

This classification reflects a historical thinking in term of formats without markups (i.e., using indicators), though it also applies to other formats:
10.4.5 Text granularity
It is a property of text that refers to the level of detail that segments in a text can be programatically identified. Different parts of the text might have different text granularities; e.g., a file might have a full sentence granularity (i.e., the whole file can be segmented at sentence level) or partial sentence granularity (i.e., only some sentences in the file can be segmented at sentence level).

10.4.6 Relation to XML
Expressing these concepts in the XML is quite simple. Indeed, processing a densely (i.e., including sub-sentence segments) marked XML document would be straightforward. But often one has to deal with documents with little or no markups.

10.5. Multilingual parallel texts
Abbreviated to parallel texts. These are linguistic versions of the same content; e.g., the Maastricht Treaty in English and Spanish are parallel texts. Parallel texts are a metaphor on parallel lines where each line represents one language, though some lines might be “broken”; e.g., one linguistic version might be a partial translation.

10.5.1 Segment semantics
By definition, the semantics in each linguistic version must be the same. The segment might be just a string where there is no further analysis or attempt to knowledge representation. One has to consider:

- **Own semantics**: It is having a meaning on its own.
- **Context semantics**: It is having the proper meaning in relation to the whole text. It increases when the text has an associated domain; e.g., law, computers, etc. Indeed, there could be finer attributes.

One seeks semantic safety; i.e., using the segment with the intended semantics. This is particularly important for the generation of parallel texts and it is related to one to many records. The larger the segments safer they are; indeed a topic should be totally safe. Sentence is the smallest that has a good chance of being semantically safe. Sub-sentence is a too broad classification and it is usually not sufficiently safe.

10.5.2 Parallel texts entirety
Abbreviated to entirety. It is a property of parallel texts that can indicate several attributes: completeness, quality, etc. The entireties are: complete, partial, summary, translating, machine, suspended, and undefined.

Several attributes can be combined. Examples:
- **complete**: the English and Spanish linguistic versions are complete translations of each other.
- **partial**: the French version excludes a large annex.
- **summary**: the German version is just a summary.
- **translating**: the Dutch version is in the process of being translated.
- **machine**: the Chinese version was done by machine translation.
- **suspended**: the Russian version could be translated after three departments have requested it, so the cost to each department would be a third.
- **undefined**: the Estonian version is in an undefined state.
- **summary + machine**: the Farsi version is a summary done by machine translation.

As already stated in the policy section: the less is produced the lower the cost. For example, the decision of producing only summaries from large documents would represent huge saving.

### 10.5.3 Parallel texts alignness
Abbreviated to alignness. It is a property of parallel texts that refers to synchronising the segments among parallel texts.

### 10.5.4 Parallel texts granularity
It is a property of alignness that refers to which detail segments in parallel texts can be programmatically aligned. The classification of the parallel texts granularities mirrors the classification of the segments: file, paragraph, sentence and sub-sentence.

The alignness depends on the text granularity of each linguistic version. As with text granularity, different parts of the parallel texts might have different parallel texts granularities; it cannot be finer than text granularity of each file; e.g., for a given part of the parallel texts, if the English version has a text granularity at paragraph level and the Spanish version has a text granularity at sentence level, the parallel texts granularity can be only at paragraph level.

### 10.5.5 Multilingual file alignness
This is when one of the linguistic version files is multilingual. For example, one file is multilingual (English, French, German) and the other five monolingual files (English, French, German, Spanish); the aligned English segments from the multilingual file should be the same as corresponding segments from the monolingual English file. This is very much a real case and not a farfetched example; indeed, it could be worse: when the multilingual file already contains aligned text.

### 10.6. Tabular structures

#### 10.6.1 Linguistic table
It is a data structure where each linguistic record (row) is parallel texts, plus additional non-segment data. A minimal example:

<table>
<thead>
<tr>
<th>Number</th>
<th>English</th>
<th>Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>hello world</td>
<td>Hola mundo</td>
</tr>
<tr>
<td>2</td>
<td>white cat</td>
<td>gato blanco</td>
</tr>
<tr>
<td>3</td>
<td>white cat</td>
<td>gata blanca</td>
</tr>
</tbody>
</table>

Linguistic record is abbreviated to record. It is also referred as row, translation unit in TMX (the tu element), alignment in Euramis, etc. There are two field types: segments and non-segments. For example, above the columns English and Spanish are segment types; the column Number is non-
segment type, a unique key (MATID in Euramis). It might contain additional non-segment fields such as domain (e.g., law), link to the source file, etc.

One can create separated linguistic tables for specific non-segment fields and eliminate the corresponding fields; e.g., one might create a table only for the domain law and hence it would not need to contain the classification field indicating the domain.

The main types of linguistic tables are:

- **Translation memory data**: a small linguistic table.
- **Linguistic database**: a large linguistic table.

### 10.6.2 Translation memory data

It is a small linguistic table that might contain at most few thousands records. Often, the data is related to one or a small collection of related files. The processing is usually interactive; e.g., with a CAT tool. Translation memory data might be created in batch from a linguistic database; usually, the exchange format is TMX, though one might use any format that represents a linguistic table, not even necessarily in XML (e.g., comma separated values). Also, a translation memory data could be constructed while translating.

Translation memory data beyond a certain size (i.e., when it starts to become a linguistic database) becomes inefficient, particularly with poor or no indexes. It is far better to maintain a linguistic database and extract a small translation memory data specific to one document. Also, one has to be careful with the implementation (see *TMX considered harmful*).

*Translation memory* (TM) refers to the technique (i.e., literal strings) as oppose to traditional *machine translation* (MT). The term TM might be ambiguous and one might have to be more specific: *translation memory tools* are programs for processing *translation memory data*.

### 10.6.3 Linguistic database

It is a large linguistic table that might contain millions of records; e.g., Euramis. Often, the processing on linguistic databases is in batch; also, for extraction (exact or fuzzy) it requires indexes.

### 10.6.4 Linguistic data harvesting

Abbreviated to *harvesting*. It is data extracting (segments and other data) from parallel texts (e.g., parallel corpora, completed or ongoing translations, etc) into linguistic tables. There are two types:

- **Programmatic harvesting**: data extracting with a **batch** program **without** human intervention. Usually it would go directly into a linguistic database.

- **Manual harvesting**: data extracting with an **interactive** program **with** human intervention, usually with processing the text for other purposes; e.g., translation. Usually it would go into a translation memory data and later into a linguistic database.

The additional data might be: a pointer to the file(s) from where the segment was extracted from, if possible to the exact place in the text; domain (e.g., law), etc. These two harvesting types mirror segmentation (also programmatic and manual) and share similar characteristics.

### 10.6.5 Record value

Ideally, this metric should reflect the future usefulness. If a person knows this value, it can be set manually; e.g., for a new term that will be use in the future such the term *blog* when it was coined.
More realistically, the value is calculated according to usage. The problem is that reading a record is not the same as using a record; the metric of reading a record is better than nothing, though it is far from reflecting the real usefulness of the record. In particular, a low value means low usefulness, but a high value does not necessarily mean a high usefulness; in other words, the figure detects low usefulness but not necessarily high usefulness. Analysing the translated documents can help to refine the record value; i.e., one can determine which record was really used, particularly if the format keeps the record identifier.

10.6.6 One to many records
A typical case is due to inflexion. Several records might have the same segment content in a language (e.g., English) and different segment contents another language (e.g., Spanish); the word roots should be the same. The more languages, the trickier it is; e.g., the records 2 and 3 in the table above due to grammatical gender.

An extraction from a linguistic database to create a translation memory might result in several records for one segment; in the case of CAT, a human translator would choose the correct segment. In the case of generation of parallel texts one has to be particularly careful.

10.7. Combination of textual and tabular data

10.7.1 Parallel texts corpora
Abbreviated to parallel corpora. It is a large set of parallel texts files that are not necessary related. Parallel corpora must be properly structured, so it can be processed programmatically and be used as the basic data for creating tabular data. From the raw parallel corpora one could create intermediate parallel corpora; e.g., from a parallel corpora with mostly RTF files it can be created an intermediate parallel corpora with files mostly in XML, so to facilitate further processing. One must preserve the original format as new algorithms might extract more information from the original documents.

Parallel corpora are the basic ingredient for techniques such as translation memories and the very promising statistical machine translation [MOSES]. Daydreaming: one computer disk with a directory structure containing all the translations made by of all the European institutions/bodies: over 56 years worth of translation at present in 23 languages; millions of pages. Indeed, however controls such massive repository dominates the field; in comparison the programs are secondary.

10.7.2 Record identification in text
In continuous narrative text, segments should be identified if they come from linguistic databases or similar resources. The identification is the linguistic database name and the record number; the segment (the field) as per the processing language. This might be done with a Uniform Resource Identifier (URI); e.g., http://example.com/r1, where http://example.com is the database name and r1 the record number, though the database name could be in a header and applied to the whole file (similar to the base element in HTML) and only the record number (r1) would be with each segment.

11. Electronic dossier
All the elements on a paper-based production of parallel texts constitutes a dossier containing administrative data, source text, translations, background documentation, etc. In the electronic world, one also needs an electronic dossier with all these components, if one seeks interoperability in the whole ATP-chain, particularly in the case of loose phase binding.
Xdossier [XDOSSIER] is a type of electronic dossier. It is a data object composed of a directory structure with files often in several formats. It is designed for browsing with web browsers. An Xdossier can be one file (container format) or a data object in a server that has the same outward look as the file.

The data object can be packaged as one single file with zip; similar to ODF and Microsoft Open Office XML [OOXML]. The main reason for zipping is packaging a structure containing several files into one file. Xdossier can have three contain forms:

- **Self-contained**: all components are in the file.
- **Mix**: some components are in the file and others are external (URIs point to these components).
- **External only**: the file contains only external components (URIs point to these components).

The rationale is that one could process (e.g., create or view) an Xdossier with existing generic tools such as an editor (e.g., vi, Notepad), zipping programs or browsers (e.g., Firefox, Internet Explorer). However, it is better to use specific programs such as a computer-aided translation (CAT) tool.

It should be avoided overloading a format; e.g., using namespace in XML to embed additional terminology. It is generally better to keep the overlay data in separate files. The whole could be packaged into an electronic dossier.

12. Multilingual Electronic Dossier (MED)

The MED is an Xdossier designed for the whole ATP-chain. The main MED sections are:

- **Header**: data concerning the whole dossier; e.g. administrative data, statistics, etc.
- **Parallel**: parallel texts.
- **Artefacts**: auxiliary items; e.g., translation memories, background documentation.

It is recommended to view an example of a MED to get a better feeling. The MED is one type of glue for loose phase binding; indeed, the first implemented programs should just use MED as an interface. MED is open and non-proprietary. Other formats and protocols with similar functionalities could be specified.

At the end of the ATP-chain, a MED might have data for the whole ATP-chain or just a subset; e.g., the publisher might not be interested in the gory detail of translation.

13. Miscellaneous linguistic aspects

13.1. Internationalization and localization (I18N, L10N)

Internationalization (I18N) means creating culture neutral systems apt for Localization (L10N) into different cultures; for example, Greece, Canada-French or Belgium-French. Language is one of the aspects, but there are others such as date representation [XLIFF].

13.2. Text reusability

Abbreviated to reusability. It is a measure of how much could be copied from previous texts and/or translation to translate a new text. It is a continuum between 0 and 1. Reusability 0 means that the whole text has to be translated. Reusability 1 means the whole text could be copied; e.g., a topic.
13.3. TMX considered harmful
TMX is useful for data exchange among unrelated systems. It has little sense to create a physical TMX file containing segments when a computer-aided translation (CAT) tool can address a server; e.g., when the CAT tool and the server are in the intranet of an organisation.

For a new file that has to be translated, one can submit the file in batch to a linguistic database system and the result should be an URI (not physical files) that points to a list of record identifiers (not the segments). CAT tools can use the URI, with the appropriate parameters if needed (e.g., language and/or format), to request translation memories (e.g., a language pair or a set of 23 languages) that might be even in TMX. This approach would avoid the creation and management of hundreds of thousand of physical TMX files. It can be implemented as a web service. The results could be ready, constructed on the fly or a combination of both; e.g., as the man command in Unix.

This technique can also be used in other cases such as putting in common linguistic resources from different organisations.

13.4. Characters
Unicode [UNICODE] must be the reference model for characters, although one can have different encodings as long as they are labelled; e.g., it is perfectly fine to use Latin-1 [L1] and using the Unicode Transformation Format in 8 bits [UTF8] does not need to be compulsory.

13.5. Language labels

13.5.1 Language(s) labelling
There are two types of language labelling:

- **Language(s) of the file**: the metadata indicating the language(s) in a file. It could be several languages. In the Dublin Core [DC] is the label language; also called language of the intended audience [IBP].

- **Processing language**: the language at any given point in the file. It can be only one language. It is particularly important in the case of multilingual files. In XML, normally the attribute xml:lang. Also called text-processing language.

13.5.2 Mislabelling
The usage of inappropriate codes must be avoided; e.g., the code ml [ISO-639-1], sometimes used to label multilingual files, is reserved for Malayalam, a language spoken by 36 millions people.

13.5.3 Missing language codes in ISO-639-1
Hereby, it is proposed to the ISO 639/Joint Advisory Committee adding to ISO-639-1 the following missing codes:

- **Multilingual file**: code mm.
- **Undetermined**: code un (in ISO-639-2 is und).
- **No linguistic content**: code xx (in ISO-639-2 is zxx).

If these codes are not available in ISO-629-1 and they are needed, people would use anything.
14. Administrative organisation

There should be a new organisation to lead and coordinate this initiative. But as many as possible of the activities (specifications, meetings, etc) must be done within (or in close collaboration) with other existing organisations. For example, the IETF, W3C, Organization for the Advancement of Structured Information Standards [OASIS], Localization Industry Standards Association [LISA], etc.

This new organisation could be similar to the XMPP Standards Foundation [XMPP]. The approach must be similar to the IETF [TAO]: open to everybody, participation at a personal level, inform the stakeholders (e.g., vendors, specification organisations and users), create the specifications and programs simultaneously ("running code wins"), create a web site, wiki, mailing list, organise meetings, etc.

In the case of closed collaboration, it might take different forms: working groups, workshop, etc. For example, for some aspects one might apply to the IETF to create a new working group, probably in the Applications Area [APPS]; for other aspect one might apply to the W3C for a workshop [NLPIX2008] in the context of their annual conference [WWW2008].

15. Legal and miscellaneous

15.1. Disclaimer
This document represents only the views of the author and not necessarily the views of any other parties. In particular, it does not necessarily represent the opinion of the European Commission, his present employer.

15.2. Comments
To send comments to the author and follow-ups see:

http://dragoman.org/par

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