

research directions— *universal interchange*

Technology changes rapidly. Just think about the development of the PC in the last two decades of the previous century. And applications change rapidly too. At the time of writing the web does barely exist for ten years. Information spaces, on the other hand, from a sufficiently abstract perspective at least, should be rather stable over time. So the question is, *how can we encode information content in an application-independent way?* As a remark, application-independence implies technology-independence. The answer is, simply, XML. The next question then should be, what is XML and why is it more suitable for encoding information than any of the other formats, such as for example relational tables.

The first question is not so difficult. There are many sources from where an answer may be obtained. Perhaps too many. A good place to start is the XML FAQ (Frequently Asked Questions) at the Web Consortium site:

<http://www.w3.org/XML/1999/XML-in-10-points>

XML is a set of rules (you may also think of them as guidelines or conventions) for designing text formats that let you structure your data.

More specifically, XML may be characterized as follows:

XML in 10 points

1. XML is for structuring data
2. XML looks a bit like HTML
3. XML is text, but isn't meant to be read
4. XML is verbose by design
5. XML is a family of technologies
6. XML is new, but not that new
7. XML leads HTML to XHTML
8. XML is the basis for RDF and the Semantic Web
9. XML is license-free, platform-independent and well-supported

Perhaps not all of these points make sense to you at this stage. So let me first indicate that XML has in fact quite a long history. XML is the successor of SGML (the Structured Generalized Markup Language) that was developed in the 1980s to encode documents (such as airplane manuals) in an application-independent manner. SGML is not a language itself, but a description of how to create a content description language, using tags and attributes (as in HTML). In fact, HTML is an application of SGML, using tags with attributes both for formatting and hyperlinks. In other words, SGML is a meta language. And so is XML. Since everything got messy on the web, XML was proposed (as a subset of SGML) to make a clear distinction between content and presentation. Presentation aspects should be taken care of by stylesheets (see below) whereas the content was to be described using an XML-based language.

Now, why is XML a suitable format for encoding data? That question is a bit harder to answer. One of the reasons to use XML might be that it comes with a powerful set of related technologies (including facilities to write stylesheets):

related technologies

- Xlink – hyperlinks
- XPointer – anchors and fragments
- XSL – advanced stylesheets
- XSLT – transformation language
- DOM – object model for application programmer interface
- schemas – to specify the structure of XML documents

These technologies (that are, by the way, still in development) provide the support needed by applications to do something useful with the XML-encoded information. By itself, XML does not provide anything but a way to encode data in a meaningful manner. Meaning, however, comes by virtue of applications that make use of the (well-structured) data.

In summary, XML and its related technologies provide the means to

XML

- separate data from presentation
- transmit data between applications

Actually, the fact that XML was useful also for arbitrary data interchange became fully apparent when XML was available. To get an impression of what XML is used for nowadays, look at www.xml.org.

This leaves us with the question of why XML is to be preferred over other candidate technologies, such as relational databases and SQL. According to [XSLT], the answer to that question is simply that XML provides a richer data structure to encode information. In the multimedia domain we see that XML is widely adopted as an encoding format, see section ???. For an example you might want to have a look at MusicXML, an interchange format for notation, analysis, retrieval, and performance applications, that is able to deal with common Western musical notation as used from the 17th century onwards. In appendix ?? we will explore how XML might be useful for your own multimedia application by treating some simple examples.