

Recordare Case Study



An Altova customer uses XMLSpy and DiffDog to develop MusicXML-based “universal translator” plugins for popular music notation programs.

Overview

Recordare® is a technology company focused on providing software and services to the musical community. Their flagship products, the Dolet® plugin family, are platform-independent plugins for popular music notation programs, facilitating the seamless exchange and interaction of sheet music data files by leveraging MusicXML.

Dolet acts as a high quality translator between the MusicXML data format and other applications, enabling users to work with these files on any conceivable system, including industry leading notation and musical composition applications Finale®

and Sibelius®. The list of MusicXML adopters also includes optical scanning utilities like SharpEye or capella-scan, music sequencers like Cubase, and beyond. Dolet increases the MusicXML support in all of these programs and promotes interoperability and the sharing of musical scores.

In creating the Dolet plugins, Recordare used Altova's XML editor, XMLSpy, for editing and testing the necessary MusicXML XML Schemas and DTDs, and its diff/merge tool, DiffDog, for regression testing.

The Challenge

Music interchange between applications had traditionally been executed using the MIDI (Musical Instrument Digital Interface) file format, a message transfer protocol that has its roots in electronic music. MIDI is not an ideal transfer format for printed music, because it does not take into account the multitude of notations (e.g., rests, repeats, dynamics, lyrics, slurs, tempo marks, etc.) that convey much of the meaning.

MusicXML is an open, XML-based file format specifically created to encapsulate musical notation or digital sheet music data that was built on top of previous formats, MuseData and Humdrum. XML lends MusicXML the power and flexibility to be easily accessed, parsed, rendered, and otherwise manipulated by a wide variety of automated tools, and its general acceptance as a standard makes it an ideal format for scoring using computer technology.

Since its original release by Recordare in January of 2004 (version 2.0 was released in June 2007), MusicXML has gained acceptance in the music notation industry with support in over 100 leading products, and is recognized as the de facto XML standard for music notation interchange. These products would not have adopted MusicXML unless it could be used to exchange data with industry-leading applications like Finale and Sibelius.

By developing advanced plugins for popular music notation suites, Recordare would be able to deliver to their customers all of the advantages that XML can bring for data exchange and standardization.

The Solution

Below is an example showing the score of the first few measures of Beethoven's *An die ferne Geliebte*, Op. 98 as it is written in sheet music:

Ziemlich langsam und mit Ausdruck

Auf dem Hü - gel sitz' ich spä - hend in das blau - e Ne - bel -

Rea * Rea * Rea *

and a small snippet of the same piece translated to MusicXML:

```

103 <part id="P1">
104 <measure number="1" width="324">
105 <print>
106 <system-layout>
107 <system-margins>
108 <left-margin>150</left-margin>
109 <right-margin>0</right-margin>
110 </system-margins>
111 <top-system-distance>300</top-system-distance>
112 </system-layout>
113 </print>
114 <attributes>
115 <divisions>24</divisions>
116 <key>
117 <fifths>-3</fifths>
118 <mode>major</mode>
119 </key>
120 <time>
121 <beats>3</beats>
122 <beat-type>4</beat-type>
123 </time>
124 <clef>
125 <sign>G</sign>
126 <line>2</line>
127 </clef>
128 </attributes>
129 <direction placement="above">
130 <direction-type>
131 <words default-y="26" font-size="11" font-weight="bold" relative-x="-40" xml:lang="de">Ziemlich
langsam und mit Ausdruck</words>
132 </direction-type>
133 <sound tempo="60"/>
134 </direction>

```

The MusicXML-based Dolet 4 plugins for Finale and Sibelius provide a more accurate and usable representation of sheet music than Standard MIDI translation. For example, the images below show the same piece of music. On the left is a

Finale 2009 rendering of a MIDI file exported from Sibelius, and on the right is the same application's interpretation of a MusicXML 2.0 file exported from the same version of Sibelius.

Score **[Title]** [Composer]

Voice

Piano

Score **Can You?** Michael Good

Moderately slow

Voice

Piano

f

Cm *F* *Cm*

Can you feel... every-one or is it on-ly me Who

Cm

thought that you were nice and then got lod in mis - e-ry? Can you al-ways pull the weed

In the MIDI rendition, vital information like chord symbols, lyrics, slurs, articulations, and even title and composer are omitted from the translation.

In addition to providing native support for MusicXML, the recently released Dolet 4 for Finale and Dolet 4 for Sibelius plugins enhance the capabilities of these programs by adding advanced features like:

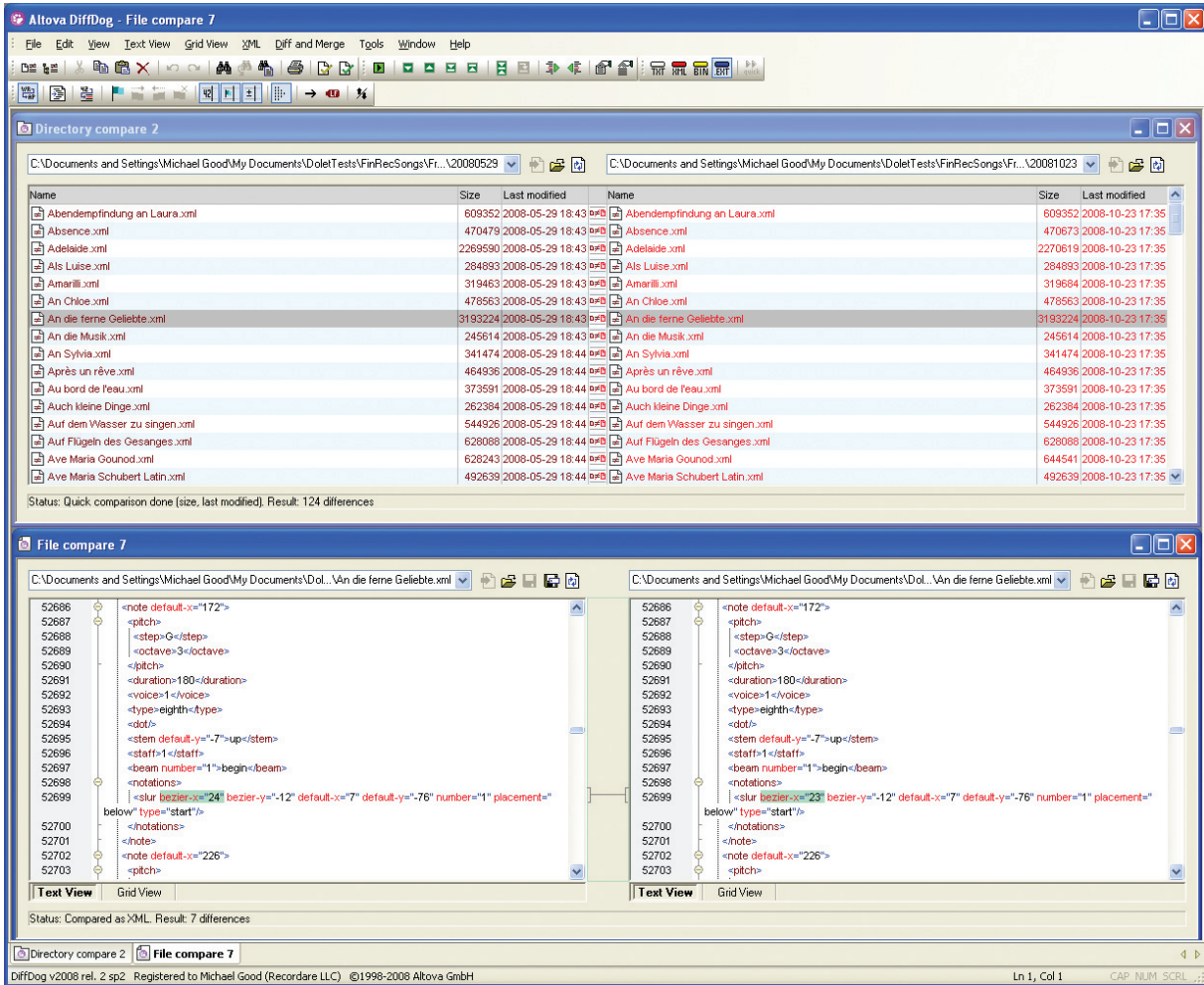
- **batch translation**
- **more accurate and reliable data exchange**
- **more formatting control**
- **support for the MusicXML XML Schema (in addition to the DTD)**

In developing the plugins, Recordare was subject to specific requirements dictated by the Sibelius and Finale applications. The Sibelius plugin was programmed in ManuScript, and is one of the largest plugins ever written in that language. Finale, on the other hand, requires plugins to have a C++ core, and Recordare implemented this, adding MusicXML logic in Java and a JNI layer to provide the two-way Java/C++ communication.

Recordare's Dolet plugins are now critical aspects of the music preparation process for many television and film scores as well as new music publications. Errors in translation need to be fixed in maintenance updates, while ensuring that no new errors are introduced into these complex translation plugins. Regression testing of the

MusicXML file produced by the Dolet plugins is thus an essential part of Recordare's quality assurance process.

Recordare used Altova XMLSpy and DiffDog in the development of the Dolet plugins. XMLSpy was used to test and edit their DTDs and XML Schemas, and DiffDog was utilized for regression testing the MusicXML files produced by the software. Recordare has several regression test suites covering a wide range of musical repertoire, from baroque to hip-hop. DiffDog allows easy differencing of multiple runs of these test suites, including the ability to ignore differences in XML metadata elements such as software version and XML creation date that always change across test cases.



Recordare has used Altova XMLSpy to edit the MusicXML DTDs and XML Schemas, starting with the use of XMLSpy 3.5 (released in 2001) to create the earliest alpha and beta versions of the MusicXML DTD. Version 2.0 of MusicXML added a compressed zip version of the format,

similar to what is used in other XML applications like Open Office and Open XML. XMLSpy 2008 Enterprise Edition's comprehensive support for zipped XML files made it easy to test this new feature together with the Dolet for Finale plugin.

XMLSpy's support for XQuery has also contributed to Recordare's regression testing efforts. In response to a customer request, Recordare now exports XML processing instructions from the Dolet for Sibelius plugin when it encounters a musical feature that it is unable to translate correctly. A simple XQuery execution to search for all the processing instructions

in the XML files in a given folder lets Recordare check for the presence of these restrictions within each test suite, and then compare the resulting XML files using DiffDog between runs of the test suite.

Recently, customer demand led Recordare to develop an XSD version of the MusicXML format. XMLSpy was used to develop and test the schemas. Schema validation, schema restriction and extension, and automatically-generated schema documentation were all able to be tested using XMLSpy's features.

The Results

The Dolet plugins are extensions for common industry software that harness the built-in capabilities of the MusicXML format to make musical scores truly interchangeable across disparate systems and toolsets. These plugins have the capacity to render accurate and meaningful musical notation based on the powerful MusicXML specification.

The leading XML Schema editing capabilities in XMLSpy and the strong XML file and directory differencing support in DiffDog enabled Recordare to write and polish the MusicXML schemas and perform regression testing on the Dolet plugins. The resulting high quality of the schemas and software has made MusicXML and the Dolet plugins a key element of the toolkit for composers, arrangers, publishers, copyists, and engravers throughout the industry wherever printed music is used.

<http://www.recordare.com/sibelius/video/dolet3sib.html>

Reproduction in whole or in part in any form or medium without express written permission is prohibited. Altova®, MissionKit™, XMLSpy®, MapForce®, StyleVision®, UModel®, DatabaseSpy®, DiffDog®, SchemaAgent®, SemanticWorks®, Authentic®, and AltovaXML™ are trademarks and/or registered trademarks of Altova GmbH in the United States and/or other countries. The names of and reference to other companies and products mentioned herein may be the trademarks of their respective owners. Altova believes that the information in this publication is accurate as of its publication date; such information is subject to change without notice.

