

Markup Languages for Music: MusicXML

Music 253/CS 275A
Stanford University

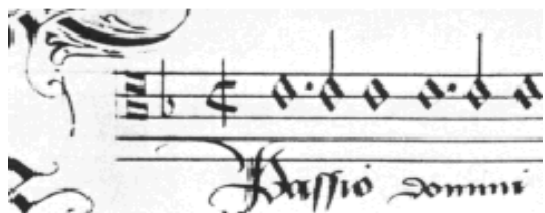
XML-based codes: CMME for virtual editions (early music)

- *Corpus Mensurabilis Musicarum* (est. 1998)

Est. and built by Theodor Dumitrescu, Oxford-Utrecht-Berkeley



Goal: *One encoding, multiple systems of notation for mensural notation*



cmme.org

From *The Virtual Score*. Used by permission.

CMME (2013)

Early Music Editing

Principles, Techniques, and Future Directions



about **program** pictures

3-5 July 2008
Universiteit Utrecht
The Netherlands

- *Computerized Mensural Musical Editing*
- *Based in Utrecht*
- Marnix van Berchum (director from 2012--)
- Home of “The Other Josquin” [attribution study]
- Source code publicly available (GNU license) at <https://github.com/tdumitrescu/cmme-editor>



CMME today

Content lists,
some scores
for 15th-16th cent
music

The image displays two windows of the CMME Viewer software. The main window, titled '05-anon-hec_est_preclarum_vas.cmme.xml: CMME Viewer', shows a musical score for 'Hec est preclarum vas' by Anonymus. The score is displayed in a multi-staff format with lyrics in Latin. The lyrics include: 'Do - mi - na no - mi - na no - no - fac nos tuis precibus consortes'. The score is marked with measure numbers 64 and 69. The interface includes a 'File View' menu, a search bar, and a 'Commentary' section at the bottom indicating 'No commentary selected'. A smaller window in the foreground shows a different view of the score, with lyrics: 'Sancta maria clemens et pia domina nostra fac nos tuis precibus consortes celestis glorie amen'.

<http://www.cmme.org>

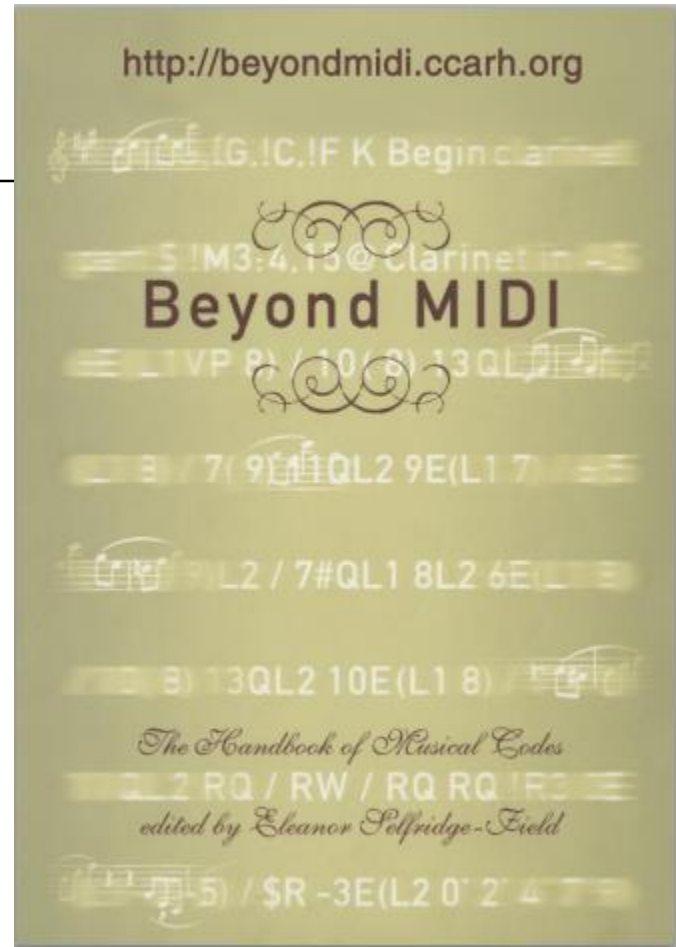
In the beginning...

Beyond MIDI (1997)

- IMS study group
- 39 contributions
 - 3 interchange codes
 - 5-10 defunct
- Lacks Guido (2001); cf. CM 13 (2001)

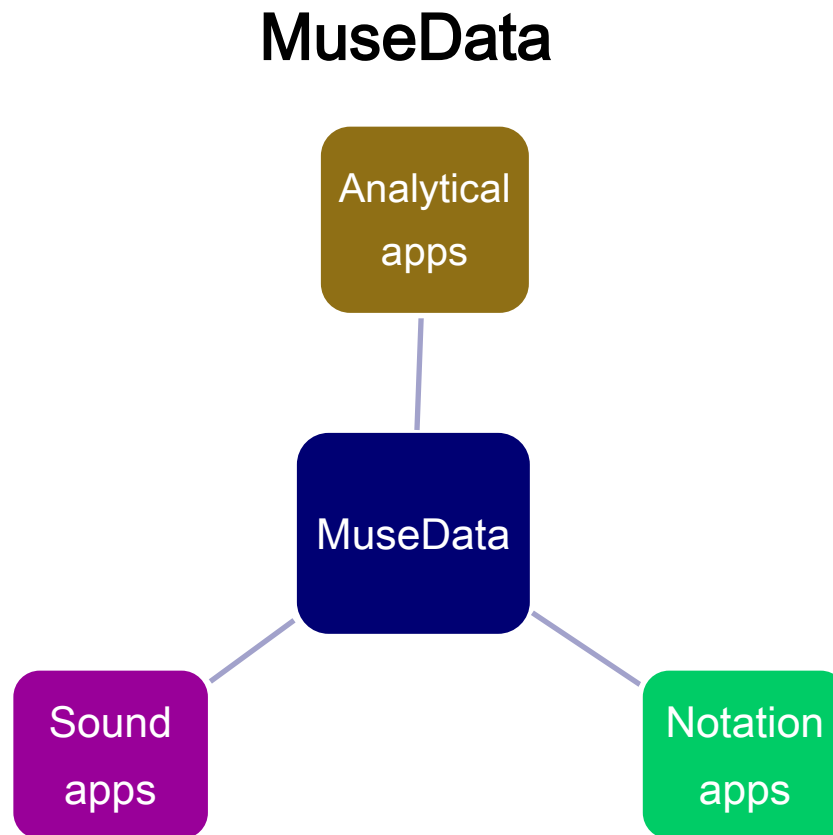
Efforts to facilitate interchange (via XML)

- CMME (1998)
- MusicXML (2000)
 - MuseScore
- Add-ons to other software



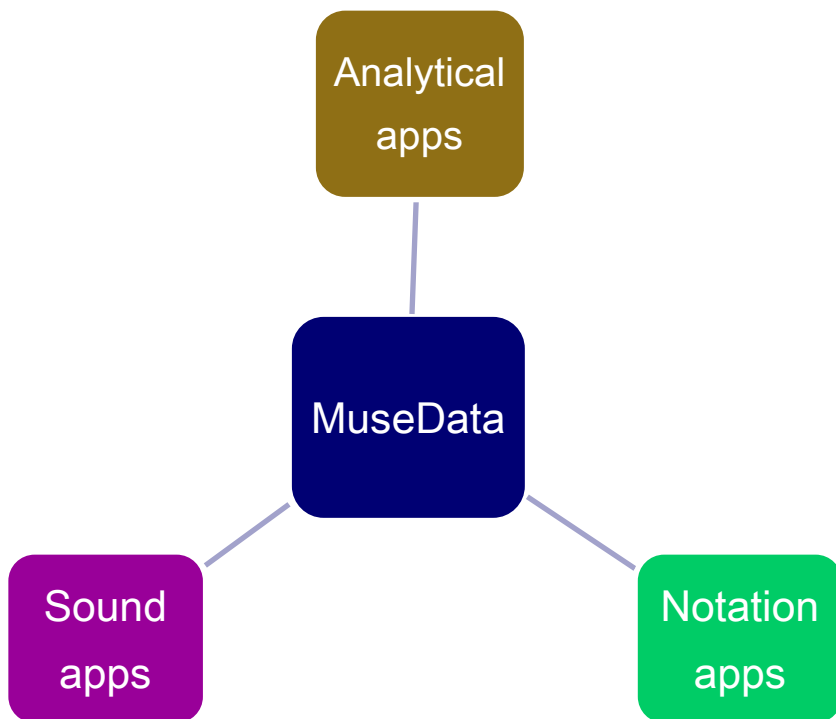
<http://beyondmidi.ccarh.org/beyondmidi-600dpi.pdf>

From data to apps: *MuseData* Model

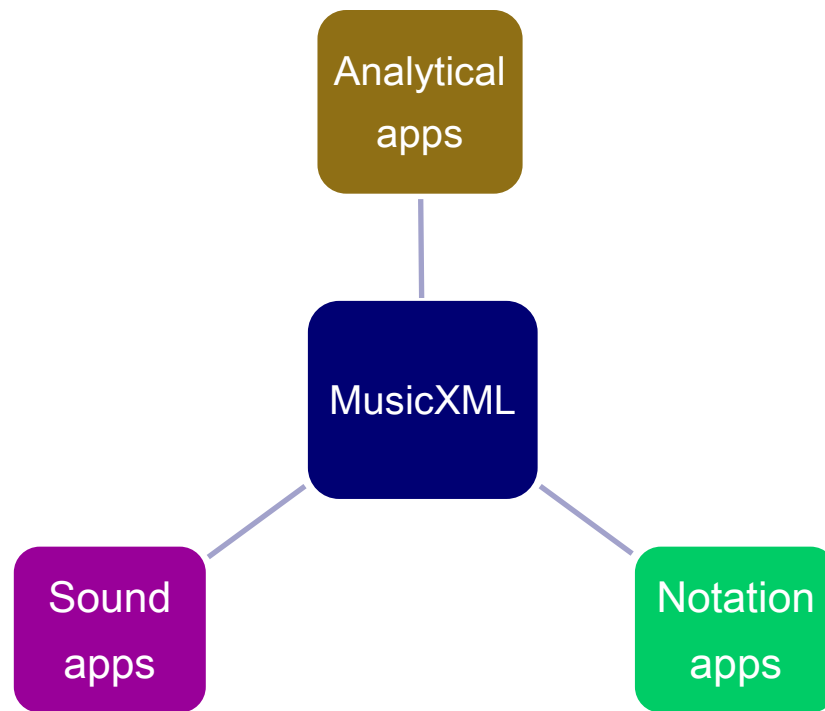


MusicXML vis-à-vis MuseData

MuseData



MusicXML

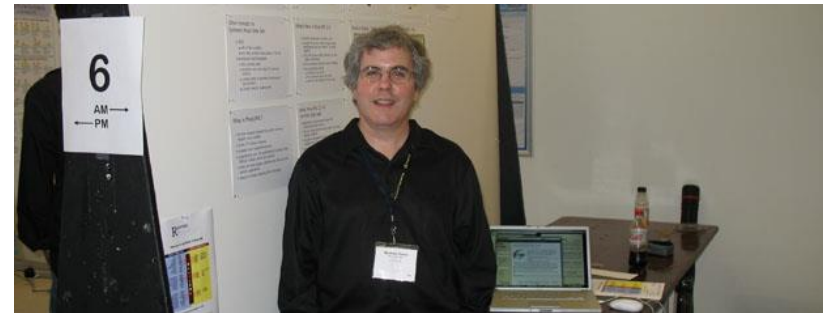


MusicXML: History

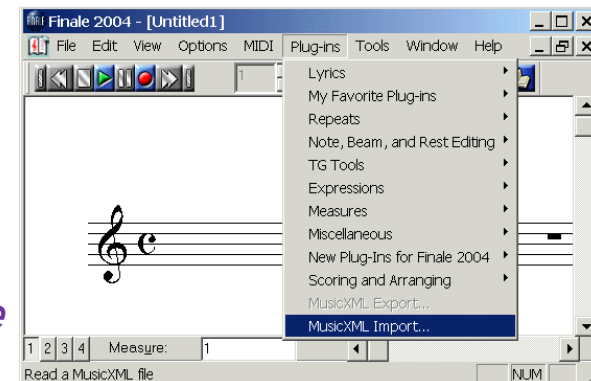
- Developed from 2000 by Michael Good
- **Distrib Recordare** (2002-2011)
 - V. 1: platform-specific (2004)
 - V. 2: Java (2007)
 - V. 3: Java (2011)
 - Sold as add-on to *Finale*, *Sibelius* et al.
- Sold to **MakeMusic** (*Finale*) in 2011
 - Native in *Finale*; more limited capabilities in *Sibelius*

<http://www.makemusic.com/musicxml/>

Sibelius team moved to Steinberg as *Keeping Score*



NAMM 2011



MusicXML: Main Aims

- Nexus of all **commercial** notation interchange schemes
- Highest structural compatibility with MuseData and Humdrum
- Most useful tool for converting from older to newer versions of Finale!
- In use for over past decade by many small sw companies and a few music publishers (inc. Hal Leonard)

Purpose

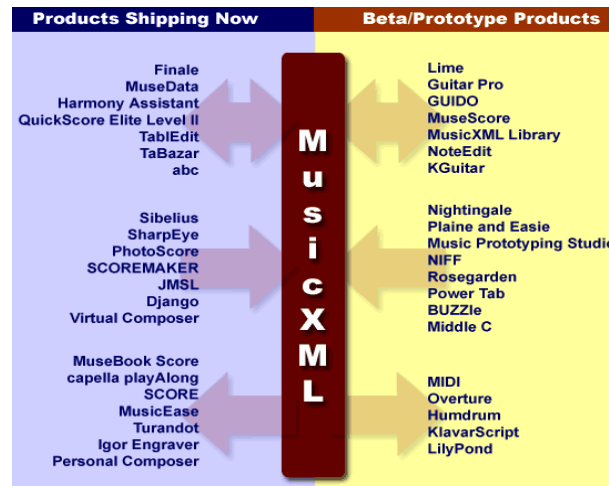
- Primary function of MusicXML is **data interchange** between programs:

Finale

MuseData

Sibelius

SCORE



Guido

MuseScore

Humdrum

Lilypond

image from: <http://recordare.com/xml.html>

- Designed for encoding **common-practice western music notation.**

Part/score orientation in *MuseData*

1. Encode voice by voice for full movement
2. Add lyrics, other refinements
3. Repeat until all movements are encode
4. Assemble score

The image displays two examples of musical score orientation in MuseData. The top example shows a part score with five staves: clarinet in A, violino I, violino II, viola, and violoncello. The bottom example shows a full score with five staves, including a vocal line at the top. Both examples show musical notation with notes, rests, and dynamic markings like 'p'.

Part/score orientation in *MusicXML*

Both/and

1. Encode **voice by voice** or **bar by bar**
2. **Transform array** as needed

Part-wise (MuseData)

Time-wise (Humdrum)

The image displays two musical score excerpts. The top excerpt shows a score with five staves: 'clarinet in A', 'violino I', 'violino II', 'viola', and 'violoncello'. A vertical yellow bar highlights a single bar across all staves, representing a 'part-wise' orientation where data is organized by instrument. The bottom excerpt shows a score with five staves, with the top staff labeled 'S'. A vertical yellow bar highlights a single bar across all staves, representing a 'time-wise' orientation where data is organized by time step. In this view, the staves are labeled 'pt--', 'pi--', and 'pc--' on the right side, indicating a time-wise structure.

MuseScore

- Uses MusicXML instead of individual rep system
- Java-based
- Doc in several languages
- Open-source level
- Closed-source level
- *YouTube* tutorials
- *For now*: shareware

The image displays a page of musical notation for a piano piece. The notation is arranged in five systems, each with a treble and bass clef staff. The piece is in 4/4 time and features various dynamics and tempo markings. The first system is marked "Andante con moto (♩ = 120)" and "mp". The second system is marked "più mosso" and "rit.". The third system is marked "rit." and "tempo primo". The fourth system is marked "accel.", "rit.", "meno mosso", and "mf". The fifth system is marked "rall." and "mp". The piece concludes with a "8va" marking, indicating an octave shift.

musescore.org

Music by Marc Sabatella

Lilypond



- Shareware (GNU) engraving, own code (c. 2005)
- Dev (Han Wen Nienhuys) in Netherlands (now lives in Brazil)
- All platforms (mainly unix/linux)
- TeX-like syntax, markup
- Extensive online documentation
- *Musicxml2lp* script (Lilypond 2.12.3)
- Hosts “unofficial MusicXML test suite”
 - (no official test suite)
 - Good categorical organization



<http://www.lilypond.org/doc/v2.16/Documentation/snippets.pdf>

<http://wiki.ccarh.org/wiki/Lilypond>



<http://lilypond.org/doc/v2.12/input/regression/musicxml/collated-files.html#Test-cases>

MusicXML: Current status (v. 3.0, 2013)

- <http://www.makemusic.com/musicxml/specification/dtd>
- Partwise/timewise conversion (v. 1.0)
- “Common” DTD (v. 3.0)
- *Sound*: timbral recognition (sounds.xml, v. 3.0)
- *MIDI*: in absolute or delta times (v. 3.0)
- *Layout module* (v.1.1): formatting data as elements
- *Other*: some support for recent music, no semantic support for early music

MusicXML: basic file structure

- Row/column rotation handled through XSLT style-sheets
 - (no style sheets in beginning)
- Score/part/measure elements at top of file
- Lots of metadata fields possible in score header
- DTD: <http://www.musicxml.com/for-developers/musicxml-dtd/>

MusicXML: MIDI interface

Andantino *dolce*

Dans un som - meil que char-mait ton i - ma - - - ge

pp

```
<attributes>
  <divisions>24</divisions>
  <key>
    <fifths>-3</fifths>
    <mode>minor</mode>
  </key>
  <time>
    <beats>3</beats>
    <beat-type>4</beat-type>
  </time>
</attributes>
```

```
<note>
  <pitch>
    <step>E</step>
    <alter>-1</alter> Accidental="alter"
    <octave>5</octave>
  </pitch>
  <duration>24</duration>
  <tie type="start"/>
  <lyric>
    <syllabic>end</syllabic>
    <text>meil</text>
    <extend/>
  </lyric>
</note>
```

```
<note>
  <pitch>
    <step>C</step>
    <octave>4</octave>
  </pitch>
  <duration>1</duration>
</note>
<note>
  <chord/>
  <pitch>
    <step>E</step>
    <alter>-1</alter>
    <octave>4</octave>
  </pitch>
  <duration>1</duration>
</note>
<note>
  <chord/>
  <pitch>
    <step>G</step>
    <octave>4</octave>
  </pitch>
  <duration>1</duration>
</note>
```

MusicXML Apps

Scorio (2014)

-import from MusicXML

-export to LilyPond



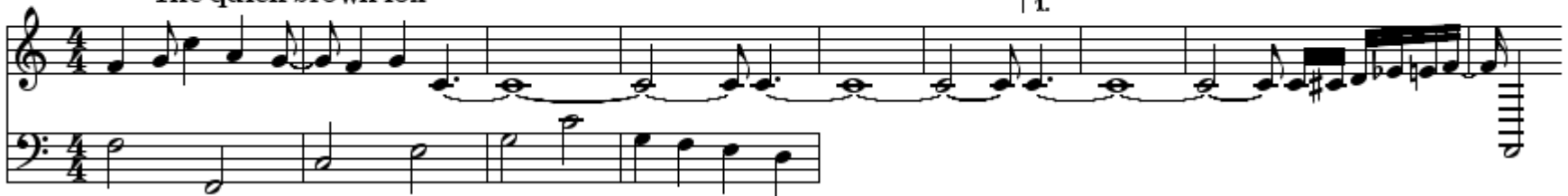
Created on www.scorio.com

Title

Composer

The quick brown fox

Part 1



MusicXML Apps

Scorio, 2

Created on www.scorio.com

Title

Composer

Part 1

The quick brown fox

1.

MusicXML: Towards the Future

- Claims 170 apps used MusicXML
 - Scorch, Frescobaldi, JillyNote, Mobile Music Trainer,
- Thrust moving towards greater privatization
 - E.g. **Steinberg's SMuFL** (<http://www.smufl.org/>):
“a specification that provides a standard way of mapping the thousands of musical symbols required by conventional music notation into the **Private Use Area** in
- **Unicode's Basic Multilingual Plane** for a single OpenType font.”
- Claims interest in **MusicXML** and **MEI**