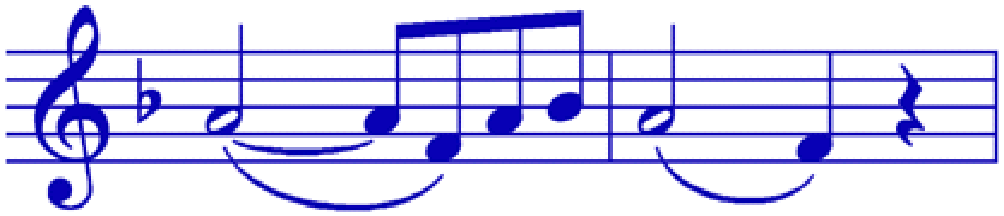
Recordare



Lessons from the Adoption of MusicXML as an Interchange Standard

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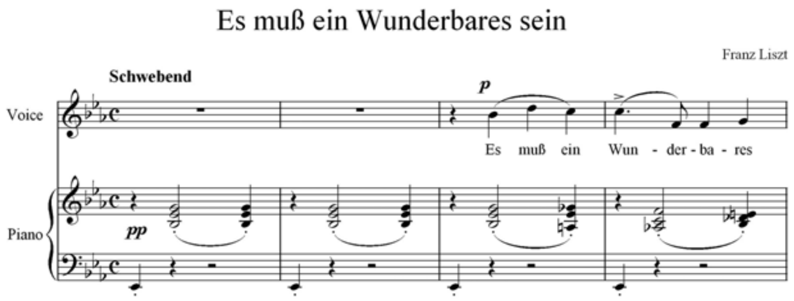
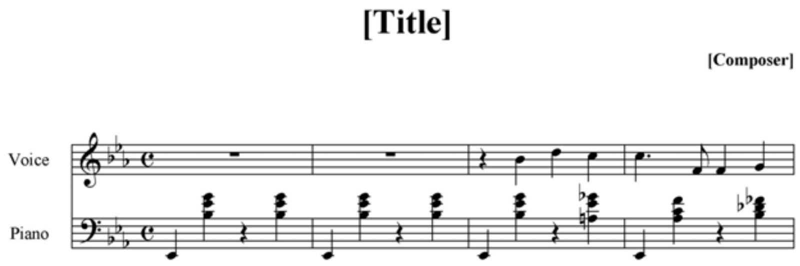
What MusicXML Does

- Allows interchange of music notation data between applications
- This is the symbolic data behind sheet music and musical scores, not the audio data for a recording
- Now widely used in music preparation and music scanning
- Based on the best academic prior art: MuseData and Humdrum
- One of many attempts to move beyond MIDI
  - Prior: NIFF, SMDL
  - Contemporary: MEI, WEDELMUSIC, MML, MusicML…

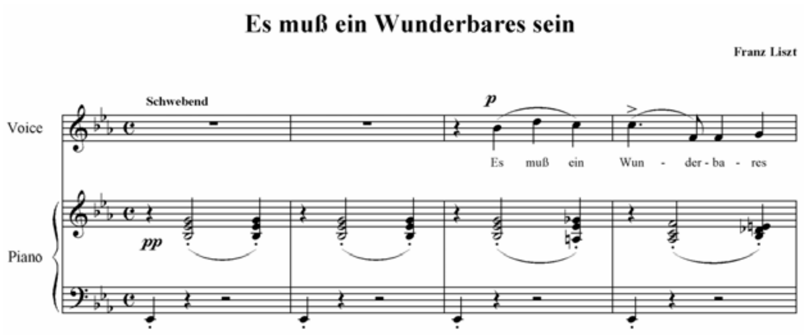
Example: Moving from Sibelius to Finale



Original as entered into Sibelius

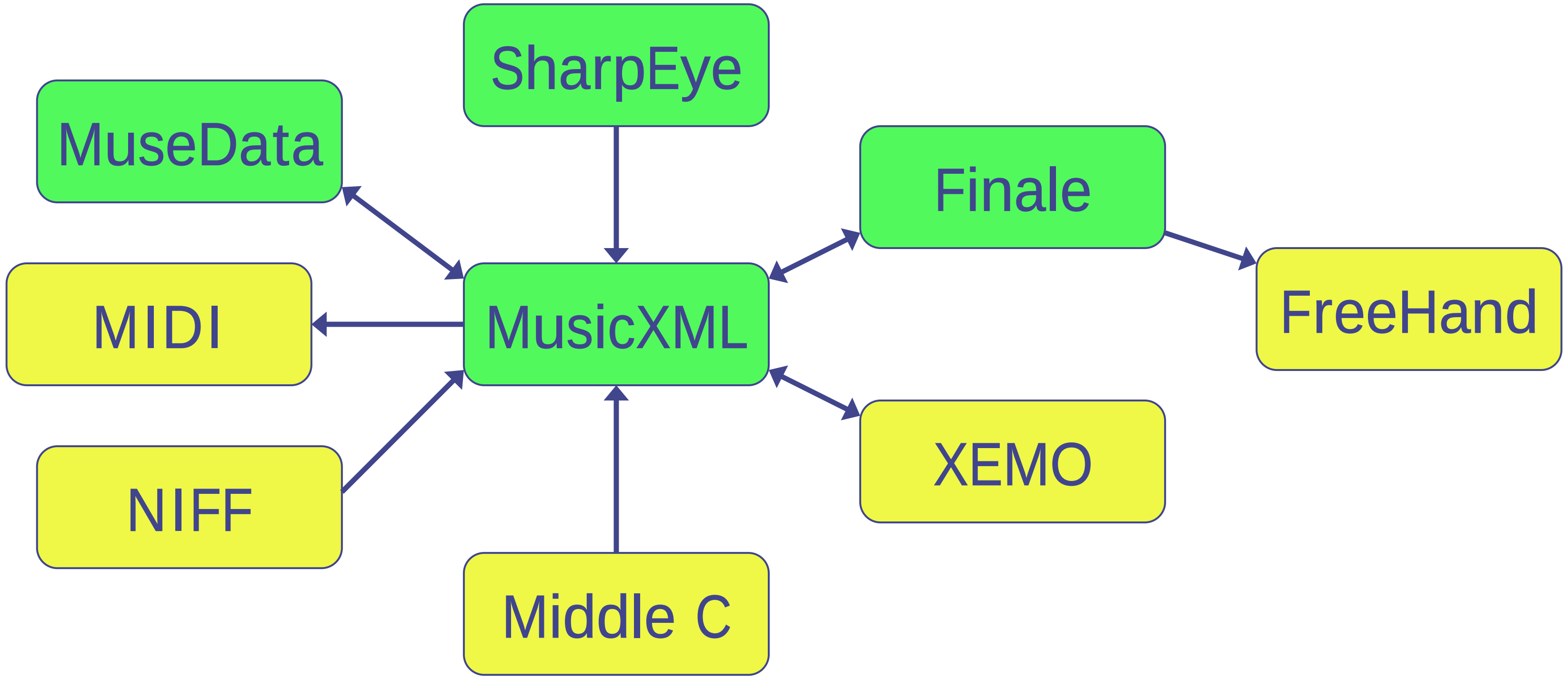


Imported into Finale via MIDI

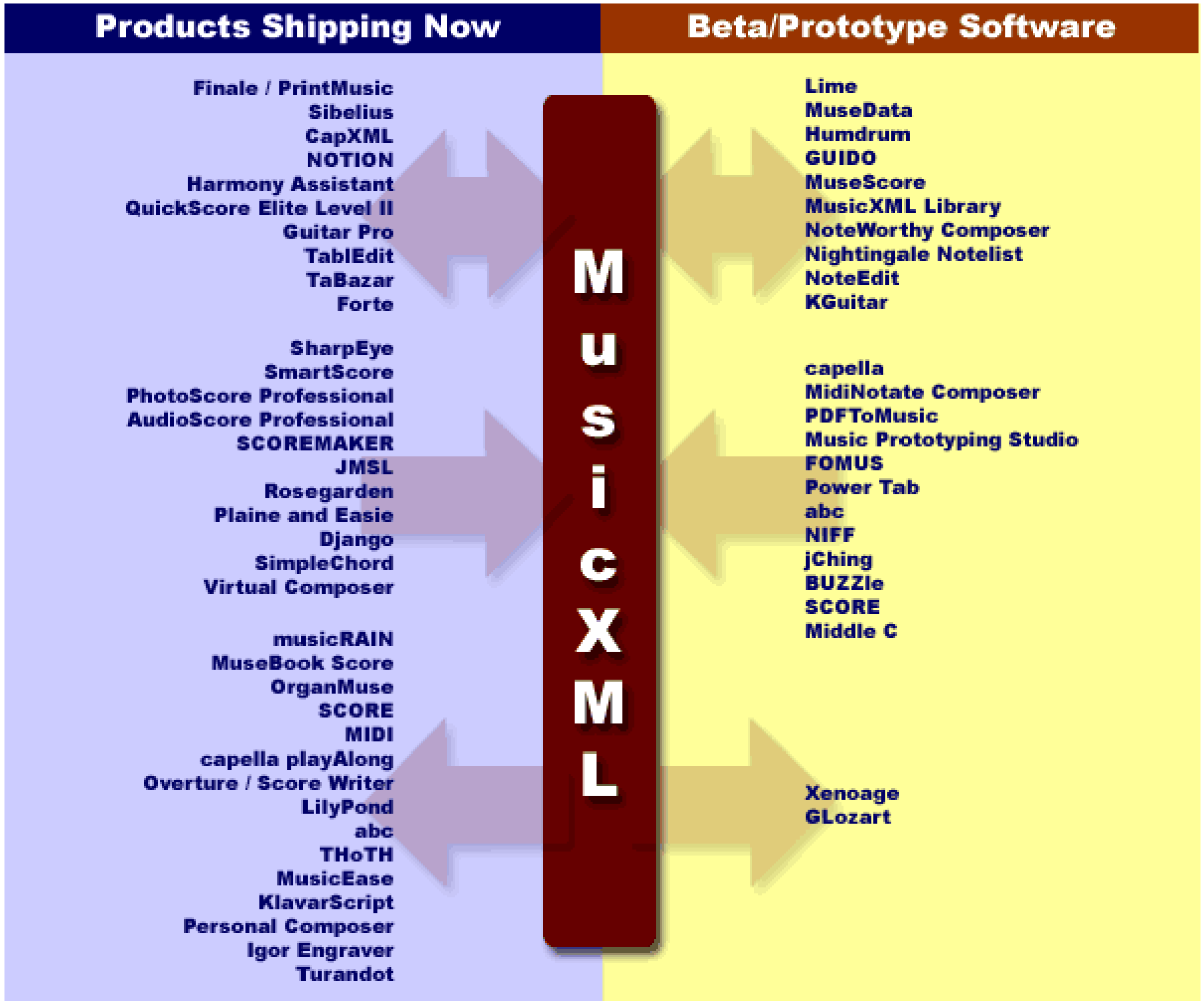


Imported into Finale via MusicXML

Where We Were at XML 2001 (MusicXML 0.5)



Where We Are at XML 2006 (MusicXML 1.1)



Products Shipping Now

Finale / PrintMusic
Sibelius
CapXML
NOTION
Harmony Assistant
QuickScore Elite Level II
Guitar Pro
TablEdit
TaBazar
Forte

SharpEye
SmartScore
PhotoScore Professional
AudioScore Professional
SCOREMAKER
JMSL
Rosegarden
Plaine and Easie
Django
SimpleChord
Virtual Composer

musicRAIN
MuseBook Score
OrganMuse
SCORE
MIDI
capella playAlong
Overture / Score Writer
LilyPond
abc
THoTH
MusicEase
KlavarScript
Personal Composer
Igor Engraver
Turandot

MusicXML

Beta/Prototype Software

Lime
MuseData
Humdrum
GUIDO
MuseScore
MusicXML Library
NoteWorthy Composer
Nightingale Notelist
NoteEdit
KGuitar

capella
MidiNotate Composer
PDFToMusic
Music Prototyping Studio
FOMUS
Power Tab
abc
NIFF
jChing
BUZZle
SCORE
Middle C

Xenoage
GLozart

Why Might Lessons Be Applicable Elsewhere?

- XML interchange standard proposals face both technical and social barriers
- MusicXML shows an example of overcoming both barriers where prior attempts in the domain had failed
- Other application domains have similar barriers
- Resistance from market leaders is common across domains

Lesson Summary

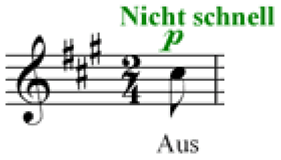
- Apply usability techniques to XML language design
- Develop the format together with the software
- Support a market leader early
- Market to other developers
- Give format developers good support
- Avoid overhead

Apply Usability Techniques to Language Design

- You cannot establish an interchange standard without developer support
- So you had better make your proposed standard usable
  - To survive an initial evaluation
  - To make it as easy as possible to get a lot of good implementations
- But you need to balance the needs of different communities
  - Users and developers
  - Different applications

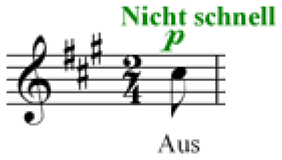
Key MusicXML Usability Techniques

- Limit scope carefully
  - Common Western music notation from 17th century on
- Choose names based on the application domain
  - When technology terms needed, abstract from limitations of current technology
- Prefer clarity over concision
  - Elements for data, attributes for formatting and performance metadata
- Make the structure compatible with leading applications
  - Presentation not strictly separated from content



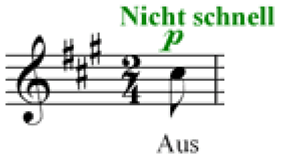
in MusicXML (1 of 3)

```
<part id="P1">
  <measure number="1" width="179">
    <attributes>
      <divisions>24</divisions>
      <key>
        <fifths>3</fifths>
        <mode>major</mode>
      </key>
      <time>
        <beats>2</beats>
        <beat-type>4</beat-type>
      </time>
      <clef>
        <sign>G</sign>
        <line>2</line>
      </clef>
    </attributes>
```



in MusicXML (2 of 3)

```
<direction placement="above">
  <direction-type>
    <words default-y="25" font-size="10.5" font-weight="bold"
      relative-x="-42">Nicht schnell</words>
  </direction-type>
  <sound tempo="42"/>
 </direction>
 <direction placement="above">
  <direction-type>
    <dynamics default-y="10" relative-x="-5">
      <p/>
    </dynamics>
  </direction-type>
  <sound dynamics="54"/>
 </direction>
```



in MusicXML (3 of 3)

```
  <note default-x="141">
    <pitch>
      <step>C</step>
      <alter>1</alter>
      <octave>5</octave>
     </pitch>
     <duration>12</duration>
     <voice>1</voice>
     <type>eighth</type>
     <stem default-y="-50">down</stem>
     <lyric default-y="-80" number="1">
       <syllabic>single</syllabic>
       <text>Aus</text>
     </lyric>
  </note>
</measure>
```

Develop the Format Together with the Software

- Iterative design and evolutionary delivery works for XML languages too
- Developed initial prototypes around logical, visual, and gestural (performance) domains
  - Logical: MuseData to MusicXML
  - Visual: NIFF to MusicXML
  - Performance: MusicXML to MIDI
- Then went in depth with a Finale translator
- Did not ship 1.0 until we had enough diverse implementation experience to avoid future incompatible changes

Support a Market Leader Early

- Key milestone was being able to read and write MusicXML files from either Finale or Sibelius
- If we could not support one of those two market leaders, nobody would care
- Finale's plug-in development kit was up to the task
- Once we built our own Finale support, then we went after SharpEye Music Reader support
  - Lowered SharpEye's barrier to entry in the Finale market
- Other major milestones
  - Built-in Finale support on both Windows and Macintosh
  - Built-in Sibelius 4 import

Build Your Own Support for Market Leader

- If your so-called standard format does not support at least one market leader, why should anyone adopt it?
- It is the format developer's responsibility to build this support
- The market leader has no incentive to do so
  - It is often an advantage to support third-party standards
  - But it is rarely an advantage to create a third-party standard
- Many market leaders are mature enough to have a plug-in development kit that lets you build your own
  - Office 97 kit was much more mature than the Finale 2000 kit

Market to Other Software Developers

- NIFF and SMDL never followed through with marketing to developers
- It takes time, especially in small markets
- Internet is an excellent channel to market to developers worldwide
- MusicXML marketing includes mailing lists, tutorials, examples, publications, conferences, trade shows, links to other software, etc.
- Royalty-free license is essential in our market
- Track developer activity on a summary spreadsheet for hundreds of current and potential applications

Give Format Developers Good Support

- Closely related to marketing the format
- Free technical support for developers adding MusicXML to their applications
- Pay consulting services available for more elaborate projects
- Work hard to provide quick and accurate answers to developer questions
- Charging for the format or the technical support would doom us to irrelevance
- Active developer community now drives the evolution of the MusicXML format

Avoid Overhead

- If you have a big market, standards organizations are important
- For small markets like music notation, they can be more detriment than advantage
- MusicXML follows the PDF model: open format under single-company control
  - Avoids design-by-committee problems
  - Allows MusicXML to respond quickly to new needs
  - Active community involvement in ongoing development
- Even ISO does not guarantee adoption
  - Nobody implemented SMDL (ISO 10743)
  - No industry interest in MPEG Symbolic Music Representation

The OASIS Decision

- Recordare joined OASIS and MIDI Manufacturers Association early on
- In November 2003, co-founded an OASIS discussion group on music notation
- At NAMM 2004, our customers advised us against it
    - Those who don't adopt MusicXML do so for their own business reasons, not because of provenance
    - Don't give up speed and flexibility: keep the PDF model
- Advice proved correct with MusicXML 1.1
    - MusicXML 1.1's 70 new features were critical for publishing
    - Needed to meet 3 companies' mid-2005 release dates
    - Could never have done it had we gone to a standards group

Conclusions

- MusicXML has succeeded in becoming a de facto interchange standard for symbolic music applications
- Succeeded where many prior and contemporary efforts failed
- Lessons from MusicXML seem applicable to other application domains
- Standards adoption is a technical and social process, and both need careful attention
- See www.recordare.com/xml for more MusicXML information and full paper