The MusicXML Meeting

MICHAEL GOOD
VICE PRESIDENT OF RESEARCH AND DEVELOPMENT

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Agenda

- Introduction to MusicXML
- MusicXML community progress in the past year
- MusicXML and the Standard Music Font Layout (SMuFL)
  - With Daniel Spreadbury, Steinberg
- Future directions for MusicXML: content and governance
  - With Joe Berkovitz, Noteflight
- Focused discussion on future directions at the end
- Reception at 4:00 pm sponsored by Hal Leonard / Noteflight

noteflight

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What is MusicXML?

- The standard open format for exchanging digital sheet music between applications
- Invented by Michael Good at Recordare in 2000
- Developed collaboratively by a community of hundreds of musicians and software developers over the past 15 years
- Available under an open, royalty-free license that is friendly for both open-source and proprietary software
- Supported by almost 200 applications worldwide

MusicXML Is a Notation Format

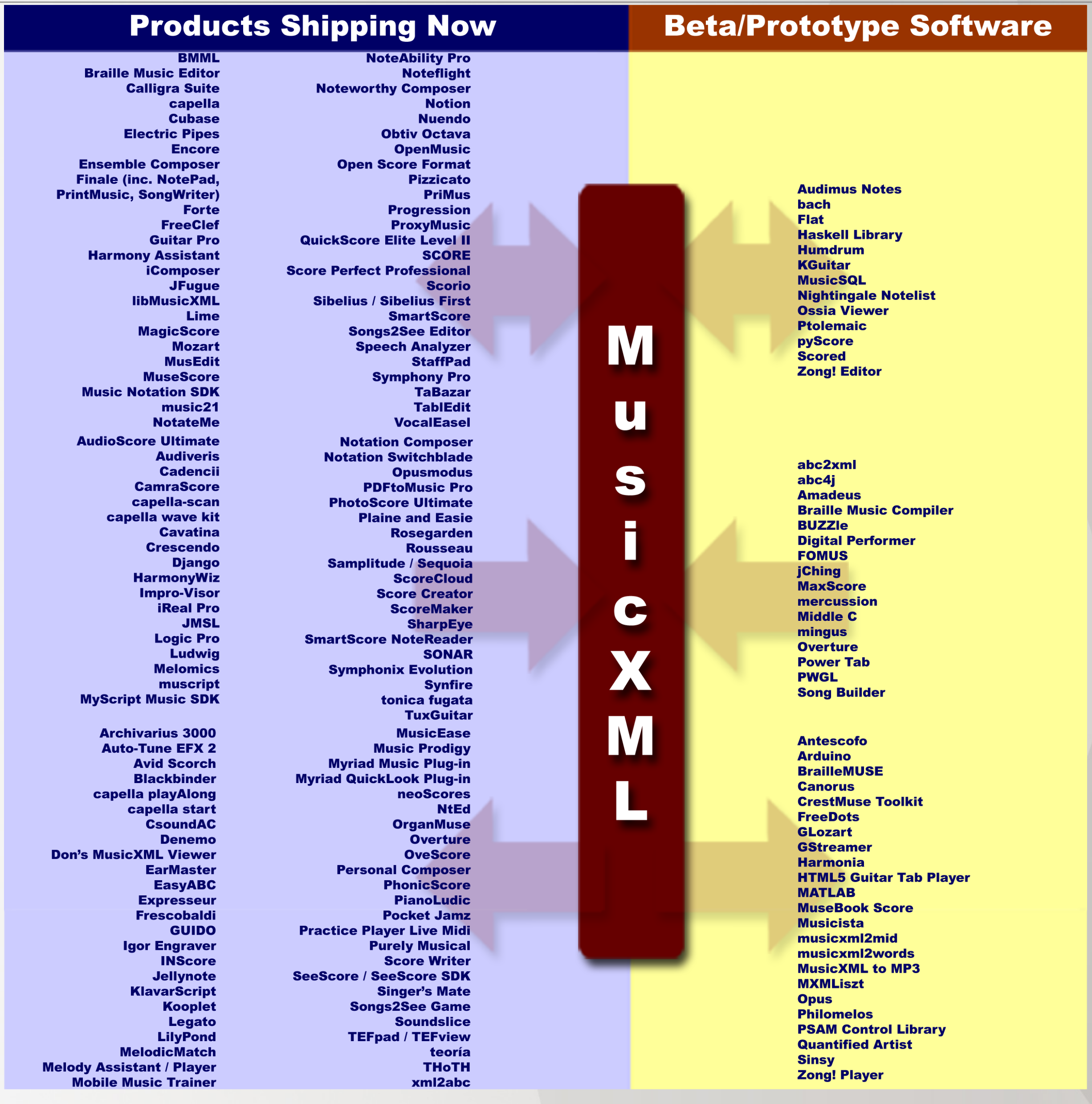
- Music is represented using the semantic concepts behind common Western music notation
- Includes both how a score looks and how it plays back
- Includes low-level details of the appearance of a particular engraving, or the nuances of a particular performance
    - Allows transfer of music between applications with high visual fidelity
    - Also allows the visual details to be ignored when appropriate
    - The best display for paper is often not the best for an interactive application

MusicXML as an Archival Format

- MusicXML is an XML format, with all its advantages:
  - Files can be opened in any computer text editor
  - Fully internationalized via Unicode
  - Files are human-readable as well as machine-readable
  - Can use all the standard XML tools developed by larger industries than the music industry
- Backward compatibility: all valid MusicXML 1.0 files are also valid MusicXML 3.0 files
- MusicXML license allows continued development of the format by anyone, not just MakeMusic
- Already implemented by nearly 200 programs

Who Uses MusicXML

Usage map as of April 2015



Products Shipping Now

BMML
Braille Music Editor
Calligra Suite
capella
Cubase
Electric Pipes
Encore
Ensemble Composer
Finale (inc. NotePad, PrintMusic, SongWriter)
Forte
FreeClef
Guitar Pro
Harmony Assistant
iComposer
JFugue
libMusicXML
Lime
MagicScore
Mozart
MusEdit
MuseScore
Music Notation SDK
music21
NotateMe

NoteAbility Pro
Noteflight
Noteworthy Composer
Notion
Nuendo
Obtiv Octava
OpenMusic
Open Score Format
Pizzicato
PriMus
Progression
ProxyMusic
QuickScore Elite Level II
SCORE
Score Perfect Professional
Scorio
Sibelius / Sibelius First
SmartScore
Songs2See Editor
Speech Analyzer
StaffPad
Symphony Pro
TaBazar
TablEdit
VocalEasel

AudioScore Ultimate
Audiveris
Cadencii
CamraScore
capella-scan
capella wave kit
Cavatina
Crescendo
Django
HarmonyWiz
Impro-Visor
iReal Pro
JMSL
Logic Pro
Ludwig
Melomics
muscript
MyScript Music SDK

Notation Composer
Notation Switchblade
Opusmodus
PDFtoMusic Pro
PhotoScore Ultimate
Plaine and Easie
Rosegarden
Rousseau
Samplitude / Sequoia
ScoreCloud
Score Creator
ScoreMaker
SharpEye
SmartScore NoteReader
SONAR
Symphonix Evolution
Synfire
tonica fugata
TuxGuitar

Archivarius 3000
Auto-Tune EFX 2
Avid Scorch
Blackbinder
capella playAlong
capella start
CsoundAC
Denemo
Don's MusicXML Viewer
EarMaster
EasyABC
Expresseur
Frescobaldi
GUIDO
Igor Engraver
INScore
Jellynote
KlavarScript
Kooplet
Legato
LilyPond
MelodicMatch
Melody Assistant / Player
Mobile Music Trainer

MusicEase
Music Prodigy
Myriad Music Plug-in
Myriad QuickLook Plug-in
neoScores
NtEd
OrganMuse
Overture
OveScore
Personal Composer
PhonicScore
PianoLudic
Pocket Jamz
Practice Player Live Midi
Purely Musical
Score Writer
SeeScore / SeeScore SDK
Singer's Mate
Songs2See Game
Soundslice
TEFpad / TEFview
teoría
THoTH
xml2abc

MusicXML

Beta/Prototype Software

Audimus Notes
bach
Flat
Haskell Library
Humdrum
KGuitar
MusicSQL
Nightingale Notelist
Ossia Viewer
Ptolemaic
pyScore
Scored
Zong! Editor

abc2xml
abc4j
Amadeus
Braille Music Compiler
BUZZle
Digital Performer
FOMUS
jChing
MaxScore
mercussion
Middle C
mingus
Overture
Power Tab
PWGL
Song Builder

Antescofo
Arduino
BrailleMUSE
Canorus
CrestMuse Toolkit
FreeDots
GLozart
GStreamer
Harmonia
HTML5 Guitar Tab Player
MATLAB
MuseBook Score
Musicista
musicxml2mid
musicxml2words
MusicXML to MP3
MXMLiszt
Opus
Philomelos
PSAM Control Library
Quantified Artist
Sinsy
Zong! Player

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Publishing Scores in MusicXML

- MusicXML is the way that scores get from composition/publishing applications like Finale and Sibelius to the new wave of musician applications
- No DRM controls built-in, though these have been added in the MusicXML-based Open Score Format
- For copyrighted music, MusicXML has usually been a Business-to-Business format, not Business-to-Consumer
- Many sites available with public domain MusicXML scores: see www.musicxml.com/music-in-musicxml

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What Is New With MusicXML?

- New and improved application support
  - 25 new applications since last Musikmesse
  - 4 more applications out of beta
- New MusicXML Forum replacing the MusicXML mailing list
  - http://forums.makemusic.com/viewforum.php?f=12
  - Atom feed, forum and topic subscriptions in place
- New possibilities for MusicXML 4.0
  - SMuFL
  - Evolution for more use cases
  - Change of governance

New MusicXML Reader/Writers

- BMML
- NotateMe
- StaffPad
- Mozart (formerly read-only)
- bach (beta)
- Flat (beta)
- Scored (beta)

New MusicXML Writers

- CamraScore
- Cavatina
- HarmonyWiz
- Melomics
- MyScript Music SDK
- Opusmodus
- Score Creator
- SmartScore NoteReader
- Braille Music Compiler (beta)
- Digital Performer 9 (beta)
- MaxScore (beta)

New MusicXML Readers

- Don’s MusicXML Viewer
- Music Prodigy
- PhonicScore
- Practice Player Live Midi
- Purely Musical
- Soundslice
- Antescofo (beta)
- Musicista (beta)

MusicXML Out of Beta

- Denemo
- INScore
- Jellynote
- neoScores

MusicXML and Music Fonts

- MusicXML provides a standard interchange format for music notation semantics, layout, and performance
- But when translating between MusicXML and a music notation application, fonts complicate things
- What code point do I use for a particular MusicXML element in a particular music notation font?
- What do MusicXML's positioning attributes mean specifically with regards to any particular music font?
- Enter the Standard Music Font Layout (SMuFL)

Standard Music Font Layout

MusicXML community meeting
19 April 2015

Daniel Spreadbury

steinberg

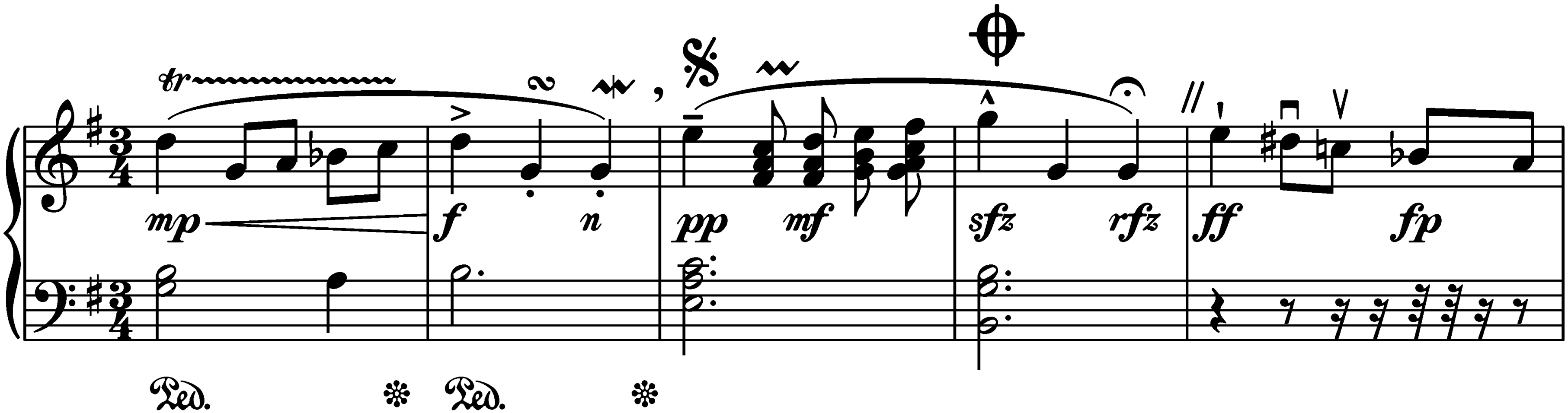
What is SMuFL?

- A standard way of mapping musical symbols to the Private Use Area of the Basic Multilingual Plane in Unicode
- A set of technical guidelines for how music fonts should be designed and built
- Simple JSON metadata formats to help applications use SMuFL fonts easily
- Released under MIT license, free to use/modify

What’s included

- 2407 glyphs in 108 ranges
- Includes all 220 glyphs from the Unicode Musical Symbols range
- Also includes recommendations for ligatures, stylistic alternates/sets, etc.
- Reference fonts for scoring and text-based application

Bravura



steinberg

Bravura

- Reference SMuFL font (OpenType/SVG/WOFF)
- Includes all SMuFL recommended glyphs, and hundreds of optional glyphs
- Released under the SIL Open Font License
  - Free to use, bundle, embed, create derivative versions, etc.
  - Only licensing restrictions are that the font cannot be sold on its own; derivative versions cannot use the same name; and derivative versions must be released under the same licensing terms

Current status

- Version 1.12, released January 2015
- Short backlog of pending suggestions and issues
- Considered stable at this time

Implementations

- Bravura now supported by or shipping with:
  - MuseScore 2.0 (open-source scoring software)
  - Logic Pro X 10.1 (Apple’s DAW)
  - Soundslice (web-based interactive sheet music)
  - Verovio (web-based MEI viewer)
  - Groove Freedom (iOS drum tuition app)
- All above SMuFL-compliant to varying degrees

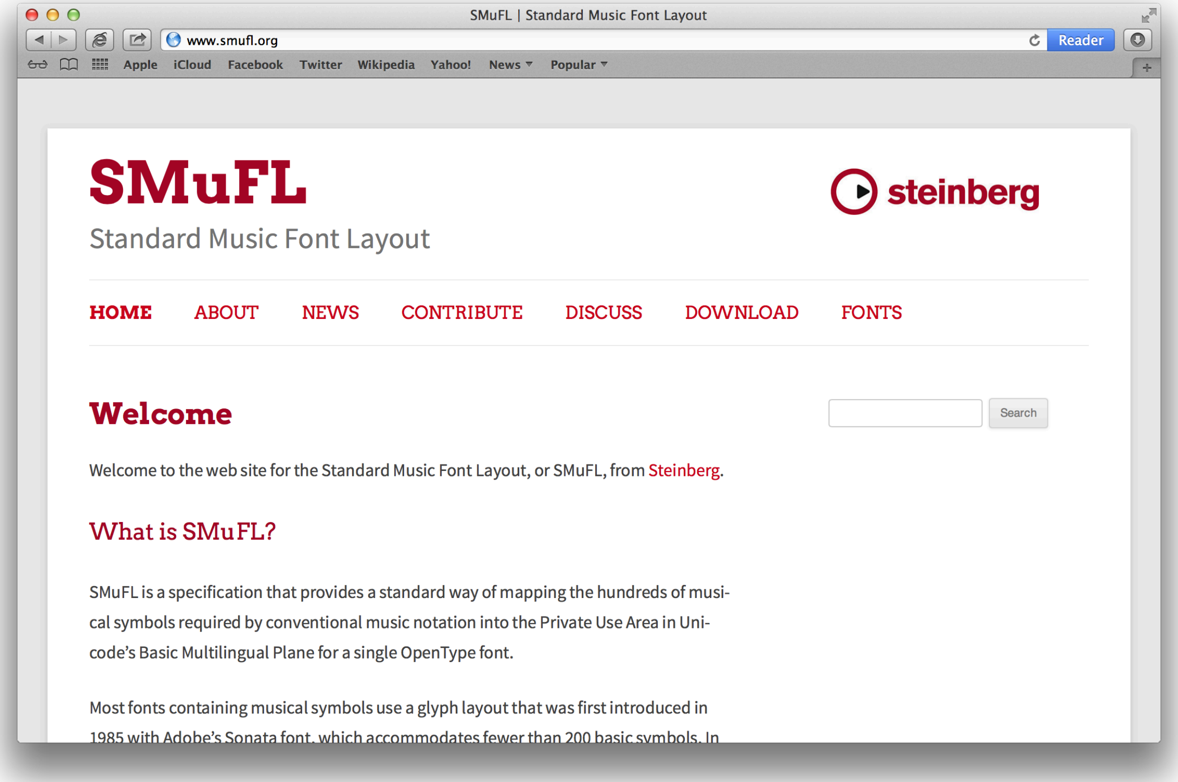
Implementations

- Third-party SMuFL-compliant fonts include:
  - November 2.0 (commercial license)
  - Gootville (based on Gonville, MuseScore 2.0)
  - Leipzig (Laurent Pugin, ships with Verovio)
  - Maestro (MakeMusic Inc., for future Finale)
  - Others in development by independent font developers

Future directions

- Integrate with MusicXML 4.0
- Continue advocacy of standard to font designers and application developers
- Further development to be guided by requirements of community, and Steinberg’s own needs

More information



SMuFL

Standard Music Font Layout

Welcome

Welcome to the web site for the Standard Music Font Layout, or SMuFL, from Steinberg.

What is SMuFL?

SMuFL is a specification that provides a standard way of mapping the hundreds of musical symbols required by conventional music notation into the Private Use Area in Unicode's Basic Multilingual Plane for a single OpenType font.

Most fonts containing musical symbols use a glyph layout that was first introduced in 1985 with Adobe's Sonata font, which accommodates fewer than 200 basic symbols. In

www.smufl.org

Thank you!

d.spreadbury@steinberg.de

MusicXML 4.0 and SMuFL 1.12

- SMuFL addresses many standardization issues that have troubled MusicXML developers for years
- What could better MusicXML support for SMuFL mean?
  - Does MusicXML add support for all of SMuFL's thousands of glyphs?
  - If not, what guidelines to determine which ones?
  - Could we add escape methods to access SMuFL glyphs by their canonical name?
  - How about standardization on areas such as font metadata?
  - Should MusicXML documentation reference SMuFL canonical names to clarify the graphical appearance of different MusicXML elements?

SMuFL Support in MusicXML 3.0

- A count of “glyphs supported” is tricky because there is not always a 1-1 mapping between MusicXML concepts and SMuFL glyphs
- Glyphs intended for music text font use in particular may not line up exactly with MusicXML concepts
- Some SMuFL sets of glyphs make semantic or graphical distinctions not captured in MusicXML 3.0, though the common set of base semantics are supported
- Nevertheless, here are some preliminary counts…

SMuFL Glyphs in MusicXML 3.0

- MusicXML 3.0 fully supports 839 out of the 2407 glyphs in SMuFL 1.12, or 35%
- MusicXML 3.0 partially supports another 254 glyphs, for a total of 1093 glyphs or 46%
- Large areas of non-support:
  - Extended accidentals: 11 ranges not supported at all, covering 348 glyphs or 14% of SMuFL
  - Pre-CMN notation: 11 ranges not supported at all, covering 217 glyphs or 9% of SMuFL
- Missing less common symbols in other ranges, or most symbols in some ranges like multi-segment lines

MusicXML 4.0

- SMuFL provides one motivation for a major new MusicXML release
- What else besides SMuFL support?
  - Features and fixes as discussed at last year's meetings and on the MusicXML forum
  - Improved online documentation
- But most interesting is the concept of evolving MusicXML for better support of more use cases
  - Joe Berkovitz will be discussing this in more detail

MusicXML as a Document Format

- MusicXML has very much focused on a printed musical score as a reference for its data model
- Remember the context in 2000: there had been repeated failure to build a useful music notation interchange format
- So make it easier to standardize among competing programs by primarily modeling physical, real-world object
- Make modeling compatible with leading commercial and academic applications to ensure ease-of-use for developers
- MuseData was primary starting point, plus Humdrum

Times Have Changed

- All but 2 of the major applications related to notation now support MusicXML
- Document interchange gets better as software matures and – even more important – publisher processes change to emphasize digital-ready scores
- Starting with the iPad, digital sheet music has gotten much more popular
- MusicXML can improve its support for interactive applications that reflow and go beyond a substitute for paper
- The need for a better specification has grown with success

Change Can Be Hard

- MIDI and HTML are two standards whose success led to limited change and lack of innovation over time
- Transitions from MIDI 1.0 to HD Protocol and HTML4 to HTML5 have been difficult
- MusicXML 3.0 works very well as an exchange and archival format for common Western music notation, and we need to keep that compatibility
- But if MusicXML does not evolve, the odds increase for fragmentation and losing the interchange that all here have worked so hard to achieve

MusicXML as an Interactive Platform

- One great advantage of MusicXML is that it serves as a model for what one needs to cover in representing music notation on paper and on screen

- Can we expand that to being a model for what one needs to cover to interact with music notation on screen?
  - While maintaining capability with MusicXML 3.0
  - And maintaining agreement between different vendors who implement things in different ways
  - The paper score is no longer the external authority outside of software implementations

Could Change of Governance Help?

- Standards organization resources could help create a tighter specification with better validation
- A standards organization could provide greater stability than single-company ownership
- More opportunity for integration with web standards
- Need a lightweight home that still keeps widespread participation from individuals and small companies
- New standards venues might avoid past pitfalls of standards organization efforts
- Explored interest at W3C, MMA, and IEC this past year

Staying in Touch

- MusicXML forum: http://forums.makemusic.com
- Shows: Musikmesse, NAMM, SF MusicTech
- Twitter: @MusicXML
- Facebook: www.facebook.com/MusicXML
- Email: mgood@makemusic.com

MusicXML: Framing the Future

MusicXML Community Meeting
Musik Messe 2015

Joe Berkovitz (joe@noteflight.com)
President, Noteflight LLC
Co-chair, W3C Web Audio Working Group
W3C Advisory Committee Rep., Hal Leonard Corporation

Who am I?

- I compose and play music
- I build notation software
- My company is owned by a music publisher
- I work on Web standards

Where can MusicXML go from here?

- The Case for Evolution
- How to Evolve?
- Choices in Governance

Facets of Evolution

- History
- Process
- Specification
- Features
- Governance

History

- De facto use cases: exchange and archive
- De facto steering: by notation software vendors
- Non-PDF digital music publishing initially a sideline, now growing rapidly
- Needed to create conditions for success of a viable standard

Present-day Publishing with MusicXML (wishful version)

- Get hold of some MusicXML files from any source
- Feed them into some compatible application
- Everything looks great
- Drink a beer, glass of wine, shot of amaro (perhaps several) in celebration

Reality Check!

- Get hold of some MusicXML files from any source
- Discover that they use different subsets of MusicXML in different ways
- Discover that engravers used different features to mean the same thing, or the same features to mean different things
- Discover that your renderer requires certain features to be present that are not in your files, or can’t use the features that are there
- Discover that you have no way to specify how your scores should look in diverse end-user environments (paper, desktop, mobile, …)
- Drink something stronger (perhaps several) in despair

For Developers, It’s No Easier

- See previous page :-)

Looking Forward

- Many historical goals have been met
- Other goals remain to be clarified, addressed
- Successful digital publishing with MusicXML is possible, yet challenging
- MusicXML remains the best way forward
- What is the best way to chart and pursue its future path?

Evolving the Process

- Identify major stakeholder roles
- Form group of active stakeholders
- Develop use case document
- Identify underserved use cases
- Identify key features unlocking these cases

Some Use Cases and Needs

- Notation editor import/export
- Music Publishing
- Reading/performance systems, both desktop & mobile
- Non-editor notation apps (e.g. theory, ear training)
- Scholarly and specialist publications
- In-house publishing
- Libraries and archival services
- Convergence with Web and Epub technologies

Developing a Specification

- MusicXML needs one - XSD distillation is not equivalent or sufficient
- Large number of optional features creates confusion, makes results unpredictable
- Spec must identify distinct feature profiles addressing common use cases.
- Spec must make testable statements about conformance.

Likely areas for evolution

- Flexible Styling and Layout
- Syntactic validation of semantics
- Metadata vocabularies
- Manipulation, interactivity and selection
- Playback
- Graphics and hypertext inclusion
- Anchors and Pointers
- Annotations
- Accessibility

One likely area:
Cascading Style Sheets (CSS)

- Stylesheets allow definition of “how it looks” to be cleanly separated from “what it is”.
- Many documents can share the same set of stylesheets.
- To customize the look of a document, change the stylesheet you are using.
- Style “attributes” can reflect high-level concerns of engravers (e.g. density or placement conventions) not low-level details (X/Y positions of many individual objects)
- Stylesheet queries support responsive design

Cascading Style Sheets (CSS)

print.css: (print-oriented stylesheet)

```
credit.title {   /* manner in which title-type credit should be shown */
  position: absolute:
  top: 120px;
  horizontal-align: center;
}

part {   /* inherited attributes applying to all <part> children */
  staff-line-spacing: 6px;       /* 6 pixels between staff lines */
}
part#P1 {  /* override for violin part shown at smaller size */
  staff-line-spacing: 4px;
}

measure {
  duration-spacings: 5L 3L 2L 1L 0.71L;   /* standard spacings for durations */
}

direction.tempo {  /* How should a tempo direction look? */
  font-weight: bold;
  font-size: 15px;
  default-offset: +2L;  /* 2 lines above staff */
}

note.alternateReading { /* special style class for alternate readings */
  note-size: 0.5;   /* relative size of note heads */
}
```

Example: Styling and CSS

Excerpt of score.xml: (note independence from CSS stylesheet)

```
 . . .
<credit class=‟title">Sinfonia XLVII</credit>
 . . .
<part id=‟P1”>
    <measure number="1">
      <direction class="tempo">Grandly</direction>
      <note>
        . . .
      </note>
      <note class=‟alternateReading”>
        . . .
      </note>
   . . .
 </part>
 . . .
```

Example: Styling and CSS

mobile.css:

```
credit.title {
  display: none;  /* in mobile app, title is not part of score rendering */
}

part {   /* inherited attributes applying to all <part> children */
  staff-line-spacing: 8px;
}

note.alternateReading { /* special style class for alternate readings */
  color: rgb(127,127,127);   /* on mobile, gray out rather than make smaller */
}
```

Interactivity plus styling with CSS, DOM, jQuery

```
// Highlight the most recently clicked note as green and play it

var highlightedNote = null;   // track last-clicked note

// Highlight a given note
function highlightNote(note) {
    if (highlightedNote) {
        highlightedNote.css("color", “"); // remove previous highlight
    }

    highlightedNote = note;
    highlightedNote.css("color", “rgb(0,255,0)");  // apply new highlight
}

// Process click events dispatched from note elements in MusicXML DOM
document.addEventListener("click", function(event) {
    var target = $(event.target);
    if (target.is("note")) {
        highlightNote(target);
    }
}
```

The Best Way to Evolve

- Consortium-based governance is the best way forward
- Standards-track process will force clear specification
- Consortium ownership assures openness and fairness
- Membership supplies diverse, fresh viewpoints
- Leadership supplies continuity, domain expertise
- Consortium supplies adjacent expertise, technical/legal/process support

Compatibility

- Goal: preserve as much as possible
- Easier to migrate MusicXML than begin over again
- Always have a well-defined mapping in both directions across any syntactic change
- Public domain tools for transforming old <-> new

Some Adjacent Standards

- CSS
- SVG
- SMuFL (should ideally be open, too!)
- HTML
- MIDI
- EPUB
- others?

Consortium Choices

- W3C owns many adjacent specifications and provides access to their experts
- W3C has excellent technical support for developing specs and seeing them through
- W3C has proven its ability to adapt
- MMA is custodian of an important but singular and domain-specific spec
- EPUB still primarily targets text-oriented publications, moving towards Web, Arts, STM

Proposal

- Form W3C Community Group (CG) with Michael Good in a leadership role. CGs are the initial step on a track to W3C standard. No membership fees are required.
- CG immediately publishes current rev. of MusicXML
- Begin to identify use cases, needs, features
- Begin to codify complete, verifiable specification.
- Recruit best musical experts and experts in adjacent technologies (e.g. CSS, EPUB, MIDI)
- Eventual W3C Working Group and Recommendation

Questions for Attendees

- Do you feel this proposal is worth further consideration?
- Are there ways you would like to see MusicXML evolve?
- Would you like to be a stakeholder directly involved in this evolution?
- Or… do you want to be represented by a stakeholder whose interests align with yours?
- Do you feel consortium ownership would bring benefits for MusicXML?
- Do you feel that W3C could deliver these benefits? Would another consortium be better?