


**ATMI/CMS Conference**  
**Joint meeting of the Association for Technology in Music Instruction and**  
**The College Music Society in Rochester, New York**  
**October 7-9, 2021**



**Focus to The Future: 5G Meets MIDI 2,**  
**and Aloha. **  
**Connectivity Data-system Advancements**  
**for Reduced Latency Performance**  
**Opportunities!**

**Presenter:**  
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PRESENTATION WEBSITE ONLINE AT:  
<http://fredkersten.com/ATMI21/ATMI21WebPage.html>

## Abstract

This presentation will describe and demonstrate new developments in music technology that are presently being implemented and will directly influence teaching and performance in the near future. MIDI 2.0, 5G, and Aloha ElkLIVE will be considered. Each of these tools is in development/implementation stages and presently appearing on the market.

\*MIDI 2.0 is an update of MIDI 1.0 language and accepts bidirectional communications between various controllers and synthesizers. To the present day, MIDI 1.0 has limitations, permitting only asynchronous communications between devices. The new language included in MIDI 2.0 will provide more channels (past MIDI 1-16 channel protocol) and better resolution (overall resolution of MIDI 2.0 from MIDI 1 will update from 128 steps at seven bits of data to 4 billion steps at 32 bits).

\*5G will provide extensive data transfer at unbelievable speeds up to 10 times faster than present data networks. Musicians will be able to perform synchronously over vast distances almost instantaneously with low-latency communications.

\*ElkLIVE. previously Aloha (a beta-level interface, which allows for low-latency synchronous music interaction), is a hardware/digital protocol that provides instant performance connectivity. ElkLIVE has just now joined the commercial market. It illustrates the advancing future for low-latency sharing between individuals through distance performance.

Examples of utilization, and consideration of specific devices in present experimental usage will be provided for attendees. A dedicated webpage and detailed handout for further assistance will be developed for this presentation and remain available for referral after the session has been presented.

## Presentation Outline

Exciting new developments for sophisticated music data sharing are presently occurring. Upgraded MIDI 2.0 (Bidirectional dialogue); 5G (blazing speed--many bright prospects through currently developing networks); and ElkLIVE (low-latency, synchronous performance) are all on the horizon. This presentation will: a. explore all three, b. provide important specifics for understanding, and c. illustrate the sophistication/advantages of these music technology tools for teachers/students as better learning and musical creation take place. Examples will be provided and supported with video descriptions.

Descriptions will be provided for the following:

### 5G

- \*Synchronized Reality
- \*Virtual performances—Concerts, Classes, Live Shows Streamed to Large Groups
- \*Group Ensemble Rehearsals (Worldwide)
- \*Universal Band, Orchestra, Choral Ensembles
- \*Transfer Speed Demographics
- \*Latency\*Setup and Implementation

- \*Limitations, Development Problems
- \*Musical Importance to the Professor/Student

### MIDI 2.0

- \* MIDI Capability Inquiry (MIDI-CI):
  - a. Profile Configuration
  - b. Property Exchange
  - c. Protocol Negotiation
- \*Bidirectional dialogue--synchronous devices talk to each other--Mixer to Synthesizers
- \*High Resolution Availability
- \*New Musical Expressive Controllers--32-High-Resolution Velocity
- \*Futuristic Construction Specifications
- \*Hardware/Software Communication
- \*USB Internet Connections
- \*Ample Space for Expansion

### ElkLIVE

- \*Presently in Use (Operationalized--June, 2021)
- \*Current—in market sales and promotion
- \*Connectivity Hardware and Internet Requirements
- \*Elk Audio OS-its Value and Current Status
- \*Audio Latency: 1 ms-Signal Sent Audio; 1 ms Signal-Received Audio
- \*Live Share: Jazz Ensemble Jams, Choral/Instrumental Rehearsals
- \*Collaboration Sync Opportunities: (Lessons, Performances, Ensemble Development)

### Resources: MIDI 2 References

- \*MIDI 2 Bing. Comprehensive list of MIDI 2.0 resources.  
[https://www.bing.com/search?q=MIDI+2+&mkt=en-us&httpsmsn=1&msnews=1&rec\\_search=1&refig=008b85227a194caf8f1730d660cf0e1e&sp=-1&pq=midi+2+&sc=8-7&qs=n&sk=&cvid=008b85227a194caf8f1730d660cf0e1e&first=8&FORM=PERE](https://www.bing.com/search?q=MIDI+2+&mkt=en-us&httpsmsn=1&msnews=1&rec_search=1&refig=008b85227a194caf8f1730d660cf0e1e&sp=-1&pq=midi+2+&sc=8-7&qs=n&sk=&cvid=008b85227a194caf8f1730d660cf0e1e&first=8&FORM=PERE)
- \*MIDI 2.0 Is Around The Corner (And This Is Why You Should Care)  
<https://producerhive.com/ask-the-hive/what-is-midi-2-0/>
- \*MIDI 2.0 spec confirmed: “the biggest advance in music technology in decades” | MusicRadar  
<https://www.musicradar.com/news/midi-20-spec-confirmed-the-biggest-advance-in-music-technology-in-decades>

\*Full MIDI 2.0 specifications <https://futuremusic.com/2020/02/10/midi-manufacturers-association-ratifies-midi-2-0-specification/>

\*MIDI 2 - Bing video videos on midi 2 Check this out possible video

<https://www.bing.com/videos/search?q=MIDI+2&qvpt=MIDI+2+&FORM=VDRE>

\*MIDI 2.0 Explained - What Is MIDI 2 & Why Does It Matter? GREAT!!!

<https://www.pmtonline.co.uk/blog/2020/01/31/midi-2-0-explained-what-is-midi-2-why-does-it-matter/>

\*General MIDI 2 (GM 2) <https://www.midi.org/specifications-old/item/general-midi-2>

\*What is MIDI 2.0, and what does it mean for musicians and producers? | MusicRadar

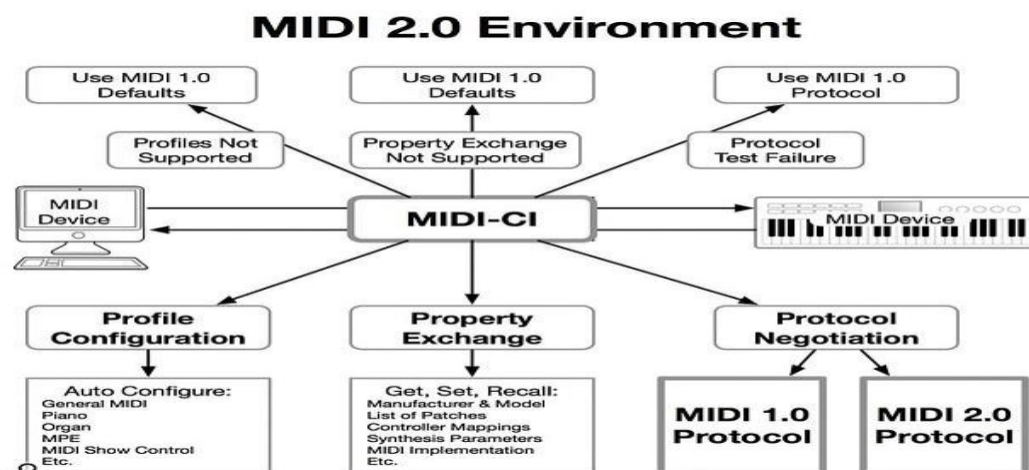
<https://www.musicradar.com/news/what-is-midi-20-and-what-does-it-mean-for-musicians-and-producers>

\*MIDI 2.0: What Actually Matters for Musicians <https://www.sweetwater.com/insync/midi-2-0-what-actually-matters-for-musicians/>

\*MIDI 2.0 Bing collective. <https://www.sweetwater.com/insync/midi-2-0-what-actually-matters-for-musicians/>

\*MIDI 2 Video <https://youtu.be/QvJhLQnuktg> Adam Neely-New Horizons in Music Jan 19 NAMM Conference.

\*MIDI Manufacturers Association (The MIDI Association) Organization that governs the development and promotion of MIDI. <https://www.midi.org>



MIDI CI: Reference: This illustration and information was referenced from  
<https://www.soundonsound.com/music-business/introducing-midi-20>

[https://www.bing.com/search?q=5G+influences+on+music&form=PRUSEN&mkt=en-us&httpsmsn=1&msnews=1&rec\\_search=1&refig=92521a99deb743fc96d9d78d7fbdcd38&sp=-1&pq=5g+influences+on+music&sc=1-22&qsn=&sk=&cvid=92521a99deb743fc96d9d78d7fbdcd38](https://www.bing.com/search?q=5G+influences+on+music&form=PRUSEN&mkt=en-us&httpsmsn=1&msnews=1&rec_search=1&refig=92521a99deb743fc96d9d78d7fbdcd38&sp=-1&pq=5g+influences+on+music&sc=1-22&qsn=&sk=&cvid=92521a99deb743fc96d9d78d7fbdcd38)

### Aloha ElkLIVE References

\*Aloha web page <https://alohabyelk.com/>  
<https://elk.audio/elk-audio-os-update/>

YouTube video jam online—has been downloaded [https://youtu.be/I5\\_G4A\\_-bBg](https://youtu.be/I5_G4A_-bBg)

Elk Audio Picture <https://elk.audio/elk-audio-os-update/>

Elk Audio update page <https://github.com/elk-audio/elk-pi/releases/tag/0.9.0>



\*San Francisco Opera Collaboration

<https://www.businesswire.com/news/home/20210330005146/en/San-Francisco-Opera-Pilots-Aloha-Real-Time-Remote-Collaboration-Music-Service-to-Prepare-for-Live-Performances>

Web page downloaded

&San Francisco Collaborative Video <https://youtu.be/s32qs3-52a0>



\*5g technology & music performance online - Bing video

<https://www.bing.com/videos/search?q=5g+technology+%26music+performance+online&qpv=5g+technology+%26music+performance+online&FORM=VDRE>

\*LOOK AT THIS \*A GLOBAL PERSPECTIVE OF 5G NETWORK PERFORMANCE  
OUR ANALYSIS OF NETWORK PERFORMANCE AND USER EXPERIENCE RESULTS  
FROM SUB-7.125 GHZ AND MILLIMETER WAVE 5G NETWORKS IN EUROPE, ASIA,  
AND NORTH AMERICA *October 2019 Prepared by Signals Research Group*

[www.signalsresearch.com](http://www.signalsresearch.com) White Paper on 5G importance to music The .pdf file on this topic can be downloaded. <https://www.qualcomm.com/media/documents/files/signals-research-group-s-5g-benchmark-study.pdf> (signals research.pdf).

\*5 reasons why 5G will be amazing for music lovers and producers | MusicRadar

<https://www.musicradar.com/news/5-reasons-why-5g-will-be-amazing-for-music-lovers-and-producers>

\*5G Is Coming: So What Does This Mean for Music (If Anything)?

<https://www.digitalmusicnews.com/2019/01/13/5g-music/>

\*Is the Music Industry Ready for 5G? Embracing the Future of Music Beyond Streaming | by Sergey Bludov | HackerNoon.com | <https://medium.com/hackernoon/is-the-music-industry-ready-for-5g-embracing-the-future-of-music-beyond-streaming-18867590a2e5>

\*5 reasons why 5G will be amazing for music lovers and producers | MusicRadar

<https://www.musicradar.com/news/5-reasons-why-5g-will-be-amazing-for-music-lovers-and-producers>

\*neXt Curve Inspiring our Digital Future Untethering the Live Music Experience with 5G

<https://next-curve.com/2021/01/28/untethering-the-live-music-experience-with-5g/>

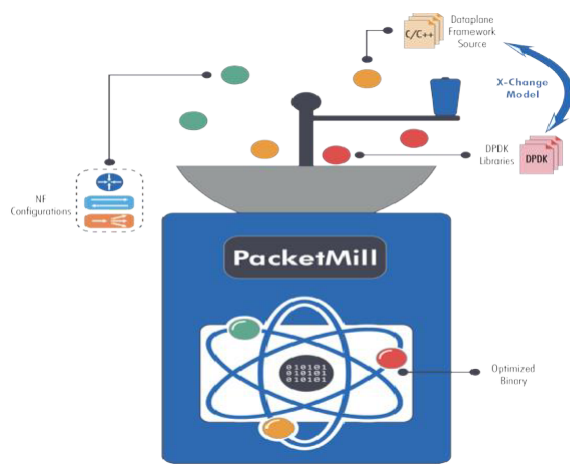
\*5g technology & music performance online – Bing

<https://www.bing.com/search?q=5g+technology+%26music+performance+online&go=Search&qsn&form=QBRE&sp=-1&pq=&sc=0-0&sk=&cvid=5DD2D555B08244C492687B3F6F017146>

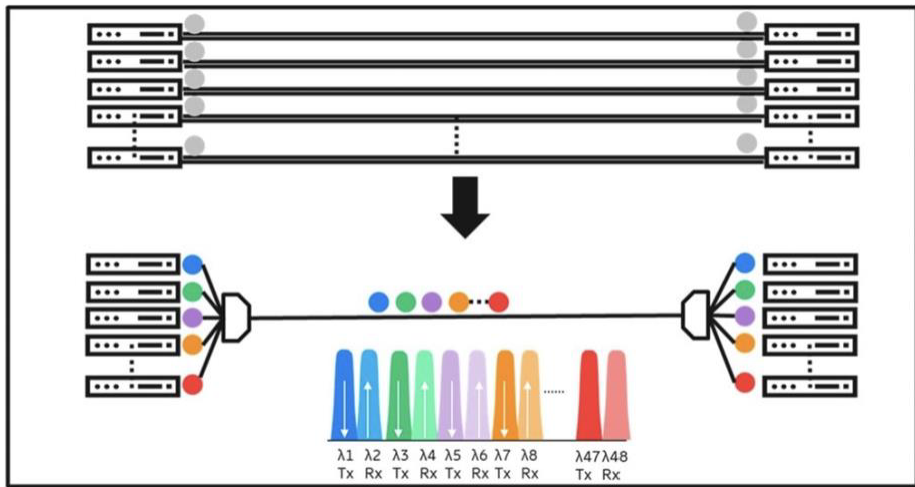
PackMill References

\*PackMill: toward per-Core 100-Gbs networking. PackMill provides a way to speed up software packet processing for faster processing of data.

<https://dl.acm.org/doi/abs/10.1145/3445814.3446724>



**DWDM-Dense Wavelength Division Multiplexing (DWDM) is a mature and well-established technology capable of improving fiber efficiency by multiplexing multiple wavelengths over a single fiber.**



Traditional transmission foresees that each optical signal (grey optic) is transported via a fiber pair

DWDM leverages on colored optics: signals have different color can be multiplexed over a single fiber strand

**Ericsson Worldwide Resources and References**





\*A real-time music collaboration powered by 5G technology. – Ericsson

<https://www.ericsson.com/en/cases/2020/a-real-time-5g-music-collaboration>

\*Verizon 5G: This is 5G Built Right | Verizon <https://www.verizon.com/5g/>\*Ericsson

Communications Company a world leader in the rapidly changing environment of communications technology – by providing hardware, software, and services to enable the full value of connectivity. <https://www.ericsson.com/en>

\* Edge Computing next frontier of 5G <https://www.ericsson.com/en/edge-computing>

Mobile Edge Computing, MEC, or Multi-Access Edge Computing, provides execution resources (compute and storage) for applications with networking close to the end users, typically within or

<https://www.ericsson.com/en/mobile-transport/optical-fronthaul> DWDM image to include Dense Wavelength Division Multiplexing.

#### \*Video Resources Locations

<https://www.ericsson.com/en/cases/2017/kings-college/education> Kings College Talk about Piano learning

\*Video Reaching New Audiences through Connected Music

<https://www.ericsson.com/en/cases/2018/connected-music-with-kings-college>

Video sources Verizon and 5G Verizon and

5G. <https://www.bing.com/videos/search?q=Verizon+5G+and+music&qpv=Verizon+5G+and+music&FORM=VDRE>. <https://www.bing.com/videos/search?q=Verizon+5G+and+music&qpv=Verizon+5G+and+music&FORM=VDRE>

\*Bristol, London, Manchester Video source. Valuable and important! <https://www.youtube.com/watch?v=vEv8-Ii8I3g> Full Live Coverage: World's First 5G Music Lesson with Jamie Cullum –WATCH THIS!!

### About The Presenter



#### Dr. Fred Kersten:

Fred Kersten is currently and has been for twelve years an Online Graduate Facilitator for Boston University. He works with graduate music education majors around the world who are completing their masters and doctorate degrees in music education. Currently he is instructor in charge of online music technology courses taught.

A veteran of public-school music teaching in Choral, General and Instrumental areas, Fred has taught music from Nursery, and Kindergarten through Graduate Levels. His doctoral dissertation focused on Music for the Visually Impaired and was developed from his many years of teaching music to students with exceptionalities. Interest in the recorder as a performing instrument led to study at Indiana University and he authored a book on Teaching Recorder that has been published by NAFME. His performance repertoire includes Bach, Handel, Telemann, and the vast repertoire of classical recorder literature. His current interests are focused on music technology and his study of classical pipe organ, which was his dual major as an undergraduate in addition to clarinet and recorder.