

# IAB STANDARDS ARE DONE



Brian Vessa  
Sony Pictures Entertainment

# WHAT IS IMMERSIVE SOUND AND IMMERSIVE AUDIO?

- Immersive Sound
  - Adds the dimension of height by putting speakers above the listener
  - Every speaker in the system is individually addressable
  - The listener is enveloped in a sonic hemisphere
- Immersive Audio
  - Has 10 or more channels and allows for audio objects (audio+metadata)
  - Audio can be placed anywhere in the room with precision
  - Audio can be moved anywhere in the room with precision

# WHAT IS IMMERSIVE SOUND AND IMMERSIVE AUDIO?

For more information about immersive audio, see these webinars:

**What is Immersive Audio and why is it so cool? (Brian Vessa)**

<https://www.smpte.org/webcasts/standards-Immersive-Audio>

<https://www.youtube.com/watch?v=nsoDChjHNtY>

**The Ins and Outs of ST 2098-2 Immersive Audio Bitstream (Stan Cossette)**

<https://www.smpte.org/webcasts/standards-ST-2098-2>

<https://www.youtube.com/watch?v=U50WYIvo98k>

**ST 429-18 Immersive Cinema Track File and 429-19 Immersive Audio DCP constraints (Steve Llamb)**

<https://www.smpte.org/webcasts/Immersive-cinema-track>

<https://www.radiotvlink.com/en/webinars/783-st-429-18-immersive-cinema-track-file-and-429-19-immersive-audio-dcp-constraints>

# THE IMMERSIVE AUDIO DELIVERY DILEMMA

- Each immersive sound system has proprietary delivery requirements
- Multiple mixes need to be created, one for each playback system
- Multiple deliverables need to be created and distributed
- Adds complexity!

# IMMERSIVE AUDIO BITSTREAM (IAB) TO THE RESCUE!

- The Immersive Audio Bitstream (IAB) is the interoperable solution
- For cinema, create one mix, one IAB DCP, play in multiple immersive sound systems
- For home, create one mix, one IAB IMF, transcode to multiple deliverables
- Fosters interoperability and interchange

# SMPTE STANDARDS WORK

SOME SAID  
IT COULDN'T  
BE DONE

BUT WE  
DID IT!

- ST 2098-1 Immersive Audio Metadata
- **ST 2098-2 IAB bitstream specification**
- ST 2098-5 D-Cinema Immersive Audio Channels and Soundfield Groups
- ST 429-18 D-Cinema Packaging - Immersive Audio Track File
- ST 429-19 D-Cinema Packaging —DCP Operational Constraints for Immersive Audio

# SMPTE STANDARDS WORK

SOME SAID  
IT COULDN'T  
BE DONE

BUT WE  
DID IT!

- ST 430-1 AMD D-Cinema Operations – Key Delivery Message
- ST 430-12 AMD D-Cinema Operations – FSK Synchronization Signal
- ST 430-14 D-Cinema Operations — Digital Sync Signal and Aux Data Transfer Protocol
- **ST 2067-201 Immersive Audio Bitstream Level 0 Plug-in**

# SMPTE STANDARDS WORK

SOME SAID  
IT COULDN'T  
BE DONE

BUT WE  
DID IT!

In progress:

- EG 2098-3 Immersive Audio Renderer Expectations and Testing Recommendations
- ST 430-17 SMS-OMB Communications Protocol Specification
- RP 430-18 Immersive Audio OMB Implementation

# DCI WORK

- Object-Based Audio Addendum (2013)
- Multiple Media Block (MMB) architecture added to DCSS (2014)
- Updated Object-Based Audio Addendum (2018)
- Object-Based Audio Essence (OBAE) specifications added to DCSS (2018)
- Updated Compliance Test Plan (DCP) to test for MMB and OBAE (in progress)

# INDUSTRY IMMERSIVE AUDIO TRENDS AND DRIVERS

- Most tentpole movies are being mixed natively in immersive audio
- The number of immersive audio feature titles is growing-over 2000 to date
- There are more movies being mixed in immersive audio then there are immersive sound screens
- The number of immersive sound theatres has grown, but many have still not taken the plunge
  - Cost is a factor, getting lower as more sound system manufacturers are involved

# INDUSTRY IMMERSIVE AUDIO TRENDS AND DRIVERS

- Premium UHD BD discs with UHD video and immersive audio are doing well in the marketplace
- Several streaming services are delivering immersive audio to the home and asking for more content
- Home immersive audio systems (speakers, soundbars and TV's) are readily available and growing in the marketplace
- Mobile immersive audio is a growing trend, using the speakers in the device or headphones
- Music is now being mixed in immersive audio and has a Grammy category-over 2000 songs and growing

# IAB IN CINEMA



# BENEFITS OF ROLLING OUT IAB DCP

- Single deliverable--makes for more efficient mixing and mastering, which in turn leads to quicker and easier distribution
- Opens the door for more immersive audio titles
- All immersive content for all immersive sound theaters. Exhibition owners can feel more comfortable installing systems
- Opens field for more manufacturers to make and sell equipment, favors healthy competition and lower costs

# CINEMA ROLLOUT CHALLENGES

- ~6300 Immersive Sound screens worldwide
  - ~5000 have Dolby Atmos systems
  - ~1000 have DTS:X systems
  - ~300 have Barco/Auro systems
- Each sound system manufacturer must design an update and/or issue an SDK
- Each server and renderer manufacturer must create a specific update
- Cinemas must install these updates, no entity can enforce this
- Not unlike SMPTE DCP rollout, but far fewer screens!

# CINEMA ROLLOUT CHALLENGES

- Mixing tool sets must be able to create IAB
- DCP mastering equipment must be able to create IAB DCP
- Studios/Content Creators must have confidence that there won't be dark screens in order to embrace and distribute IAB DCP
- Studios/Content Creators want to make sure their content is being reproduced as intended. There is interest in a minimum immersive sound system configuration definition

# CINEMA ROLLOUT-STATUS

- ISDCF plugfest very successful
  - 4 manufacturer's renderers could play IAB DCP with currently deployed features
  - All could play forward-looking features to varying extents
- The three major systems' manufacturers have all issued SDKs
- Server and renderer manufacturers are creating updates to existing equipment (no information on expected dates)
- New IAB-compatible equipment is in the works or currently available
- IAB DCP mastering tools are already in place

# CINEMA ROLLOUT-STATUS

- Barco/Auro cinema status
  - Barco APX renderer can play all currently deployed features
  - 130 theaters have APX renderers currently
  - Remaining theaters plan to move forward now that content will be available
  - Auro Technology is in beta with tools to create IAB
- Dolby Atmos cinema status
  - All Dolby Atmos theaters can play the currently deployed features
  - A software update is in the works that will add some of the forward-looking features to the Atmos renderers
  - Dolby is issuing information about the currently supported features on their developer's site
  - No information about updates to cinema tool set

# CINEMA ROLLOUT-STATUS

- DTS:X cinema status
  - No DTS:X theaters can currently play IAB
  - Update will allow DTS:X renderers to play all IAB features
  - Plans to roll out to all theaters within this year. SDK's have been delivered to partners
  - IAB verification tools to be issued shortly
  - No information on updates to cinema tool set

Other manufacturers are getting into the Cinema IAB rendering game!

# RECOMMENDED PLAN TO ROLL OUT IAB DCP

- ST 2098-2 was created with future-proofing in mind
  - It has all the currently deployed Atmos features
  - It allows for additional bed channels e.g. height channels
  - It also has “forward-looking” features that are not currently being utilized
- Implementation of all ST 2098-2 features will take some time
- To get things started, define a “IAB Profile 1” that utilizes the currently deployed Atmos features
- Define other “stepping-stone” profiles based on industry implementation

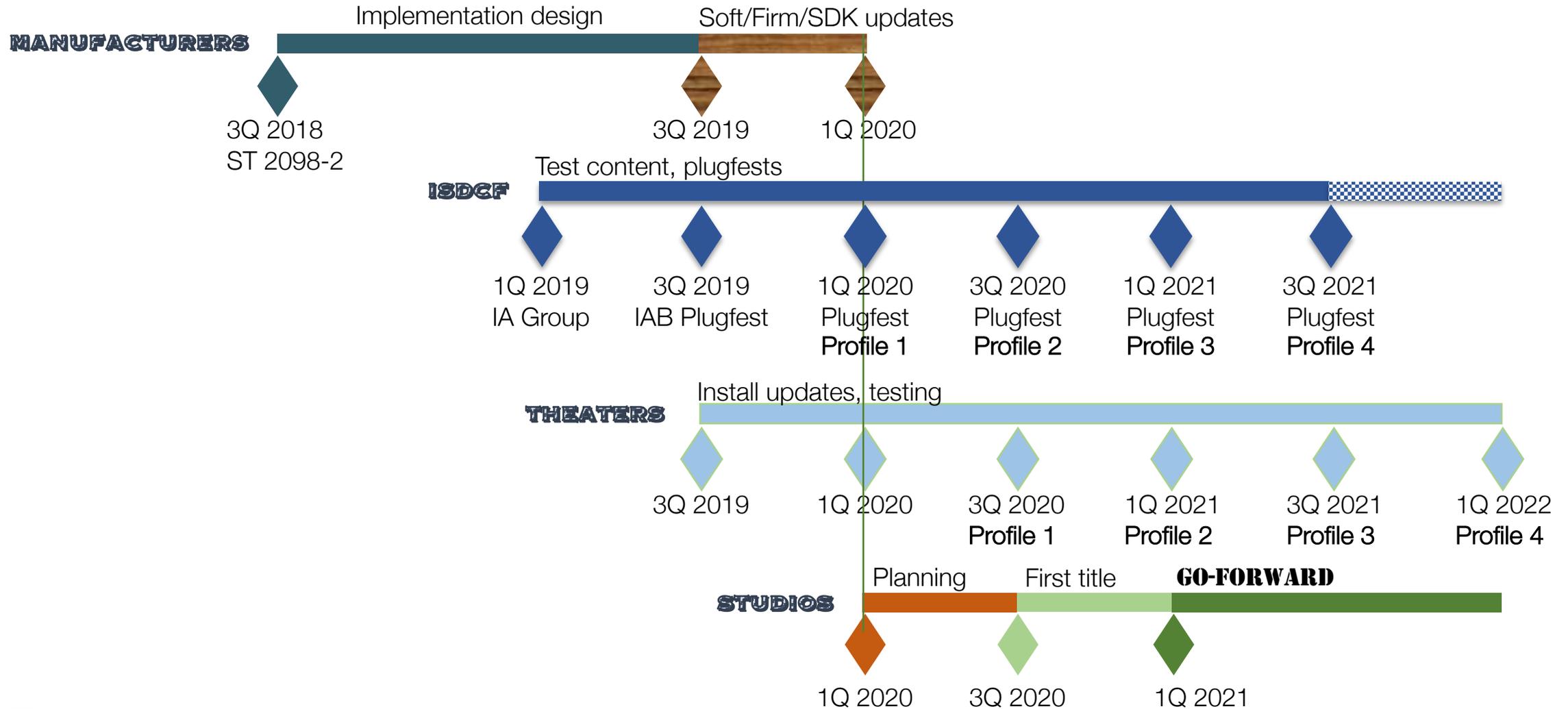
# RECOMMENDED PLAN TO ROLL OUT IAB DCP

Phased approach with specific goalposts:

1. NOW: Roll out IAB DCP to Cinema using Profile 1
  - All immersive audio renderers should be able to play this feature set
  - Matches what many studios are already distributing
  - Mixing tools could have a default mode to create IAB in Profile 1 for now
2. Define implementation goalposts and timelines as an industry
3. Set date to have full ST 2098-2 feature implementation in all immersive audio theaters. December 2021 is suggested
4. ISDCF should continue to assist with the rollout as they did with SMPTE DCP



# RECOMMENDED PLAN TO ROLL OUT IAB DCP



**IAB STANDARDS ARE DONE-TIME TO ROLL OUT!**

# IAB IN IMF



# BENEFITS OF ROLLING OUT IAB IMF

- Deliver in IMF as a standardized mezzanine format rather than a separate, proprietary delivery
- One-stop creation and delivery encourages mastering immersive audio for the home
- Fosters automated IMF cloud transactions and delivery
- Facility confidence in buying immersive audio capable equipment
- IAB IMF will not change delivery to the home but will ease B2B delivery

# IAB IMF ROLLOUT CHALLENGES

- Mixing tools must be upgraded to create ST 2067-201 IAB IMF
- IMF authoring equipment must be upgraded to author IAB IMF
- IMF playback equipment must be upgraded to read IAB IMF
- Compression software requires upgrades to read IAB IMF and transcode to consumer deliverables
- Disc authoring facilities and streaming companies need to update their tools to utilize IAB IMF
- Studios/Content Creators need to create and distribute IAB IMF. Some have yet to fully utilize IMF.

# IAB IMF ROLLOUT STATUS

- IMF plugfest-good start for IAB
  - IAB test vector was created
  - Three vendors created IMF packages, another was created using the script on Gitlab
  - Two vendors participated and could decode and play all IAB IMF packages
- Colorfront, Marquise, MTI Film, Rohde&Schwarz and Visible Light are in the process of adding IAB functionality
- Other vendors plan to add authoring or playback functionality later this year
- Photon and Colorfront Transkoder have IAB IMF verification functionality, other verification vendors plan to add later this year

# IAB IMF ROLLOUT STATUS

- **Mixing tool status:**
  - Auro Technologies: Actively working on mixing tools to create IAB for IMF
  - Dolby: RMU can export IAB, Conversion Tool can convert DAMF or ADM to IAB
  - DTS: No update information
- **Compression software status:**
  - Auro Technologies-actively working on compression software
  - Dolby: Dolby Encoding Engine (DEE) can ingest IAB and encode to DD+JOC or AC-4. TrueHD will be coming soon. So far cannot directly utilize IAB IMF
  - DTS: No information available

# IAB IMF ROLLOUT STATUS

- Disc authoring:
  - No specific information-noting that these facilities rely on compression software implementations and should be capable of disc authoring using IAB IMF once compression software is updated
- Streaming services
  - Netflix moving toward taking IAB IMF, currently taking ADM
  - No information on other streaming vendors, most take ADM now
  - These services also rely on compression software implementation

# SUGGESTED PLAN TO ROLL OUT IAB IMF

- Create IAB now: Create IAB on all home immersive mixes going forward to Profile 1
- Build an IAB IMF library: Create IAB IMF as soon as equipment becomes available
  - Build or add to an existing IMF library
  - Likely will continue delivering proprietary files to some partners until all have upgraded
- Content providers should work with with vendors and partners to test functionality and establish comfort
- IMF UG could manage the rollout plan, stepping-stones and a goal for full compliance

# CRYSTAL BALL

- Studios/Content Providers will begin delivering IAB DCP's by Q3 of 2020 to theaters that can play them, some already are
- Studios/Content Providers will deliver only IAB DCP's to immersive sound theaters at some point in the not-too-distant future
- Studios/Content Providers will begin creating IAB IMF's this year
- Studios/Content Providers will begin delivering IAB IMF's to disc authoring and streaming vendors in 4Q of 2020

# RECAP

- Immersive Audio is well established in our industry
- IAB standards are published
- There are many benefits to utilization
- Implementation challenges are known and solutions in progress
- Cinema rollout can begin now using IAB Profile 1
- ISDCF should shepherd the IAB DCP rollout á la SMPTE DCP
- IAB IMF rollout should start later this year as tools become available
- IMF UG could shepherd the IAB IMF rollout

LET'S DO THIS!



# THANK YOU!



Brian Vessa

Sony Pictures Entertainment

Brian\_Vessa@spe.sony.com