THE FUTURE OF AUDIO IN BROADCASTING, A DTS PERSPECTIVE

ITU-R WORKSHOP

JULY 2015

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DTS, INC.

AGENDA

- Future looking trends in broadcast
- Key consumer value propositions of NGA
- Opportunities & Challenges ahead
- Solutions of today
- MDA & DTS:X Workflows & Tools
- Closing remarks

IMMERSIVE AUDIO – A RENEWED OPPORTUNITY

Emergence of immersive audio systems in cinema

- Arrival of UltraHDTV: new experience, new premium service tier = new experience
- New standardization activities: DVB, ATSC 3.0, ITU, FoBTV, SMPTE …
- Service operators battle for technological leadership (1st to do PR) & battle to differentiate services

Opportunity for new standards, technology, and an equipment refresh, which includes codecs

- Address audio issues that have plagued the broadcast industry
- Enable new services and new experiences in broadcast sound

FUTURE LOOKING TRENDS IN LIVE PRODUCTION

- Move toward IP transport for audio production
  - AVB; AES67/Ravenna; SMPTE 2022-6; SMPTE 337
  - Standardization is key for transport, encapsulation, & production formats
- Smarter audio
  - More metadata
  - Timing info within audio ES
- Production in-sourcing
  - Trend of more production assets moving from OB Truck to BOC
  - e.g. Commentator, graphics
  - Even mixing and director can move to NOC rather than field
- More mic feeds
  - Player mics to become more common
  - Player tracking, and automated panning & ducking techniques being explored
  - Ongoing research on mic isolation / sound separation

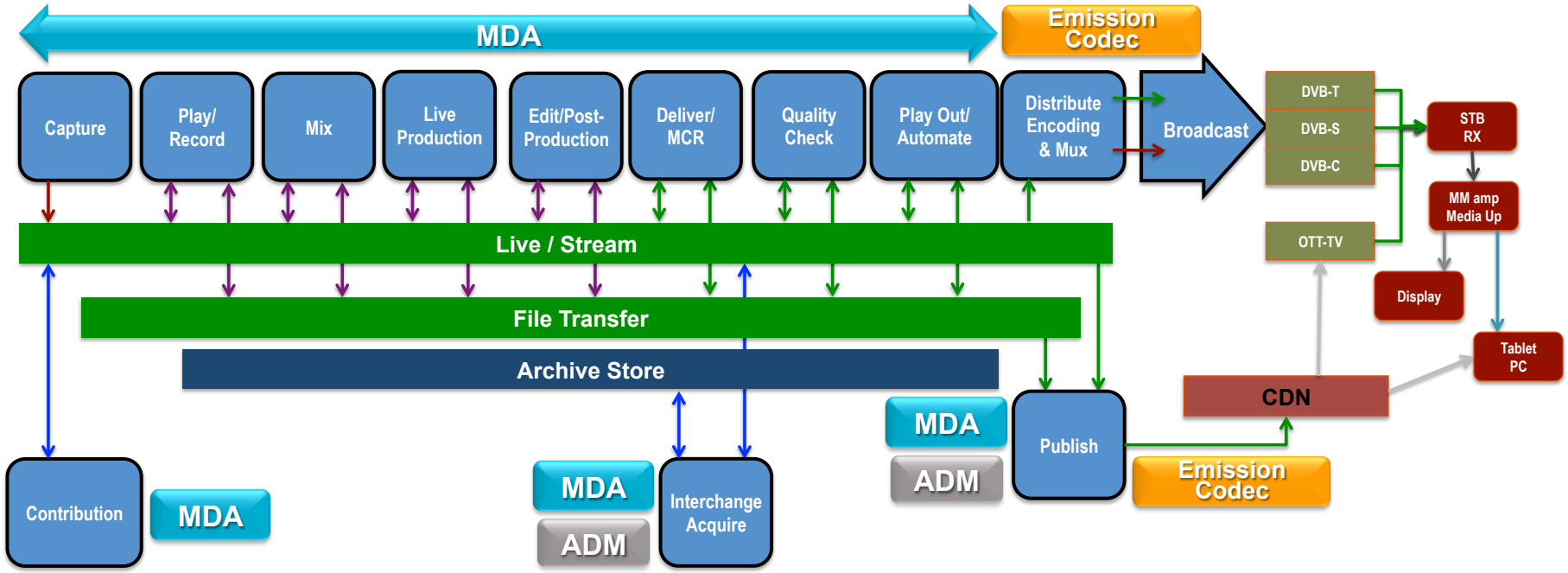
MDA ITU; ETSI; SMPTE

ADM ITU; EBU

OPEN IMMERSIVE STANDARDS IN PRODUCTION-POST-DELIVERY

** Architecture diagram courtesy of:*

Forum for Advanced Media in Europe



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FUTURE LOOKING TRENDS IN HOME DELIVERY

- Next generation delivery pipes
  - Governments and standards defining the new pipelines
  - IP –based delivery at the heart of many
  - Hybrid delivery will be key for Next-Gen Audio services
- More connected devices
  - Enabled via IP delivery
  - Easily upgradable architectures
- Service providers blur the lines
  - More & more operators offering OTT access to services
  - OTT no longer limited to on-demand architectures, live is a reality
- Models changing
  - Premium content offering direct access & subscriptions
  - PayTV offering services as OTT only to not subscribers

With hybrid delivery services, broadcasters can afford to offer a much broader degree of personalization features thanks to personalized on-demand access via streaming/IP

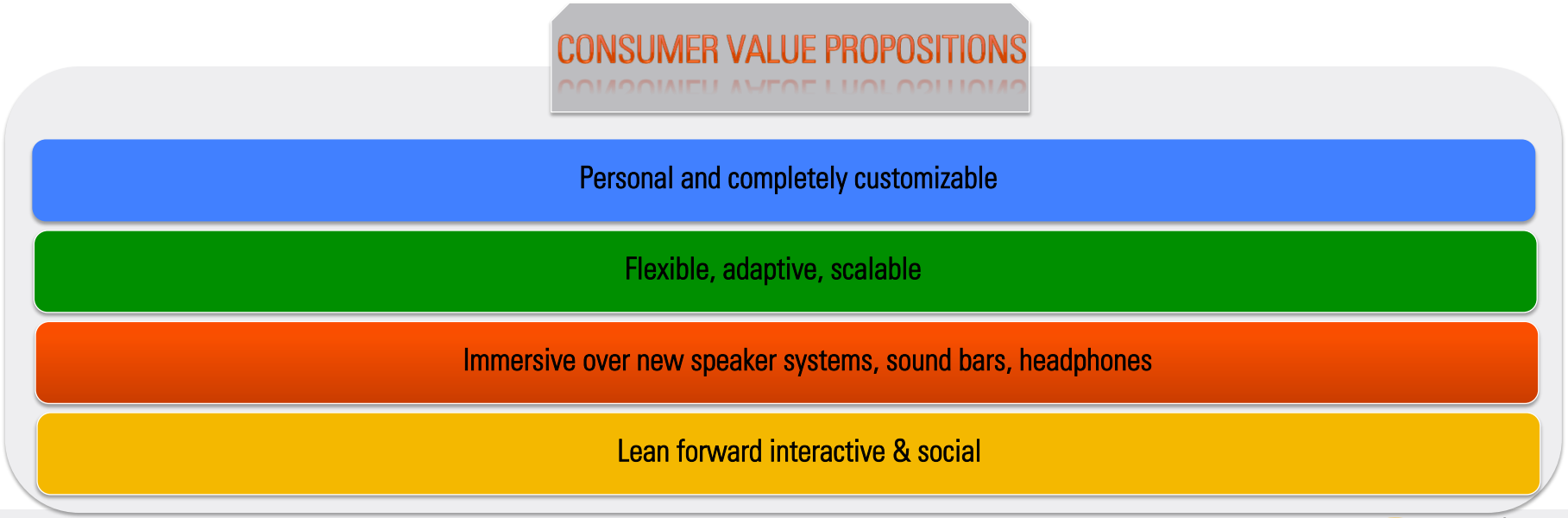
Apps on Smart phones, tablets, STBs, and connected TVs, makes deploying service with new features & codecs much more streamlined

More ways to get access to content.
More content accessible in easy to deploy services
More competition for eyeballs/ears = more reasons to differentiate services

VALUE PROPOSITIONS FOR THE CONSUMER
AS WILL BE ENABLED BY NEXT-GENERATION AUDIO SYSTEMS

CONSUMER VALUE PROPS ENABLED BY NGA

- Focusing on the consumer value propositions will be key for adoption of Next-Generation Audio technologies
- The introduction and support of Object-Based audio in Next-Gen compression systems is a key enabler



THE CONSUMER EXPERIENCE

… as enabled by object-based audio

Audio has just become more personal

- Complete personalized experience for each viewer
- Customizable to individual preferences:
  - Ability to “change the mix”
  - Preferred commentator
- Personalized sonic experience:
  - Dialog Control
  - Dynamics Control
- Enhanced sonic experience for HI/VI
  - Dialog intelligibility enhancement
  - Improved Descriptive Video Services
- Infinite choice of languages mixed via hybrid OTT

THE CONSUMER EXPERIENCE

… as enabled by object-based audio

Interactive and social

Applications that are truly engaging consumers

- Ability to change every aspect of the broadcast mix
- Access to highly desired never before offered Aux mic feeds for sports fans
- Enable sonic aspects of social TV & social networks
  - e.g. Skype/Twitter with your friends

A lean forward interactive experience via 2nd screen TV companion apps

Or an intuitive, familiar on-screen simplified UI via remote control

Interactive objects can arrive via different delivery paths (hybrid delivery) and be transparently integrated into final presentation

THE CONSUMER EXPERIENCE

… as enabled by object-based audio

Immersion

What is immersive audio?

Elevation effects, realistic diffuse ambient sounds, and precise point source placement

Immersive spatial audio rendering in consumer devices: e.g. headphones*, sound-bars and TVs

** Immersive audio can already be realized in millions of already deployed next-gen rendering technology, DTS Headphone X*

Enable optimal spatial audio fidelity

Object based audio also improves fidelity by avoiding down-mixing side effects

THE CONSUMER EXPERIENCE

… as enabled by object-based audio

Flexible, adaptive, scalable

- Loudspeaker configuration agnostic and layout tolerant
  - Adapt to non-standard setups
  - Support legacy setups: mono, stereo, 5.1, or 7.1
  - Support next gen immersive home theater layouts: 5.1.4 (9.1), 7.1.4 (11.1), 10.2, 22.2, x.y.z
  - Support multiple sound-bars
- Scalable to allow piece meal addition
  - (gradually grow your home theater systems)
- Adapt to home environment: dynamically adapt to noisy settings

OPPORTUNITIES & CHALLENGES AHEAD FOR BROADCASTERS

OPPORTUNITY FOR BROADCASTERS

- Produce a higher quality, next gen production
  - Premium experience can be monetized
  - Deliver an enveloping immersive experience
  - Deliver an enhanced experience for HI/VI
  - Enable a simplified consumer home setup
- Deliver an engaging lean forward interactive experience for fans
  - Interactivity using OBA is coming via 2nd screen or iTV
  - Offer personalized listening experience like never before
  - Produce upsell assets for tiered service subscribers
    - Locked assets are an easy extension of existing OBA metadata + DRM

CHALLENGES

- Co$t
  - An increase in production costs for managing extra mic feeds
  - Questions around ROI
- Complexity
  - Managing 5.1 workflows & multiple mixes already complex enough
  - Managing immersive mix plus numerous objects = scary
    - Restricted truck space for immersive speaker monitoring
  - Loudness solutions for OBA?
- Infrastructure requirements and Hardware upgrades
  - What has to be upgraded in order to make the move to OBA in Live?
- Technology / Product / Solution readiness

BABY STEPS SOLUTIONS

- Technology pioneers will break chicken & egg
  - Showcase the experience, wet consumer appetite, drive demand
  - The new experience everyone wants, should drive service providers to ask for it & pay for it
- Contribution migration strategies being proposed
  - From additional SDI feeds completely separate from current
  - To replacement of SDI channels reserved for Alt mixes (e.g. Alt languages)
  - To all objects mix (production in-sourcing), rendered in BOC for Distribution needs
- Mixing Presets & Preproduction:
  - Presets for Immersive bed mic groups & for certain static object positions
    - Similar concept to pre-authored interactive manifest (prior to live event)
  - Reserve dynamic on the fly mixing for certain high priority mic feeds/objects

BABY STEPS SOLUTIONS

- Infrastructure requirements and Hardware upgrades:
  - What has to upgraded in order to make the move to OBA in Live production?
    - Mixing console replacement?
    - IP Based transport for all audio?
    - Contribution encoders/decoders?
    - Monitoring & Loudness?
    - Next-Gen emissions codecs for OBA?
- How many A1s / A2s does it take?
  - Tests have shown it can be handled by one A1
  - Some will prefer two A1s in early days, depending on delivery strategy
  - Extra A2s for managing extra mic feeds
- Solutions readiness?
  - Not everything has been reinvented yet
  - But solutions to deliver OBA over existing workflows available today

SOLUTIONS OF TODAY

DTS' SOLUTIONS FOR OBJECT-BASED/IMMERSIVE AUDIO

MDA

Open, royalty-free, uncompressed, production format and standard

- Supports immersive audio: Object-Based, Channel-Based, Scene-Based (HOA) content
- Supports unrestricted number of channels and/or objects
- Specification includes: Metadata + Bitstream + Renderer
- DTS Stewardship: Specification, Reference Tools, Reference Renderer
- Cross-industry harmonization in content creation standards (e.g. Cinema, Broadcast, film production for home delivery)
  - ITU-R
  - SMPTE
  - ETSI

DTS:X

A next generation codec solution

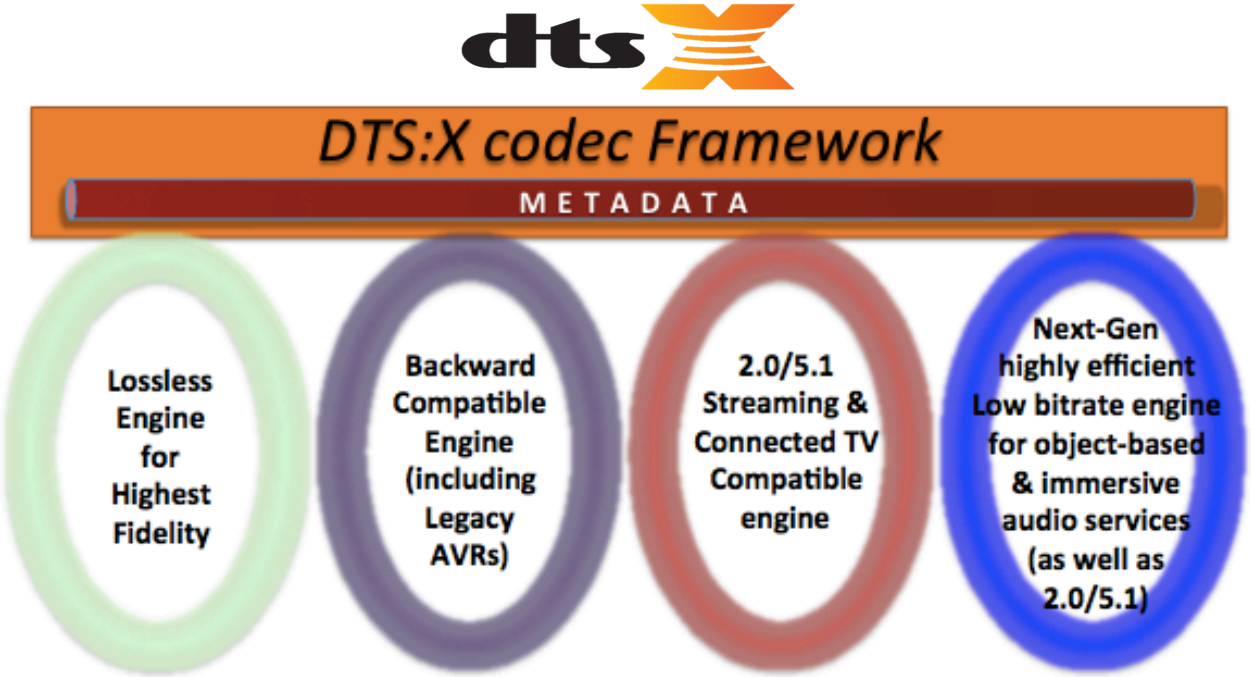
- Efficiently carries immersive audio (or MDA) content to the home
- Adaptable and scalable rendering to any loudspeaker playback configuration
- Customizable, immersive, personal, and interactive

dts:X Key Features

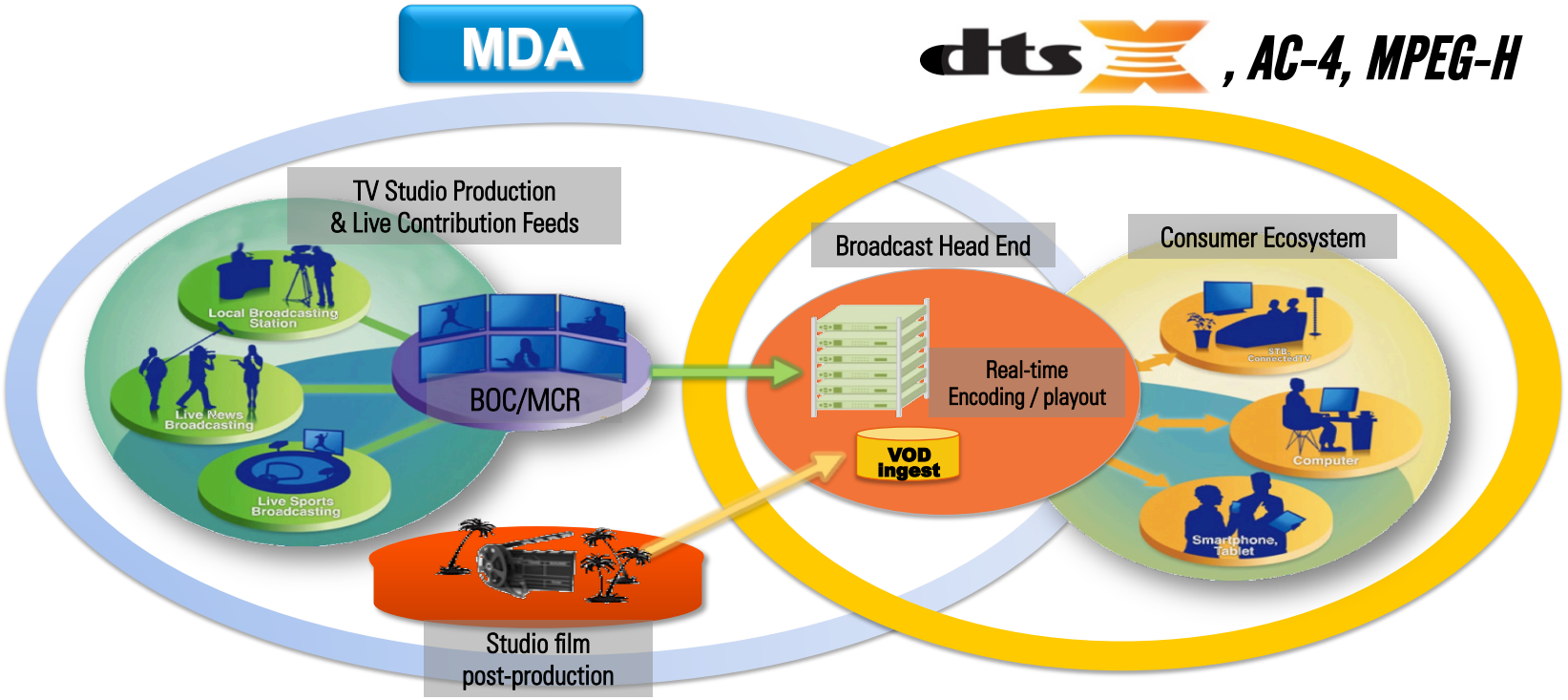
- Next-generation consumer delivery format & rendering technology
  - to be submitted to relevant standards dealing with emission codec such as:
    - DVB; FoBTV; BDA; SCSA; SMPTE; DLNA; SCTE; and other toolbox codec standards
- Codec Profiles targeting different applications & devices (e.g. Blu-ray vs Broadcast)
- Key features:
  - Support for Immersive playback and rendering
  - Support for flexible combination of channels and objects
  - Efficient compression from Low bitrates to Lossless
  - Object-based personalization and interactive feature support
  - Backwards compatibility
  - Speaker layout agnostic, offering adaptability to sub-optimal setups
  - DTS Headphone X integrated solution for mobile
- Encoding tools already available, being integrated and deployed in content delivery chain
- Decoders: SDK available, already deployed in AVRs
  - 15 brands committed to support DTS:X in their 2015 model year AVRs representing >90% of AVR market penetration

DTS:X CROSS-INDUSTRY SOLUTION

MULTIPLE CODING ENGINES, ONE COMMON FLEXIBLE BITSTREAM & METADATA FRAMEWORK



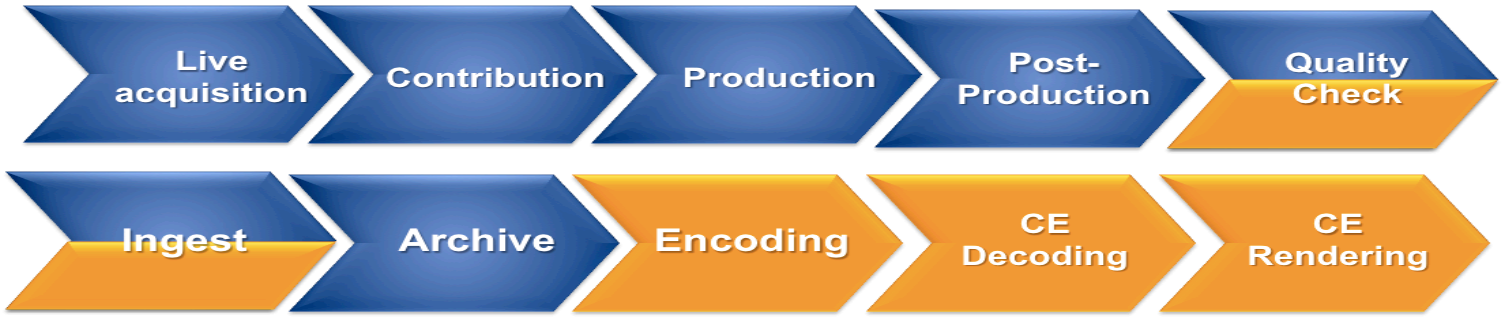
BROADCAST ECOSYSTEM: WHERE THINGS FIT IN



DTS' SOLUTIONS FOR PRODUCTION-POST-DELIVERY

MDA Production Format

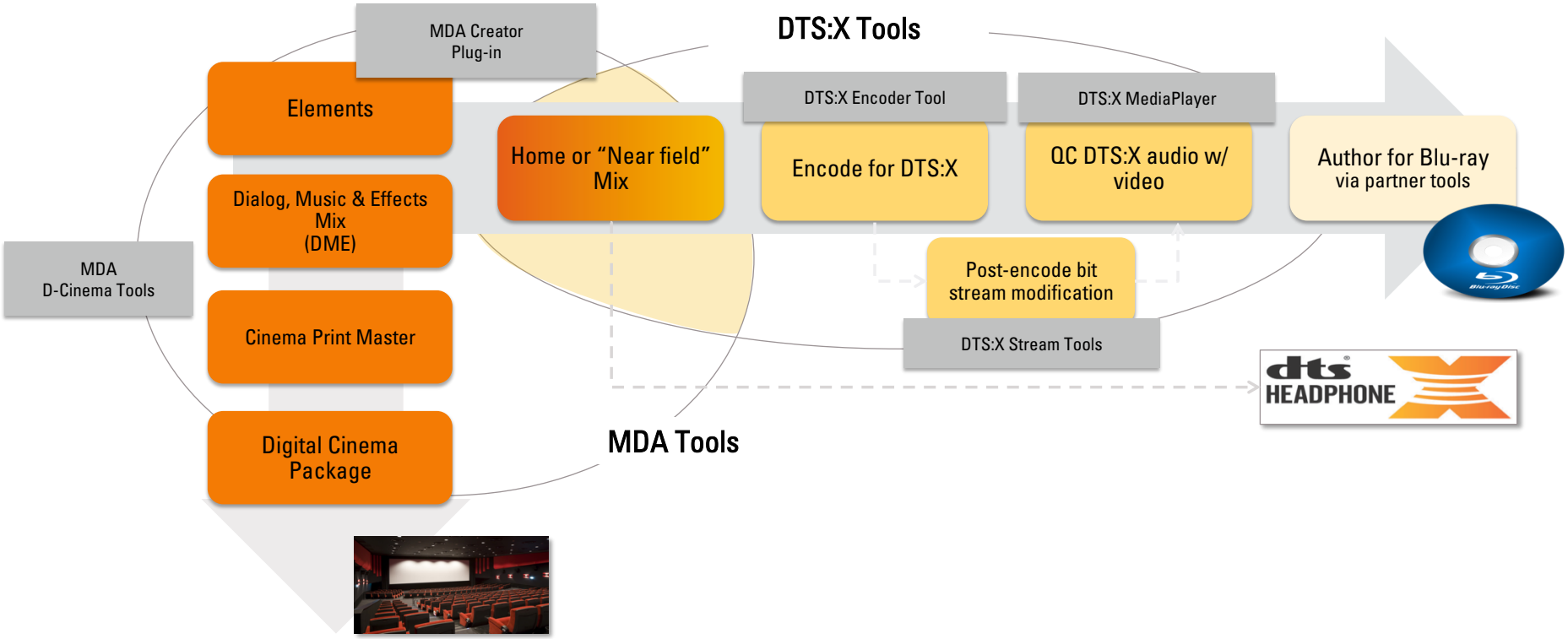
DTS:X Coding & Rendering



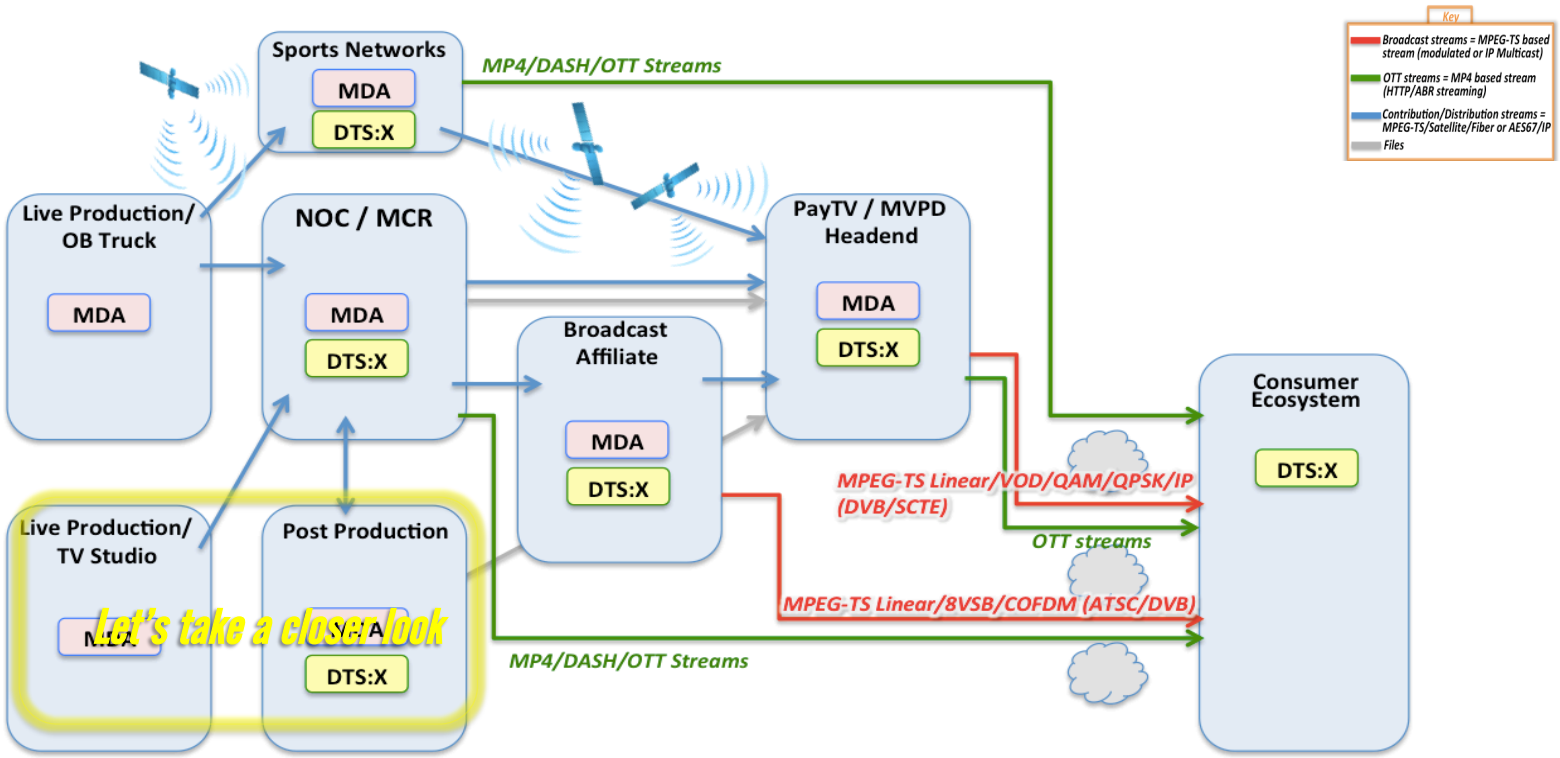
MDA & DTS:X WORKFLOWS & TOOLS

MDA POST PRODUCTION DAW TOOL EXAMPLE

CINEMA TO HOME WITH MDA & DTS-X

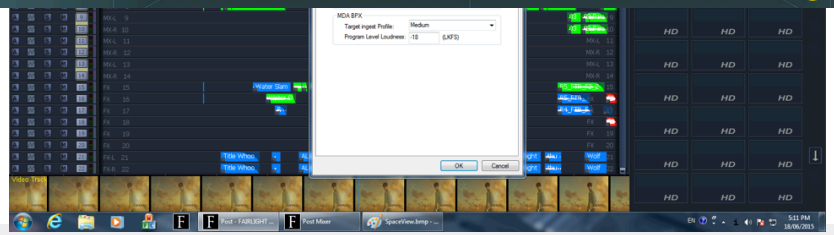


DTS BROADCAST WORKFLOW



MDA TOOLS FOR BROADCAST PRODUCTION

FAIRLIGHT



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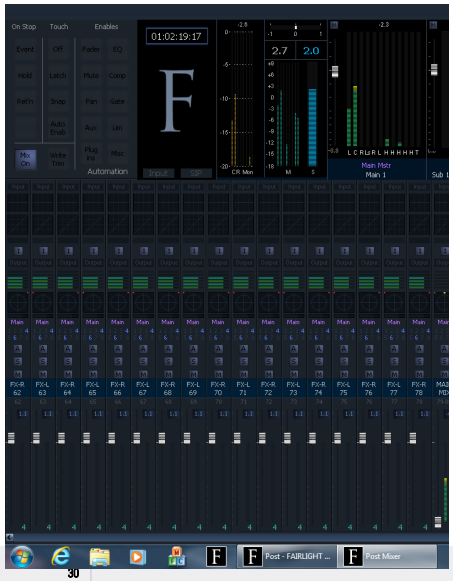

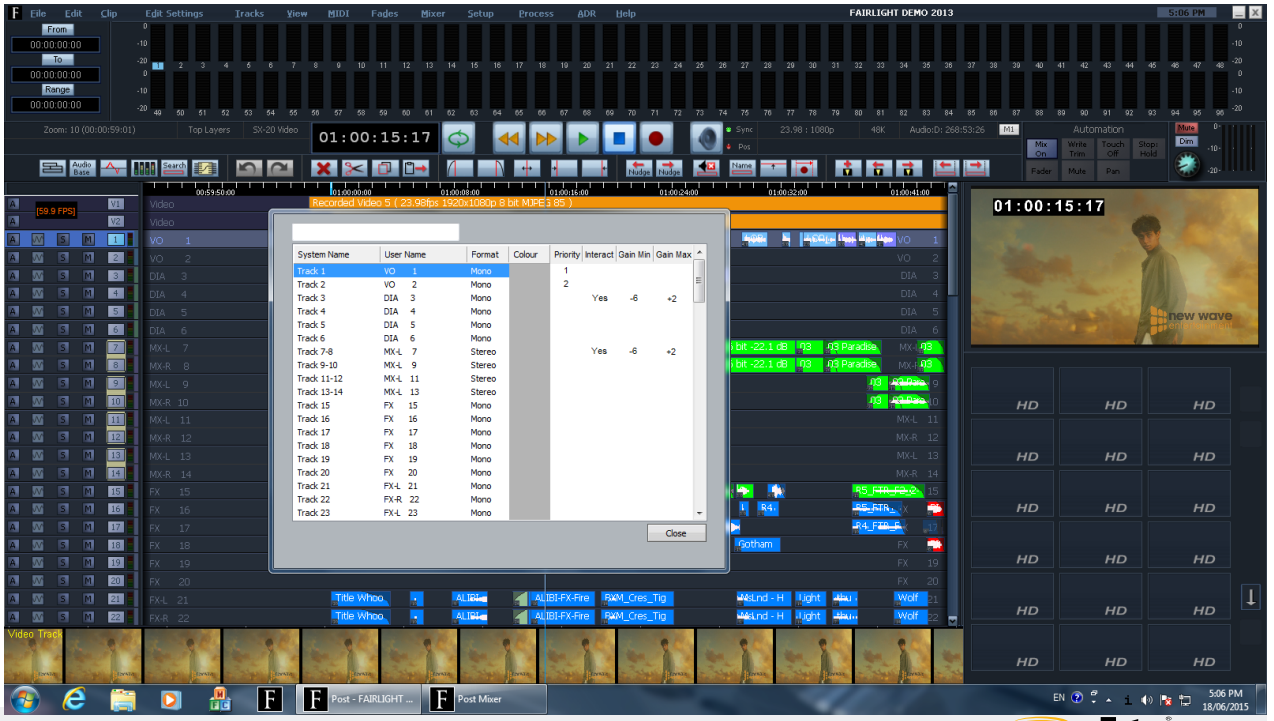

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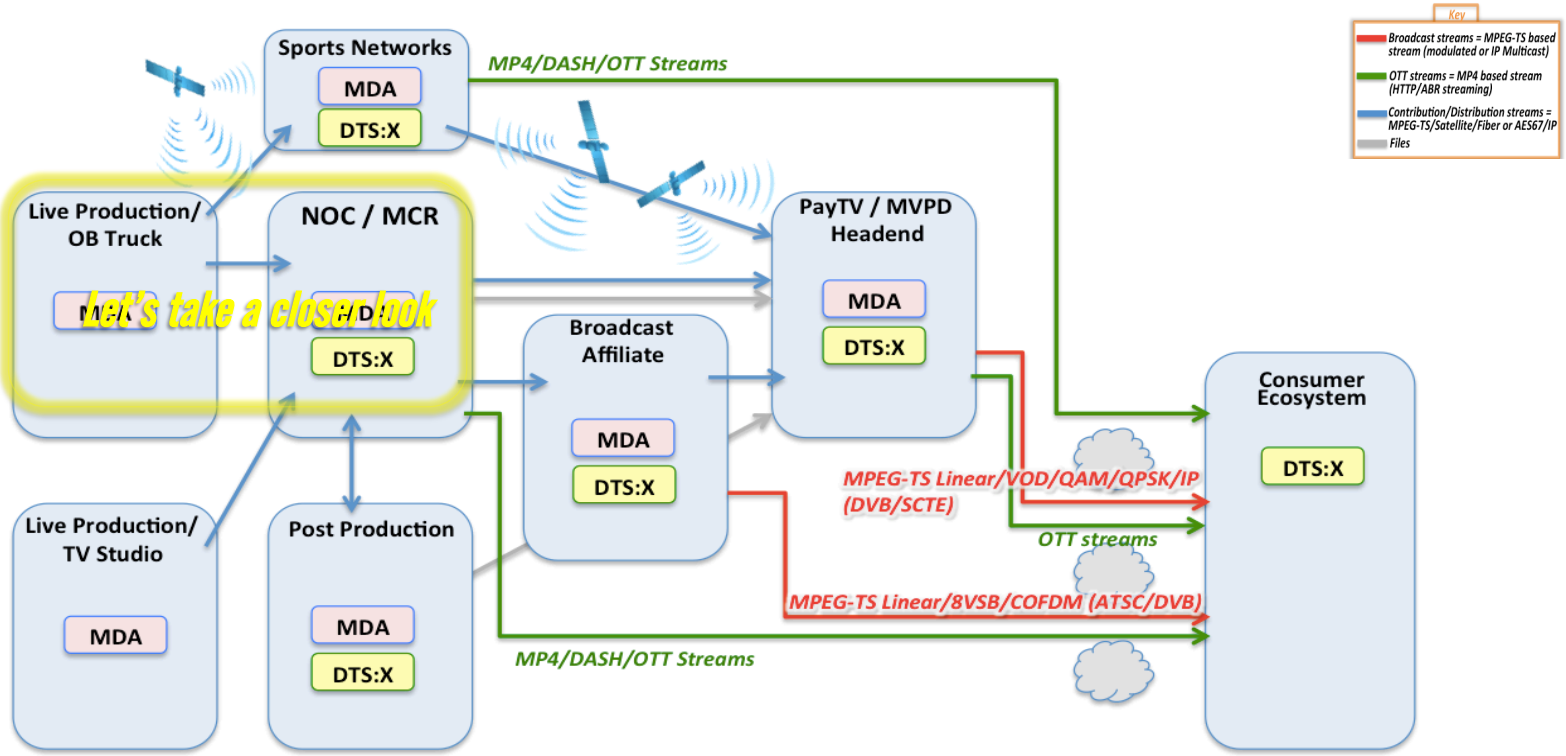
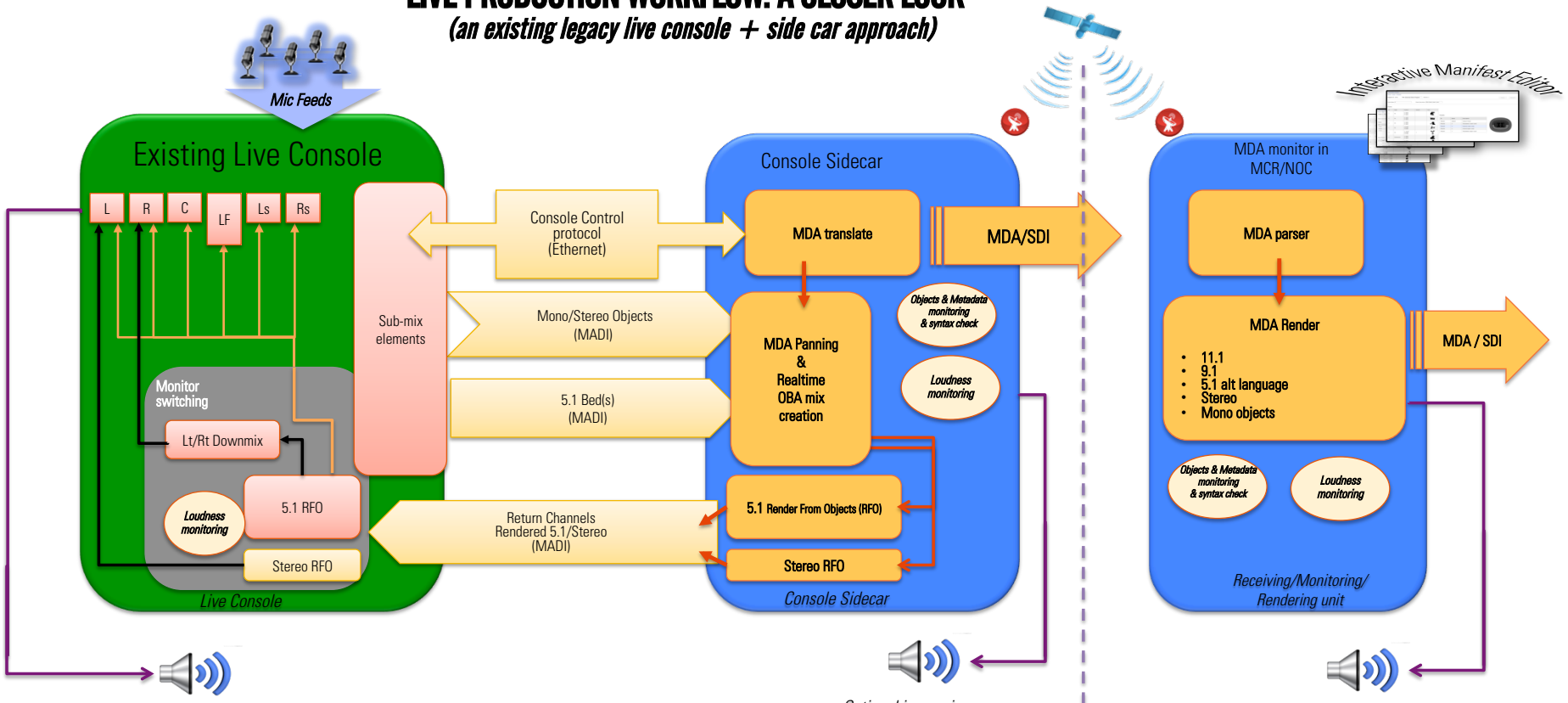
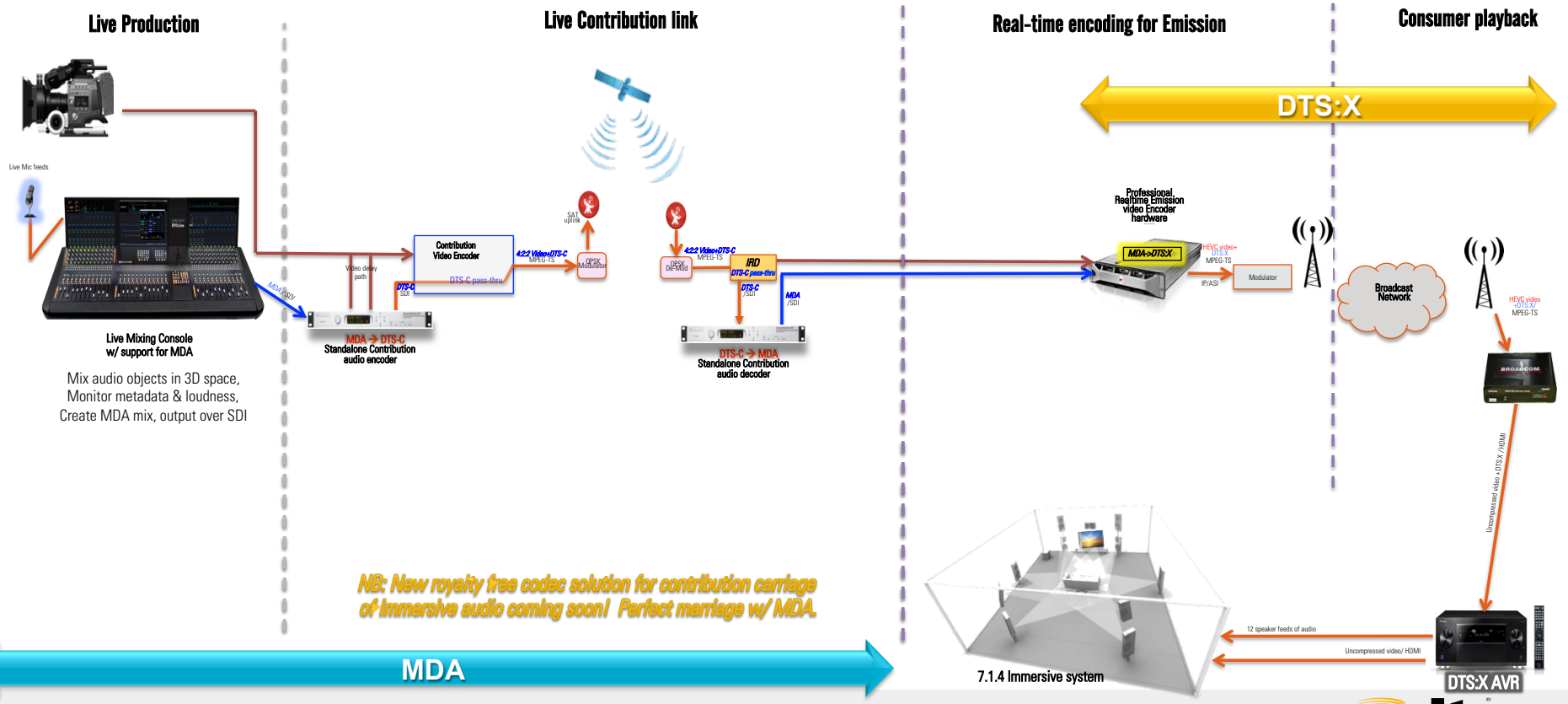


LIVE PRODUCTION WORKFLOW: A CLOSER LOOK

(an existing legacy live console + side car approach)



EXAMPLE: RECENT LIVE WORKFLOW TEST



CONCLUSION

- Lots of industry activity happening
  - Proponents building out solutions
  - Standards being defined
  - Broadcast products being refreshed
- Down to earth summary:
  - While many things possible already today, some broadcasters are still hesitant to dive in
  - Realistically you can just start by adding one static dialog object, with restricted loudness control
    - Satisfy many of today's uncontested value props in broadcast

THANK YOU

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