

Objects:

A radical new approach to audio for broadcast

PSS Doha

# Beyond 5.1:

Where do we go next



- The way customers consume content is evolving rapidly.
  - Mobile, Tablets, ...
  - OTT
- Video is moving on from HD, leaving audio once again trailing.
  - 3D...
  - 4K, 8K, 16K, ...
- We need a radical break from Channel Based Audio – 22.2 is not the answer broadcasters and consumers are looking for.

# Beyond 5.1:

Where do we go next



- Object Based
  - Scalability
  - customisation
- The role out of HEVC can be used to implement a new generation of audio codecs
  - New Audio Codec required
- Consumer playback systems are evolving
  - Soundbars
  - Surround Headphones

# Current State of Play:

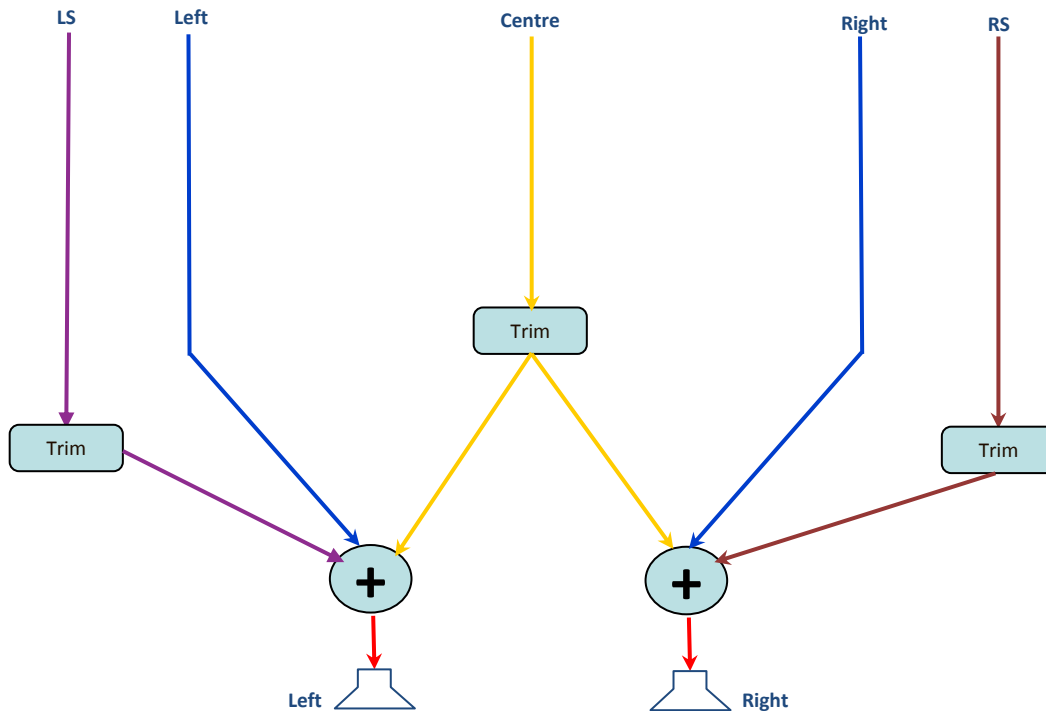
## Audio formats



- Channel based audio
- Mono, Stereo, 5.1, 6.1, 7.1, 22.2, ...
- The percentage of customers benefiting from a 5.1 production is limited to the roll-out of 5.1 playback systems
- Customers have a limited amount of control
- **Downmix** used to change between formats

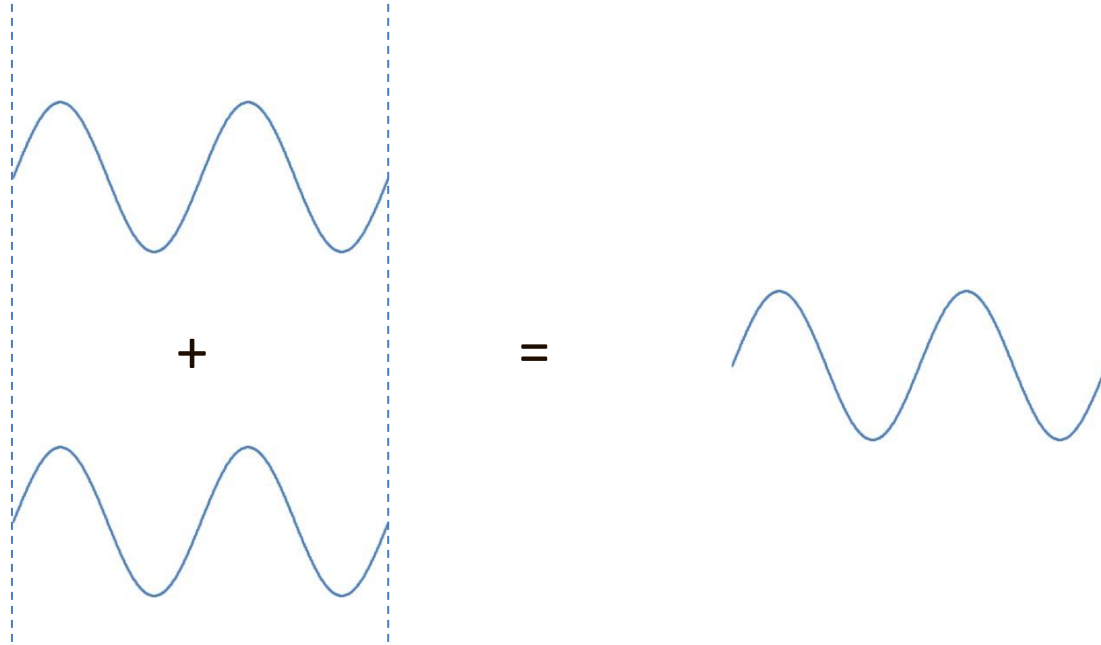
# Downmixing:

## Standard Downmix Flow Diagram



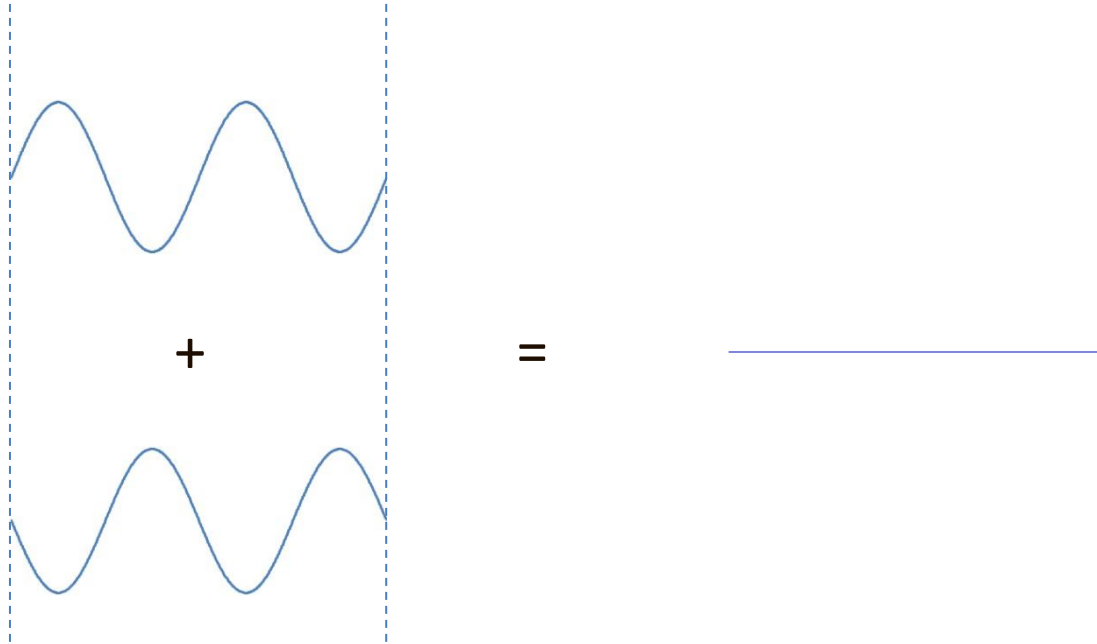
# Downmixing:

The pitfalls – All is good



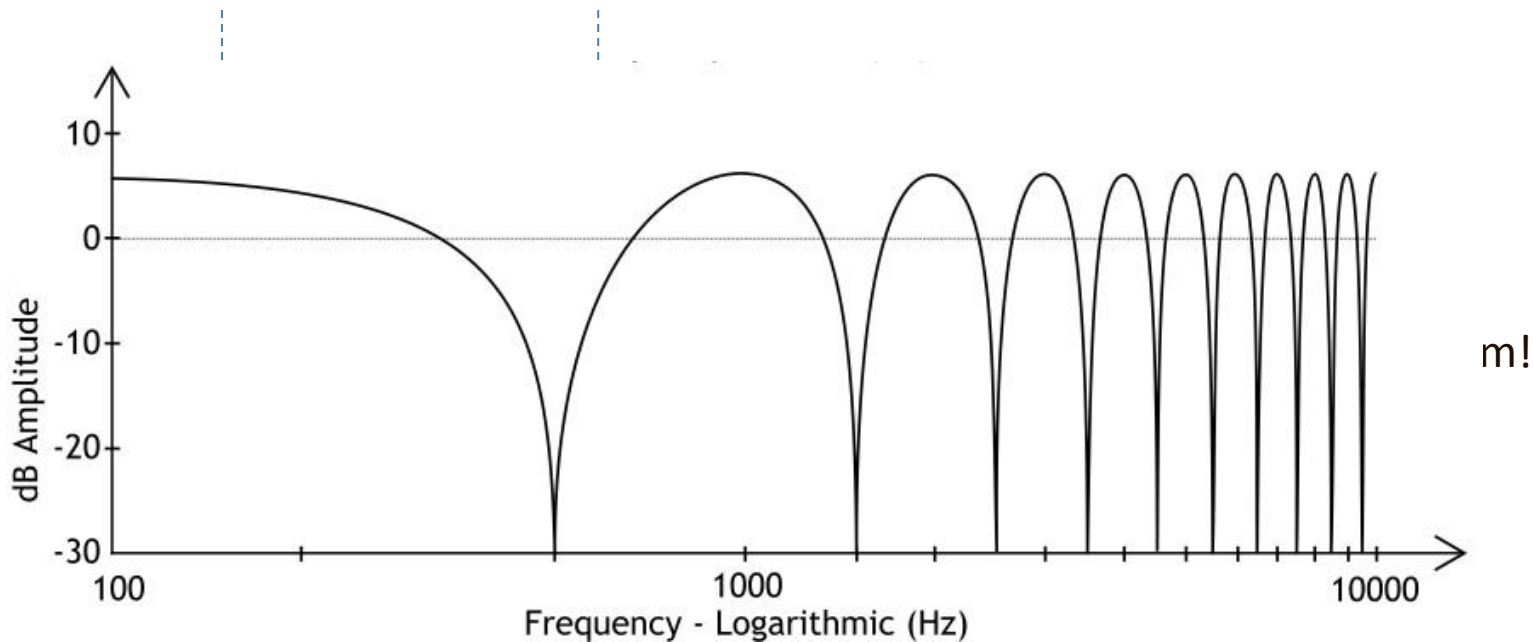
# Downmixing:

The pitfalls – Unlikely



# Downmixing:

The pitfalls – We have a problem





# Where do we go from here

## Object Based Audio



There has to be a different way...

Hopefully one that can benefit a large percentage of customers!

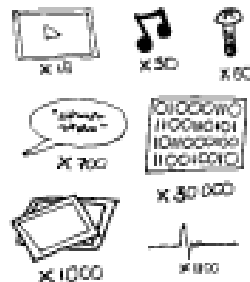
- Personalised Service
- Compatible/Benefitting a large number of devices/customers
- Without the need for downmixing
- One delivery package to suit all!
- Push towards more enveloping 'with height' surround
- Backward compatible!

# Traditional vs Object Based

## Traditional

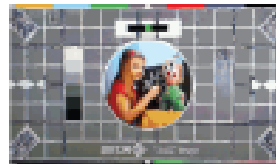
### TRADITIONAL BROADCASTING

1



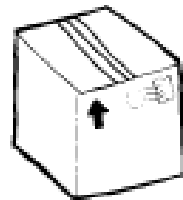
The programme is made in the traditional way.

2



The programme is turned into a piece of linear media.

3



This is broadcast to everyone.

4



The same content is played back on all devices, resulting in compromises on some devices.

# Traditional vs Object Based

## Object Based

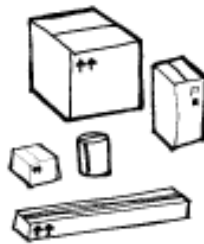
### OBJECT BASED BROADCASTING

1



The programme is made in the traditional way.

2



The programme is turned into a collection of media objects along with some metadata to describe how it should be assembled. All of this data is broadcast to everyone.

3



The device inside the viewer's home re-assembles the media objects according to the metadata.

4



The objects can be assembled differently (based on the original metadata). optimising the experience depending on local factors relating to the device, environment and viewer.

# Object Based

## What does that mean for audio



- Rather than sending a completed mix we have the ability to send individual stems with metadata
- Examples of stems:
  - Multiple commentaries
  - Audio Description
  - Multiple ambiences
  - Effects mix
  - ...
- An object based format can make for a single broadcast delivery format
- There are many challenges to overcome...

# This isn't going to be easy

## The challenges



### Challenges...

- We will require changes to the complete content production workflow
  - **How to capture**
  - How to monitor
- We will require new audio codecs that 'speak' Object Based
  - Large number of objects
  - Heavily Metadata driven
- Bandwidth
  - We will want a little more
- The complete End-Users Eco-System has to change
  - Set-Top boxes
  - Smart Phones

Ambience objects are more important than ever

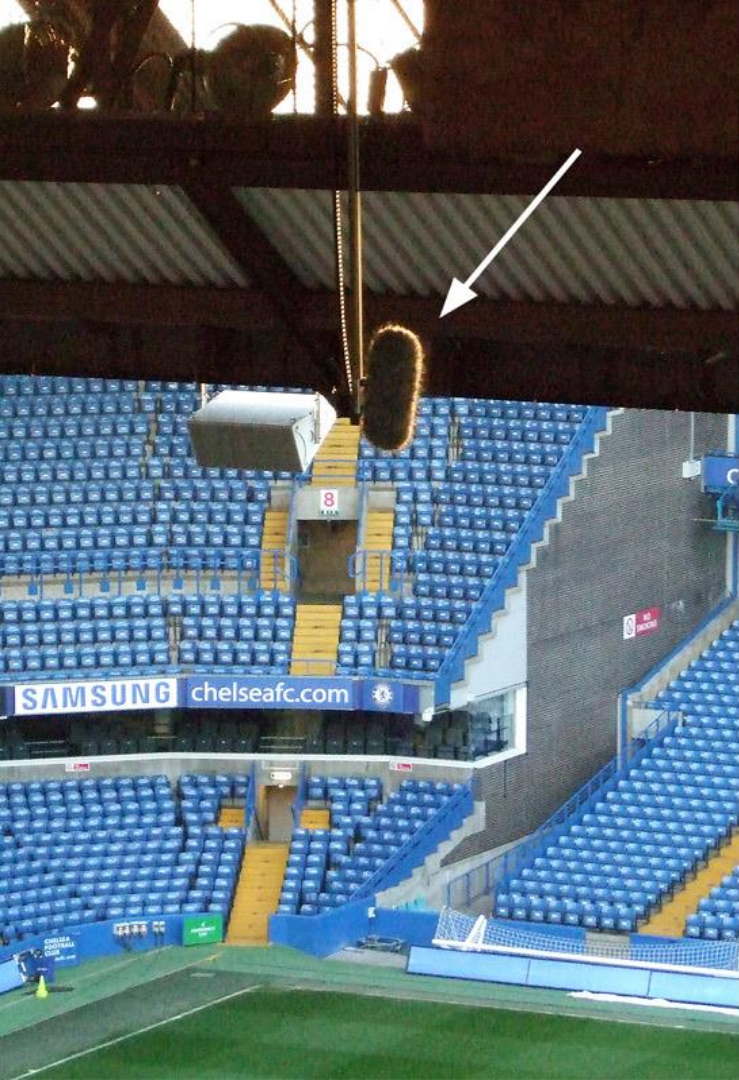
Consumers could be given a choice of ambience

Team A

Team B

Neutral





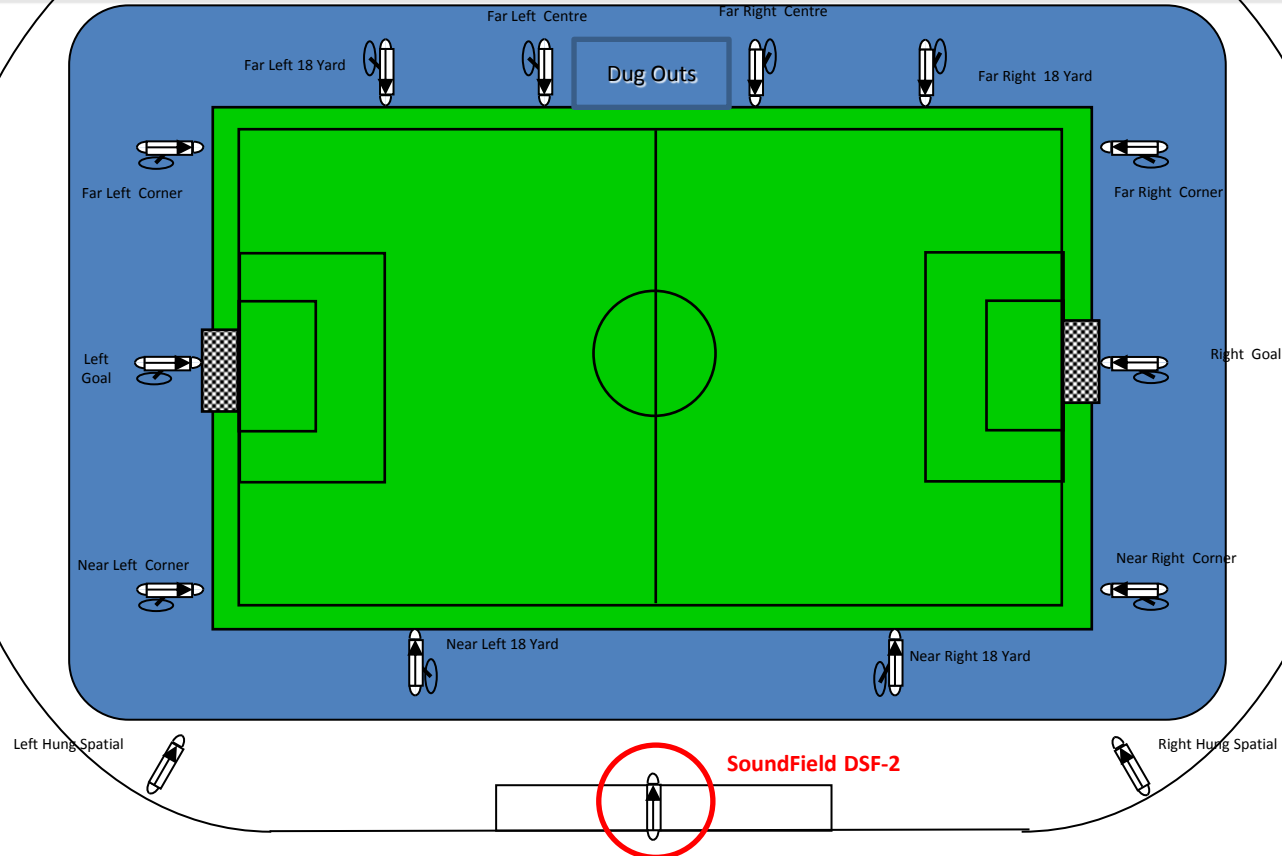




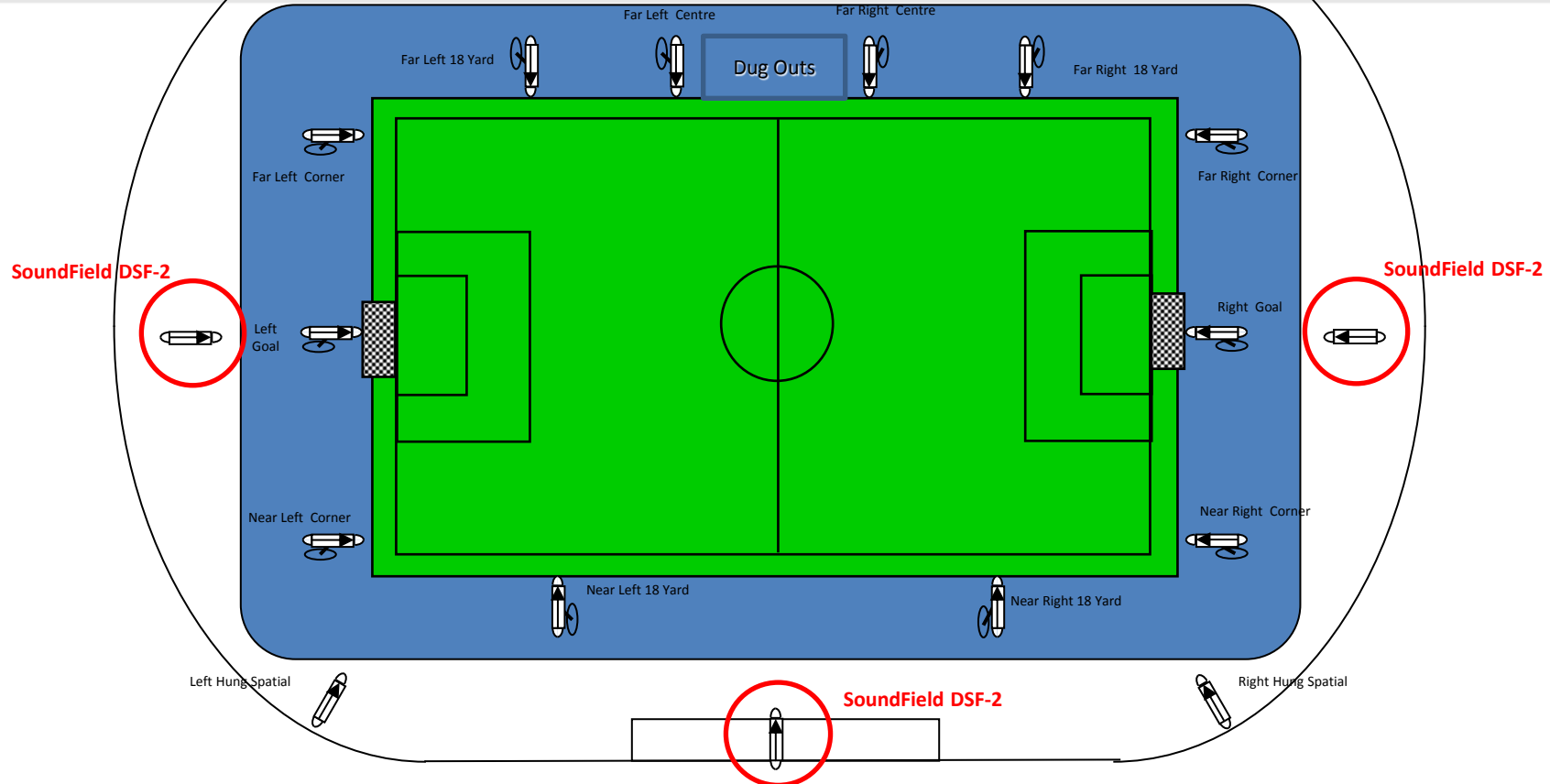




# Typical Football 5.1 Microphone Plan



## Object Based Microphone Plan?



# More Enveloping

## Taking surround a little further



This is also a great opportunity to move surround forward!

- Adding a height element to create a more enveloping experience
- Some of the formats in use today:
  - 5.1 + 2
  - 5.1 + 4
  - 7.1 + 2
  - 7.1 + 4
- Could we use B-Format as a transport format for the ambience object?
  - No need for mixdown of ambience
  - Can support any loudspeaker configuration
  - Output configured based on the consumer's device and metadata

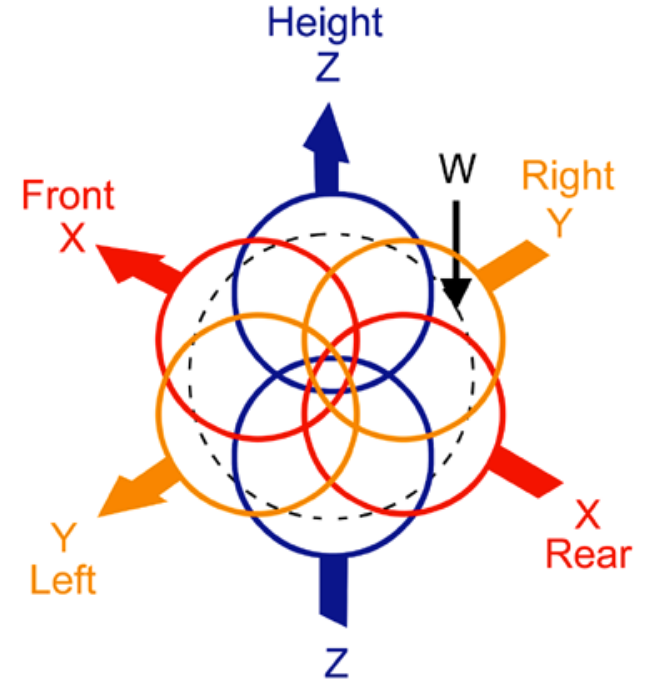
# More Enveloping

## B-Format



SoundField Technology is based on the principle that all acoustic events can be represented by four basic elements

- X, Y and Z represent depth, width and height respectively
- W represents the central point from which the above three elements are referenced



# More Enveloping

## B-Format



Each of the four capsules in the array pick up sound from a different direction.

This information is used to capture a three dimensional acoustic event.

The four signals from the capsules are collectively called SoundField A-Format.

# More Enveloping

## B-Format



Complete control of the ambience!

Currently only available to the mixing engineer

Could this be made available to the customer?

Rotate

Tilt

Zoom

Polar Patterns

Front/Rear Width



# Object Based

How to fake it



How to Create an Object Based broadcast from legacy material?

As is the case with 5.1 sometimes we have to fake it!



# Upmixing

## Channel Based



- Why the need for upmixing?
  - The drive towards a constant 5.1 broadcast feed.
  - Lots of legacy stereo material in existence.
- Applications:
  - Creating 5.1 from a finished Stereo product.
  - Creating 5.1 from Stereo stems to be used in a 5.1 production.
- Issues with existing upmix solutions:
  - The original stereo image is destroyed.
  - Unstable sound and surround image.
  - Downmix compatibility of the upmix.
- Dark Art?

# Upmixing

## Object Based



- Why the need for upmixing?

- The drive towards a constant **Object Based** broadcast feed.
- Lots of legacy stereo **and 5.1** material in existence.

- Applications:

- Creating **Object Based** from a finished Stereo **or 5.1** product.
- Creating **Object Based** from Stereo stems to be used in an **Object Based** production.

- Issues with existing upmix solutions:

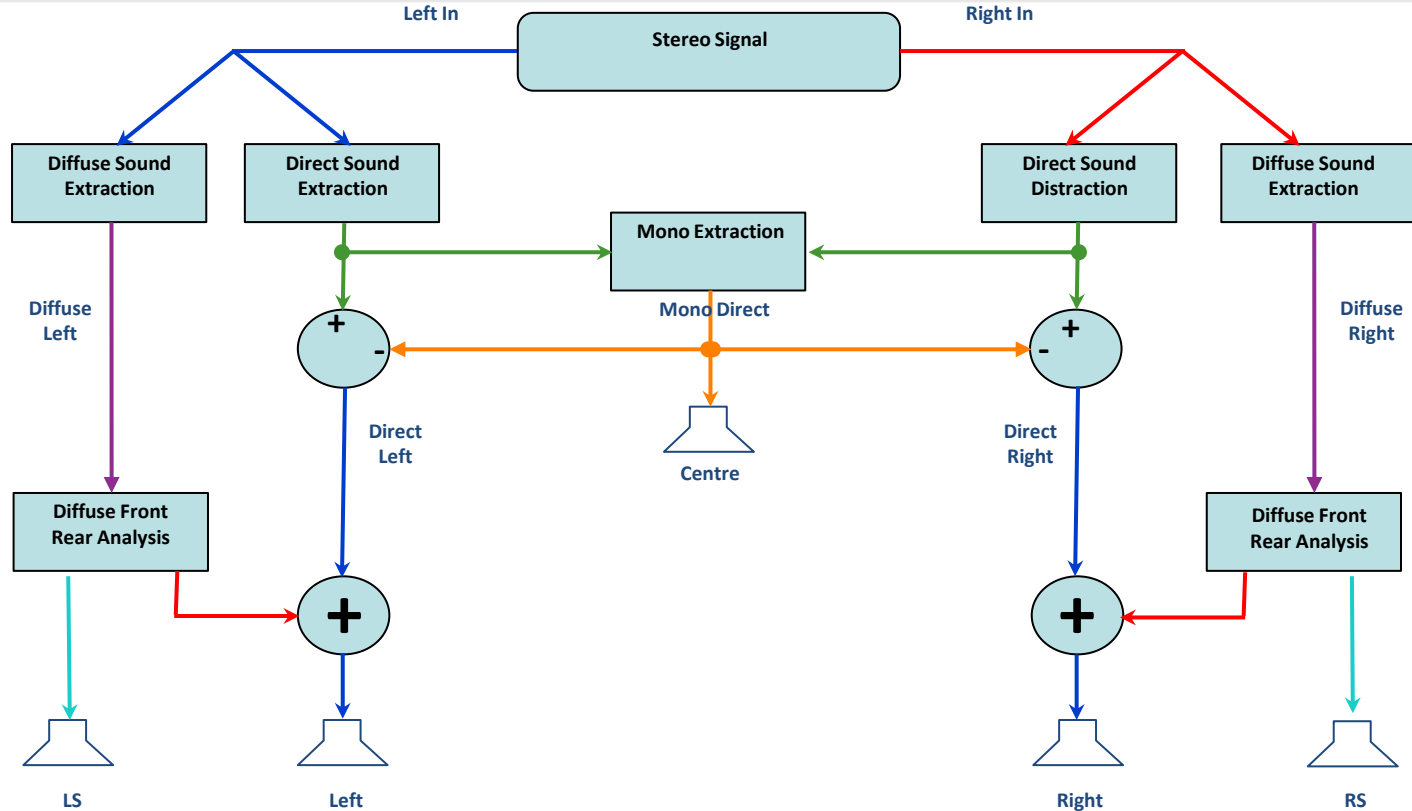
- The original stereo/5.1 image is destroyed.
- Unstable sound and surround image.
- ~~Downmix compatibility of the upmix.~~

- Dark Art?

- Stay true to the original Stereo:
  - If it is not in the Stereo or 5.1 material it should not be in the Object Based upmix
  - The original Stereo/5.1 Image should not be altered
  - direct sound does not belong in the surround channels
- A solid mono Centre channel to anchor the frontal image.
  - Centre channel divergence can easily be added later
- Different ambiances for each of the surround channels:
  - This rules out the use of phase flips often used in upmix devices
  - A high level of de-correlation between the channels

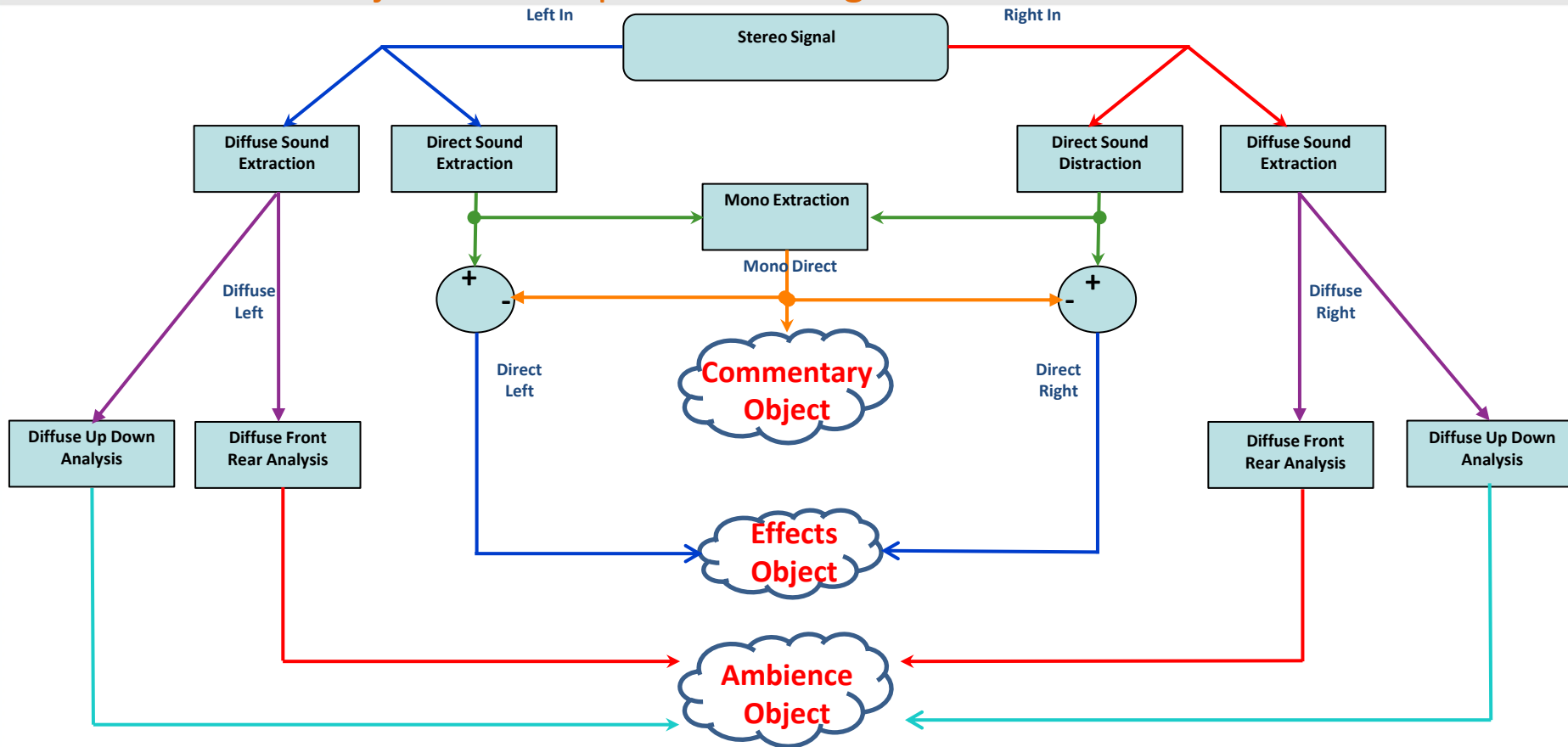
# Upmixing

## Stereo to 5.1 upmix flow diagram



# Upmixing

## Stereo to Object Based upmix flow diagram



# In Summary:



- It is time to move audio into the 21<sup>st</sup> century
- We need to offer an audio solution that benefits the majority not the minority
- The roll-out of HEVC is the 'golden' opportunity to get the infrastructure in place.
- Although there are plenty of challenges to overcome some key building blocks exist:
  - Ambience Capture
  - Upmixing
- Scalability means we can start small