

Extend X3D with new nodes

		Web Audio API	X3D	
Listener		Audiolisterner	ListenerPoint	
Acoustic		-	AcousticProperties	
Spatialization		PannerNode	SpatialSound	
Source		AudioBuffer	AudioBufferSource	
		AudioBufferSourceNode		
		OscillatorNode	OscillatorSource	
		MediaStreamAudioSourceNode	StreamAudioSource	
		-	MicrophoneSource	
Destination		AudioDestinationNode	AudioDestination	
		MediaStreamAudioDestinationNode	StreamAudioDestination	
Processing	Filters	BiquadFilterNode	BiquadFilter	
		ConvolverNode	Convolver	
		DelayNode	Delay	
		DynamicsCompressorNode	DynamicsCompressor	
		GainNode	Gain	
		WaveShaperNode	WaveShaper	
	PeriodicWave	PeriodicWave		
	Data Analysis	AnalyserNode	Analyser	
	Channels	ChannelSplitterNode	ChannelSplitter	
ChannelMergerNode		ChannelMerger		

Clarifications:

Final, open issues, change the fields, add fields

```
+ - X3DChildNode -
  |
  +- X3DBindableNode +-+ Fog (X3DFogObject)*
  |                 +- GeoViewpoint
  |                 +- NavigationInfo
  |                 +- X3DAudioListenerNode +-+ ListenerPoint (~Web Audio API: Audiolister)
  |
  |                 |
  |                 +- X3DBackgroundNode +-+ Background
  |                 |                 +- TextureBackground
  |                 |
  |                 +- X3DViewpointNode +-+ OrthoViewpoint
  |                 |                 +- Viewpoint
  +- ViewpointGroup
```

```
+ - X3DAppearanceNode +-+ Appearance
  |
  +- X3DAppearanceChildNode +-+ FillProperties
  |                         +- LineProperties
  |                         +- AcousticProperties (absorption, specular, diffuse, refraction)
  |                         |
  |                         +- X3DMaterialNode +-+ Material
  |                         |                 +- TwoSidedMaterial
```

```

+- X3DChildNode -
|
+- X3DSoundNode +- Sound
|
|   +- SpatialSound (~Web Audio API: PannerNode)
|
+- X3DTimeDependentNode +- TimeSensor
|
|   +- X3DSoundSourceNode +- AudioClip (~Web Audio API: MediaElementAudioSourceNode)
|   |   +- MovieTexture
|   |   +- AudioBufferSource (~Web Audio API: AudioBuffer + AudioBufferSourceNode)
|   |   +- OscillatorSource (~Web Audio API: OscillatorNode)
|   |   +- StreamAudioSource (~Web Audio API: MediaStreamAudioSourceNode)
|   |   +- MicrophoneSource
|   |
|   +- X3DSoundDestinationNode +- AudioDestination (~Web Audio API: AudioDestinationNode)
|   |   +- StreamAudioDestination
|   |   (~Web Audio API: MediaStreamAudioDestinationNode)
|   |
|   +- X3DSoundProcessingNode +- BiquadFilter
|   |   +- Convolver
|   |   +- Delay
|   |   +- DynamicsCompressor
|   |   +- Gain
|   |   +- WaveShaper
|   |   +- PeriodicWave
|   |
|   +- X3DSoundAnalysisNode +- Analyser
|   |
|   +- X3DSoundChannelNode +- ChannelSplitter
|   |   +- ChannelMerger

```

Insert

MFNode [in, out] audioGraph [] [X3DChildNode]

in

(AudioClip, AudioBufferSource, OscillatorSource,
StreamAudioSource, MicrophoneSource)

Extend X3D with new nodes – Fields names

1. ListenerPoint

```
<pre class="node">ListenerPoint: X3DAudioListenerNode {
  SFNode [in,out] metadata      NULL [X3DMetadataObject]
  SFFloat [in,out] positionX    0    (-&#8734;,&#8734;)
  SFFloat [in,out] positionY    0    (-&#8734;,&#8734;)
  SFFloat [in,out] positionZ    0    (-&#8734;,&#8734;)
  SFFloat [in,out] forwardX     0    (-&#8734;,&#8734;)
  SFFloat [in,out] forwardY     0    (-&#8734;,&#8734;)
  SFFloat [in,out] forwardZ    -1    (-&#8734;,&#8734;)
  SFFloat [in,out] upX          0    (-&#8734;,&#8734;)
  SFFloat [in,out] upY          1    (-&#8734;,&#8734;)
  SFFloat [in,out] upZ          0    (-&#8734;,&#8734;)
  <!-- Extra attributes -->
  SFInt32[in,out] gain          1    [0,&#8734;)
  SFBool [in,out] isViewpoint  TRUE
}
```

2. AcousticProperties

```
<pre class="node">AcousticProperties : X3DAppearanceChildNode {
  SFNode [in,out] metadata      NULL [X3DMetadataObject]
  SFFloat [in,out] absorption    0    [0,1]
  SFFloat [in,out] specular      0    [0,1]
  SFFloat [in,out] diffuse       0    [0,1]
  SFFloat [in,out] refraction    0    [0,1]
}
```

3. SpatialSound

```
<pre class="node">SpatialSound : X3DSoundNode {
  SFNode [in,out] metadata      NULL [X3DMetadataObject]
  SFFloat [in,out] positionX    0    (-&#8734;,&#8734;)
  SFFloat [in,out] positionY    0    (-&#8734;,&#8734;)
  SFFloat [in,out] positionZ    0    (-&#8734;,&#8734;)
  SFFloat [in,out] orientationX  1    (-&#8734;,&#8734;)
  SFFloat [in,out] orientationY  0    (-&#8734;,&#8734;)
  SFFloat [in,out] orientationZ  0    (-&#8734;,&#8734;)
  SFFloat [in,out] coneInnerAngle 360 [0,&#8734;)
  SFFloat [in,out] coneOuterAngle 360 [0,&#8734;)
  SFFloat [in,out] coneOuterGain  0    (-&#8734;,&#8734;)
  SFString [in,out] distanceModel "inverse"
  SFFloat [in,out] maxDistance    10000 [0,&#8734;)
  SFString [in,out] panningModel  "HRTF"
  SFFloat [in,out] refDistance    1    [0,&#8734;)
```

```

SFFloat [in,out] rolloffFactor 1 [0,&#8734;)
<!-- Extra attributes -->
SFInt32 [in,out] gain 1 [0,&#8734;)
SFNode [in,out] source NULL [X3DSoundSourceNode]
<!-- Heritage from AudioNode -->
SFInt32 [in,out] numberOfInputs 0 [0,&#8734;)
SFInt32 [in,out] numberOfOutputs 0 [0,&#8734;)
SFInt32 [in,out] channelCount 0 [0,&#8734;)
SFString[in,out] channelCountMode "max"
SFString[in,out] channelInterpretation "speakers "
}

```

4. AudioBufferSource

```

<pre class="node">AudioBufferSource : X3DSoundSourceNode {
  SFFloat [in,out] sampleRate 0 [0,&#8734;)
  SFInt32 [in,out] length 0 [0,&#8734;)
  SFFloat [in,out] duration 0 [0,&#8734;)
  SFInt32 [in,out] numberOfChannels 0 [0,&#8734;)
  SFFloat [in,out] detune 0 [0,&#8734;)
  SFBool [in,out] loop FALSE
  SFFloat [in,out] loopStart 0 [0,&#8734;)
  SFFloat [in,out] loopEnd 0 [0,&#8734;)
  SFFloat [in,out] playbackRate 0 [0,&#8734;)
  MFFloat [in,out] buffer NULL [-1,1]
  MFNode [in, out] audioGraph [] [X3DChildNode]

  <!-- Heritage from AudioNode -->
  SFInt32 [in,out] numberOfInputs 0 [0,&#8734;)
  SFInt32 [in,out] numberOfOutputs 0 [0,&#8734;)
  SFInt32 [in,out] channelCount 0 [0,&#8734;)
  SFString[in,out] channelCountMode "max"
  SFString[in,out] channelInterpretation "speakers "
}

```

5. OscillatorSource

```

<pre class="node">OscillatorSource : X3DSoundSourceNode {
  SFInt32 [in,out] frequency 0 [0,&#8734;)
  SFString [in,out] type "square"
  SFFloat [in,out] detune 0 [0,&#8734;)
  MFNode [in, out] audioGraph [] [X3DChildNode]

  <!-- Heritage from AudioNode -->
  SFInt32 [in,out] numberOfInputs 0 [0,&#8734;)
  SFInt32 [in,out] numberOfOutputs 0 [0,&#8734;)

```

```

SFInt32 [in,out]  channelCount      0      [0,&#8734;)
SFString[in,out] channelCountMode "max"
SFString[in,out]  channelInterpretation "speakers "
}

```

6. StreamAudioSource

```

<pre class="node">StreamAudioSource: X3DSoundSourceNode {
  MFFloat [in,out]  mediaStream      NULL  [-1,1]
<!-- Heritage from AudioNode -->
  SFInt32 [in,out]  numberOfInputs   0      [0,&#8734;)
  SFInt32 [in,out]  numberOfOutputs  0      [0,&#8734;)
  SFInt32 [in,out]  channelCount     0      [0,&#8734;)
  SFString[in,out] channelCountMode "max"
  SFString[in,out] channelInterpretation "speakers "
  MFNode [in, out] audioGraph [] [X3DChildNode]
}

```

MediaStreamAudioSourceNode: operates as an audio source whose media is received from a MediaStream obtained using the WebRTC or Media Capture and Streams APIs. This media could be from a microphone or from a remote peer on a WebRTC call.

Attributes:

mediaStream	The MediaStream (a stream of media content. A stream consists of several tracks such as video or audio tracks.) used when constructing this MediaStreamAudioSourceNode.
-------------	---

7. MicrophoneSource

```

<pre class="node">MicrophoneSource : X3DSoundSourceNode {
  SFBool [in,out]  isActive          FALSE
  SFString [in,out] mediaDevicesid ""
  MFNode [in, out] audioGraph [] [X3DChildNode]
}

```

8. AudioDestination

```

<pre class="node">AudioDestination : X3DSoundDestinationNode {
  SFInt32 [in,out]  maxChannelCount 2 [0,&#8734;)
<!-- Heritage from AudioNode -->
  SFInt32 [in,out]  numberOfInputs   0      [0,&#8734;)
  SFInt32 [in,out]  numberOfOutputs  0      [0,&#8734;)
  SFInt32 [in,out]  channelCount     0      [0,&#8734;)
}

```

```

SFString[in,out] channelCountMode "max"
SFString[in,out] channelInterpretation "speakers "
}

```

9. StreamAudioDestination

```

<pre class="node">StreamAudioDestination : X3DSoundDestinationNode {
  MFFloat [in,out] stream NULL [-1,1]
  <!-- Heritage from AudioNode -->
  SFInt32 [in,out] numberOfInputs 0 [0,&#8734;)
  SFInt32 [in,out] numberOfOutputs 0 [0,&#8734;)
  SFInt32 [in,out] channelCount 0 [0,&#8734;)
  SFString[in,out] channelCountMode "max"
  SFString[in,out] channelInterpretation "speakers "
}

```

10. BiquadFilter

```

<pre class="node">BiquadFilter : SoundProcessingGroup {
  SFInt32 [in,out] frequency 0 [0,&#8734;)
  SFFloat [in,out] detune 0 [0,&#8734;)
  SFFloat [in,out] Q 0 [0,&#8734;)
  SFFloat [in,out] gain 0 [0,&#8734;)
  SFString [in,out] type "lowpass"
  <!-- Heritage from AudioNode -->
  SFInt32 [in,out] numberOfInputs 0 [0,&#8734;)
  SFInt32 [in,out] numberOfOutputs 0 [0,&#8734;)
  SFInt32 [in,out] channelCount 0 [0,&#8734;)
  SFString[in,out] channelCountMode "max"
  SFString[in,out] channelInterpretation "speakers "
}

```

11. Convolver

```

<pre class="node">Convolver : SoundProcessingGroup {
  MFFloat [in,out] buffer NULL [-1,1]
  SFBool [in,out] normalize FALSE
  <!-- Heritage from AudioNode -->
  SFInt32 [in,out] numberOfInputs 0 [0,&#8734;)
  SFInt32 [in,out] numberOfOutputs 0 [0,&#8734;)
  SFInt32 [in,out] channelCount 0 [0,&#8734;)
  SFString[in,out] channelCountMode "max"
  SFString[in,out] channelInterpretation "speakers "
}

```

```
}
```

12. Delay

```
<pre class="node">Delay : SoundProcessingGroup {
  SFInt32 [in,out] delayTime 0 [0,&#8734;)
<!-- Heritage from AudioNode -->
  SFInt32 [in,out] numberOfInputs 0 [0,&#8734;)
  SFInt32 [in,out] numberOfOutputs 0 [0,&#8734;)
  SFInt32 [in,out] channelCount 0 [0,&#8734;)
  SFString[in,out] channelCountMode "max"
  SFString[in,out] channelInterpretation "speakers "
}
```

13. DynamicsCompressor

```
<pre class="node">DynamicsCompressor : SoundProcessingGroup {
  SFFloat [in,out] threshold -24 [0,&#8734;)
  SFInt32 [in,out] knee 30 [0,&#8734;)
  SFInt32 [in,out] ratio 12 [0,&#8734;)
  SFFloat [in,out] reduction 0 [0,&#8734;)
  SFFloat [in,out] attack 0.003 [0,&#8734;)
  SFInt32 [in,out] release 0.25 (-&#8734;,&#8734;)
<!-- Heritage from AudioNode -->
  SFInt32 [in,out] numberOfInputs 0 [0,&#8734;)
  SFInt32 [in,out] numberOfOutputs 0 [0,&#8734;)
  SFInt32 [in,out] channelCount 0 [0,&#8734;)
  SFString[in,out] channelCountMode "max"
  SFString[in,out] channelInterpretation "speakers "
}
```

14. Gain

```
<pre class="node">Gain : SoundProcessingGroup {
  SFInt32 [in,out] gain 1 [0,&#8734;)
<!-- Heritage from AudioNode -->
  SFInt32 [in,out] numberOfInputs 0 [0,&#8734;)
  SFInt32 [in,out] numberOfOutputs 0 [0,&#8734;)
  SFInt32 [in,out] channelCount 0 [0,&#8734;)
  SFString[in,out] channelCountMode "max"
  SFString[in,out] channelInterpretation "speakers "
}
```


15. WaveShaper

```
<pre class="node">WaveShaper : SoundProcessingGroup {
  MFInt32 [in,out] curve      0 [-1,-1]
  SFString [in,out] oversample "none"
<!-- Heritage from AudioNode -->
  SFInt32 [in,out] numberOfInputs  0    [0,&#8734;)
  SFInt32 [in,out] numberOfOutputs  0    [0,&#8734;)
  SFInt32 [in,out] channelCount     0    [0,&#8734;)
  SFString[in,out] channelCountMode "max"
  SFString[in,out] channelInterpretation "speakers "
}
```

16. PeriodicWave

```
<pre class="node">PeriodicWave : SoundProcessingGroup {
}
```

17. Analyser

```
<pre class="node">Analyser : SoundProcessingGroup {
  SFInt32 [in,out] fftSize          2048 [0,&#8734;)
  SFInt32 [in,out] frequencyBinCount 1024 [0,&#8734;)
  SFFloat [in,out] minDecibels       -100 (-&#8734;,&#8734;)
  SFFloat [in,out] maxDecibels       -30  (-&#8734;,&#8734;)
  SFFloat [in,out] smoothingTimeConstant 0.8 [0,&#8734;)

<!-- Heritage from AudioNode -->
  SFInt32 [in,out] numberOfInputs  0    [0,&#8734;)
  SFInt32 [in,out] numberOfOutputs  0    [0,&#8734;)
  SFInt32 [in,out] channelCount     0    [0,&#8734;)
  SFString[in,out] channelCountMode "max"
  SFString[in,out] channelInterpretation "speakers "
}
```

18. ChannelSplitter

```
<pre class="node">ChannelSplitter : SoundProcessingGroup {
<!-- Heritage from AudioNode -->
  SFInt32 [in,out] numberOfInputs  0    [0,&#8734;)
  SFInt32 [in,out] numberOfOutputs  0    [0,&#8734;)
  SFInt32 [in,out] channelCount     0    [0,&#8734;)
  SFString[in,out] channelCountMode "max"
  SFString[in,out] channelInterpretation "speakers "
```

}

19. ChannelMerger

```
<pre class="node">ChannelMerger: SoundProcessingGroup {  
  <!-- Heritage from AudioNode -->  
  SFInt32 [in,out]  numberOfInputs    0    [0,&#8734;)  
  SFInt32 [in,out]  numberOfOutputs   0    [0,&#8734;)  
  SFInt32 [in,out]  channelCount      0    [0,&#8734;)  
  SFString[in,out]  channelCountMode  "max"  
  SFString[in,out]  channelInterpretation "speakers "  
}
```