Extend X3D with new nodes

		Web Audio API	X3D	
Listener		Audiolistener	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: Audiolistener)

                |                   |
                |                   +- 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)
                |                        |                      +- OscilattorSource (~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

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]

   <!-- 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. OscilattorSource

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

}
```

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 "

}
```

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 ""
}
```

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 "
}
```