

# *Microsoft XNA Game Studio 4.0*

## *Compiled (XNB) Content Format*

### Contents

|                             |    |
|-----------------------------|----|
| XNB Container Format .....  | 3  |
| Object Format .....         | 3  |
| Raw Values .....            | 4  |
| Polymorphic Objects .....   | 4  |
| Shared Resources .....      | 4  |
| 7BitEncodedInt .....        | 5  |
| Built-In Type Readers ..... | 6  |
| Primitive Types .....       | 6  |
| System Types .....          | 7  |
| Enum .....                  | 7  |
| Nullable .....              | 7  |
| Array .....                 | 7  |
| List .....                  | 7  |
| Dictionary .....            | 8  |
| TimeSpan .....              | 8  |
| DateTime .....              | 8  |
| Decimal .....               | 8  |
| ExternalReference .....     | 9  |
| Math Types .....            | 9  |
| Vector2 .....               | 9  |
| Vector3 .....               | 9  |
| Vector4 .....               | 9  |
| Matrix .....                | 10 |
| Quaternion .....            | 10 |
| Color .....                 | 10 |
| Plane .....                 | 11 |
| Point .....                 | 11 |
| Rectangle .....             | 11 |

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

|                           |    |
|---------------------------|----|
| BoundingBox.....          | 11 |
| BoundingSphere .....      | 11 |
| BoundingFrustum .....     | 12 |
| Ray .....                 | 12 |
| Curve.....                | 12 |
| Graphics Types.....       | 13 |
| Texture.....              | 13 |
| Texture2D .....           | 13 |
| Texture3D .....           | 14 |
| TextureCube .....         | 14 |
| IndexBuffer .....         | 15 |
| VertexBuffer .....        | 15 |
| VertexDeclaration .....   | 15 |
| Effect.....               | 16 |
| EffectMaterial .....      | 16 |
| BasicEffect.....          | 17 |
| AlphaTestEffect.....      | 17 |
| DualTextureEffect .....   | 18 |
| EnvironmentMapEffect..... | 18 |
| SkinnedEffect .....       | 18 |
| SpriteFont .....          | 19 |
| Model.....                | 19 |
| Media Types.....          | 20 |
| SoundEffect.....          | 20 |
| Song .....                | 21 |
| Video.....                | 21 |
| ReflectiveReader.....     | 21 |

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

## XNB Container Format

|  |                        |  |
|--|------------------------|--|
| Byte   | Format identifier      | 'X'  |
| Byte   | Format identifier      | 'N'  |
| Byte   | Format identifier      | 'B'  |
| Byte   | Target platform        | 'w' = Microsoft Windows<br>'m' = Windows Phone 7<br>'x' = Xbox 360   |
| Byte   | XNB format version     | 5 = XNA Game Studio 4.0  |
| Byte   | Flag bits              | Bit 0x01 = content is for HiDef profile (otherwise Reach)<br>Bit 0x80 = asset data is compressed   |
| UInt32   | Compressed file size   | Total size of the (optionally compressed) .xnb file as stored on disk (including this header block)  |
| UInt32   | Decompressed data size | Only included for compressed .xnb files, where it indicates the expanded size of the compressed data which starts immediately after this field (unlike the compressed file size, this does not include the uncompressed portion of the header) |
| <i>If the file is compressed (flag bit 0x80 is set), data from this point on is packed using the Xbox XMemCompress API</i> |                        |  |
| 7BitEncodedInt   | Type reader count      |  |
| Repeat <type reader count><br>{  |                        |  |
| String   | Type reader name       | .NET assembly qualified name of a ContentTypeReader<T> subclass, which can be used to read one of the types contained in this file   |
| Int32  | Reader version number  | Type specific version number (typically zero)  |
| }  |                        |  |
| 7BitEncodedInt   | Shared resource count  |  |
| Object   | Primary asset data     | The primary object which will be returned when the .xnb file is loaded   |
| Repeat <shared resource count><br>{  |                        |  |
| Object   | Shared resource data   | Used to break cyclic data structures (see below)   |
| }  |                        |  |

## Object Format

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

Individual objects can be serialized in one of three ways:

## Raw Values

Indicated in this document by a raw type name such as “Byte”, “String”, or “VertexBuffer”.

This is simply a dump of whatever data is expected by the type reader for the specified type.

Because it does not include any type metadata, the type must be statically specified. It is not possible to serialize polymorphic instances this way, and the value cannot be null.

## Polymorphic Objects

Indicated in this document by the type name “Object”, or constrained to a specific subtype, eg. “Object: String” or “Object: VertexBuffer”.

This format starts with a `7BitEncodedInt` `typeid`, which indicates the type of the object:

- If `typeid` is zero, the object is null.
- If greater than zero, (`typeid - 1`) is an index into the type reader table from the XNB header. Nonzero ids are followed by the object data, in the same format as a raw value for the selected type reader.

The presence of type metadata enables serialization of polymorphic class hierarchies. For instance where the format specifies a field of type “Object: Effect”, any individual .xnb file could choose to substitute an instance of type `BasicEffect` or `SkinnedEffect`.

As shorthand, this document uses the notation “Object? T” to refer to fields that will be serialized as raw values if T is a value type, or as polymorphic objects if T is a reference type.

## Shared Resources

Indicated in this document by a type name such as “Shared Resource: VertexBuffer”.

These values are serialized as a `7BitEncodedInt` `resourceId`:

- If `resourceId` is zero, the object is null.

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

- If resourceId is greater than zero, (resourceId - 1) is an index into the list of shared resource instances, which are serialized at the end of the .xnb file (after the primary asset data).

Because the instance data is referred to by index rather than directly by value, this mechanism allows cyclic data structures and arbitrary graphs to be serialized, breaking the infinite recursion that would otherwise occur. Shared resource instances may be referenced from the primary asset data, and also from the body of any shared resource (including the resource itself). Resolving these references requires a fixup pass at the end of the main load operation.

## 7BitEncodedInt

This format matches the .NET BinaryReader.Read7BitEncodedInt method. It is a variable size encoding of a 32 bit integer value. C implementation:

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

```

int Read7BitEncodedInt()
{
    int result = 0;
    int bitsRead = 0;
    int value;

    do
    {
        value = ReadByte();
        result |= (value & 0x7f) << bitsRead;
        bitsRead += 7;
    }
    while (value & 0x80);

    return result;
}

```

## Built-In Type Readers

### Primitive Types

| <i>Target type</i> | <i>Type reader name</i>                       | <i>Format</i>  |
|--------------------|---|--|
| System.Byte        | Microsoft.Xna.Framework.Content.ByteReader    | Unsigned byte  |
| System.SByte       | Microsoft.Xna.Framework.Content.SByteReader   | Signed byte  |
| System.Int16       | Microsoft.Xna.Framework.Content.Int16Reader   | Little endian signed 16 bit int                            |
| System.UInt16      | Microsoft.Xna.Framework.Content.UInt16Reader  | Little endian unsigned 16 bit int                          |
| System.Int32       | Microsoft.Xna.Framework.Content.Int32Reader   | Little endian signed 32 bit int                            |
| System.UInt32      | Microsoft.Xna.Framework.Content.UInt32Reader  | Little endian unsigned 32 bit int                          |
| System.Int64       | Microsoft.Xna.Framework.Content.Int64Reader   | Little endian signed 64 bit int                            |
| System.UInt64      | Microsoft.Xna.Framework.Content.UInt64Reader  | Little endian unsigned 64 bit int                          |
| System.Single      | Microsoft.Xna.Framework.Content.SingleReader  | Little endian 32 bit IEEE float                            |
| System.Double      | Microsoft.Xna.Framework.Content.DoubleReader  | Little endian 64 bit IEEE double                           |
| System.Boolean     | Microsoft.Xna.Framework.Content.BooleanReader | One byte, 0 = false, 1 = true                              |
| System.Char        | Microsoft.Xna.Framework.Content.CharReader    | Single UTF8 encoded character                              |
| System.String      | Microsoft.Xna.Framework.Content.StringReader  | 7BitEncodedInt byte count, followed by UTF8 encoded string |
| System.Object      | Microsoft.Xna.Framework.Content.ObjectReader  | Never directly invoked, but sometimes referenced in .xnb   |

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

|  |  |   |
|--|--|---|
|  |  | headers as a base reader for polymorphic values |
|--|--|---|

## System Types

### Enum

*Target type:* T  
*Type reader name:* Microsoft.Xna.Framework.Content.EnumReader`1[[T]]  
*T is any enum type*

|   |            |  |
|---|------------|--|
| T | Enum value | Usually 32 bit, but can be other sizes if T is not integer |
|---|------------|--|

### Nullable

*Target type:* System.Nullable<T>  
*Type reader name:* Microsoft.Xna.Framework.Content.NullableReader`1[[T]]  
*T is any value type*

|         |           |                                      |
|---------|-----------|--------------------------------------|
| Boolean | Has value |                                      |
| T       | Value     | Only included when has value == true |

### Array

*Target type:* T[]  
*Type reader name:* Microsoft.Xna.Framework.Content.ArrayReader`1[[T]]

|                     |               |
|---------------------|---------------|
| UInt32              | Count         |
| Repeat <count><br>{ |               |
| Object? T           | Element value |
| }                   |               |

### List

*Target type:* System.Collections.Generic.List<T>  
*Type reader name:* Microsoft.Xna.Framework.Content.ListReader`1[[T]]

|        |       |
|--------|-------|
| UInt32 | Count |
|--------|-------|

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

|                |               |
|----------------|---------------|
| Repeat <count> |               |
| {              |               |
| Object? T      | Element value |
| }              |               |

## Dictionary

*Target type:* System.Collections.Generic.Dictionary<K,V>

*Type reader name:* Microsoft.Xna.Framework.Content.DictionaryReader`2[[K],[V]]

|                |            |
|----------------|------------|
| UInt32         | Count      |
| Repeat <count> |            |
| {              |            |
| Object? K      | Item key   |
| Object? V      | Item value |
| }              |            |

## TimeSpan

*Target type:* System.TimeSpan

*Type reader name:* Microsoft.Xna.Framework.Content.TimeSpanReader

|       |            |                           |
|-------|------------|---------------------------|
| Int64 | Tick count | 10000000 ticks per second |
|-------|------------|---------------------------|

## DateTime

*Target type:* System.DateTime

*Type reader name:* Microsoft.Xna.Framework.Content.DateTimeReader

|        |              |  |
|--------|--------------|--|
| UInt64 | Packed value | Low 62 bits hold a .NET DateTime tick count<br>High 2 bits hold a .NET DateTimeKind enum value |
|--------|--------------|--|

## Decimal

*Target type:* System.Decimal

*Type reader name:* Microsoft.Xna.Framework.Content.DecimalReader

|        |                |                                 |
|--------|----------------|---------------------------------|
| UInt32 | Packed value 1 | .NET System.Decimal bit pattern |
| UInt32 | Packed value 2 |                                 |
| UInt32 | Packed value 3 |                                 |
| UInt32 | Packed value 4 |                                 |

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.



## ExternalReference

*Target type:* T

*Type reader name:* Microsoft.Xna.Framework.Content.ExternalReferenceReader

|        |            |   |
|--------|------------|---|
| String | Asset name | Filename (relative to the current .xnb file, and not including the .xnb file extension) pointing to a separate .xnb file which contains an object of type T, the contents of which should be inserted at the current location into the file currently being read. If the string is empty, the resulting object is null. |
|--------|------------|---|

## Math Types

### Vector2

*Target type:* Microsoft.Xna.Framework.Vector2

*Type reader name:* Microsoft.Xna.Framework.Content.Vector2Reader

|        |   |
|--------|---|
| Single | X |
| Single | Y |

### Vector3

*Target type:* Microsoft.Xna.Framework.Vector3

*Type reader name:* Microsoft.Xna.Framework.Content.Vector3Reader

|        |   |
|--------|---|
| Single | X |
| Single | Y |
| Single | Z |

### Vector4

*Target type:* Microsoft.Xna.Framework.Vector4

*Type reader name:* Microsoft.Xna.Framework.Content.Vector4Reader

|        |   |
|--------|---|
| Single | X |
| Single | Y |
| Single | Z |
| Single | W |

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

## Matrix

*Target type:* Microsoft.Xna.Framework.Matrix

*Type reader name:* Microsoft.Xna.Framework.Content.MatrixReader

|        |     |  |
|--------|-----|--|
| Single | M11 | 16 floats make up a 4x4 row major matrix |
| Single | M12 |  |
| Single | M13 |  |
| Single | M14 |  |
| Single | M21 |  |
| Single | M22 |  |
| Single | M23 |  |
| Single | M24 |  |
| Single | M31 |  |
| Single | M32 |  |
| Single | M33 |  |
| Single | M34 |  |
| Single | M41 |  |
| Single | M42 |  |
| Single | M43 |  |
| Single | M44 |  |

## Quaternion

*Target type:* Microsoft.Xna.Framework.Quaternion

*Type reader name:* Microsoft.Xna.Framework.Content.QuaternionReader

|        |   |
|--------|---|
| Single | X |
| Single | Y |
| Single | Z |
| Single | W |

## Color

*Target type:* Microsoft.Xna.Framework.Color

*Type reader name:* Microsoft.Xna.Framework.Content.ColorReader

|      |       |
|------|-------|
| Byte | Red   |
| Byte | Green |
| Byte | Blue  |

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

|      |       |
|------|-------|
| Byte | Alpha |
|------|-------|

## Plane

*Target type:* Microsoft.Xna.Framework.Plane

*Type reader name:* Microsoft.Xna.Framework.Content.PlaneReader

|         |        |
|---------|--------|
| Vector3 | Normal |
| Single  | D      |

## Point

*Target type:* Microsoft.Xna.Framework.Point

*Type reader name:* Microsoft.Xna.Framework.Content.PointReader

|       |   |
|-------|---|
| Int32 | X |
| Int32 | Y |

## Rectangle

*Target type:* Microsoft.Xna.Framework.Rectangle

*Type reader name:* Microsoft.Xna.Framework.Content.RectangleReader

|       |        |
|-------|--------|
| Int32 | X      |
| Int32 | Y      |
| Int32 | Width  |
| Int32 | Height |

## BoundingBox

*Target type:* Microsoft.Xna.Framework.BoundingBox

*Type reader name:* Microsoft.Xna.Framework.Content.BoundingBoxReader

|         |     |
|---------|-----|
| Vector3 | Min |
| Vector3 | Max |

## BoundingSphere

*Target type:* Microsoft.Xna.Framework.BoundingSphere

*Type reader name:* Microsoft.Xna.Framework.Content.BoundingSphereReader

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

|         |        |
|---------|--------|
| Vector3 | Center |
| Single  | Radius |

## BoundingFrustum

*Target type:* Microsoft.Xna.Framework.BoundingFrustum

*Type reader name:* Microsoft.Xna.Framework.Content.BoundingFrustumReader

|        |                |
|--------|----------------|
| Matrix | Frustum matrix |
|--------|----------------|

## Ray

*Target type:* Microsoft.Xna.Framework.Ray

*Type reader name:* Microsoft.Xna.Framework.Content.RayReader

|         |           |
|---------|-----------|
| Vector3 | Position  |
| Vector3 | Direction |

## Curve

*Target type:* Microsoft.Xna.Framework.Curve

*Type reader name:* Microsoft.Xna.Framework.Content.CurveReader

|                         |             |  |
|-------------------------|-------------|--|
| Int32                   | Pre loop    | 0 = constant<br>1 = cycle<br>2 = cycle offset<br>3 = oscillate<br>4 = linear |
| Int32                   | Post loop   | Same values as pre loop  |
| UInt32                  | Key count   |  |
| Repeat <key count><br>{ |             |  |
| Single                  | Position    |  |
| Single                  | Value       |  |
| Single                  | Tangent in  |  |
| Single                  | Tangent out |  |
| Int32                   | Continuity  | 0 = smooth<br>1 = step   |
| }                       |             |  |

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

## Graphics Types

### Texture

*Target type:* Microsoft.Xna.Framework.Graphics.Texture

*Type reader name:* Microsoft.Xna.Framework.Content.TextureReader

Never directly invoked (as Texture is an abstract base type), but sometimes referenced in .xnb headers as a base reader for polymorphic values.

### Texture2D

*Target type:* Microsoft.Xna.Framework.Graphics.Texture2D

*Type reader name:* Microsoft.Xna.Framework.Content.Texture2DReader

|                    |                |  |
|--------------------|----------------|--|
| Int32              | Surface format | 0 = Color<br>1 = Bgr565<br>2 = Bgra5551<br>3 = Bgra4444<br>4 = Dxt1<br>5 = Dxt3<br>6 = Dxt5<br>7 = NormalizedByte2<br>8 = NormalizedByte4<br>9 = Rgba1010102<br>10 = Rg32<br>11 = Rgba64<br>12 = Alpha8<br>13 = Single<br>14 = Vector2<br>15 = Vector4<br>16 = HalfSingle<br>17 = HalfVector2<br>18 = HalfVector4<br>19 = HdrBlendable |
| UInt32             | Width          |  |
| UInt32             | Height         |  |
| UInt32             | Mip count      |  |
| Repeat <mip count> |                |  |

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

|                  |            |  |
|------------------|------------|--|
| {                |            |  |
| UInt32           | Data size  |  |
| Byte [data size] | Image data |  |
| }                |            |  |

## Texture3D

*Target type:* Microsoft.Xna.Framework.Graphics.Texture3D

*Type reader name:* Microsoft.Xna.Framework.Content.Texture3DReader

|                    |                |                                       |
|--------------------|----------------|---------------------------------------|
| Int32              | Surface format | See Texture2D for list of enum values |
| UInt32             | Width          |                                       |
| UInt32             | Height         |                                       |
| UInt32             | Depth          |                                       |
| UInt32             | Mip count      |                                       |
| Repeat <mip count> |                |                                       |
| {                  |                |                                       |
| UInt32             | Data size      |                                       |
| Byte [data size]   | Image data     |                                       |
| }                  |                |                                       |

## TextureCube

*Target type:* Microsoft.Xna.Framework.Graphics.TextureCube

*Type reader name:* Microsoft.Xna.Framework.Content.TextureCubeReader

|   |                |                                       |
|---|----------------|---------------------------------------|
| Int32   | Surface format | See Texture2D for list of enum values |
| UInt32  | Size           |                                       |
| UInt32  | Mip count      |                                       |
| Repeat <6x, for each cube face: +x, -x, +y, -y, +z, -z> |                |                                       |
| {   |                |                                       |
| Repeat <mip count>                                      |                |                                       |
| {   |                |                                       |
| UInt32  | Data size      |                                       |
| Byte [data size]  | Image data     |                                       |
| }   |                |                                       |
| }   |                |                                       |

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

## IndexBuffer

*Target type:* Microsoft.Xna.Framework.Graphics.IndexBuffer

*Type reader name:* Microsoft.Xna.Framework.Content.IndexBufferReader

|                  |            |  |
|------------------|------------|--|
| Boolean          | Is 16 bit  | If false, index values are 32 bits in size |
| UInt32           | Data size  |  |
| Byte [data size] | Index data |  |

## VertexBuffer

*Target type:* Microsoft.Xna.Framework.Graphics.VertexBuffer

*Type reader name:* Microsoft.Xna.Framework.Content.VertexBufferReader

|  |                    |
|--|--------------------|
| VertexDeclaration                              | Vertex declaration |
| UInt32   | Vertex count       |
| Byte [vertex count * declaration.VertexStride] | Vertex data        |

## VertexDeclaration

*Target type:* Microsoft.Xna.Framework.Graphics.VertexDeclaration

*Type reader name:* Microsoft.Xna.Framework.Content.VertexDeclarationReader

|                             |                |   |
|-----------------------------|----------------|---|
| UInt32                      | Vertex stride  |   |
| UInt32                      | Element count  |   |
| Repeat <element count><br>{ |                |   |
| UInt32                      | Offset         |   |
| Int32                       | Element format | 0 = Single<br>1 = Vector2<br>2 = Vector3<br>3 = Vector4<br>4 = Color<br>5 = Byte4<br>6 = Short2<br>7 = Short4<br>8 = NormalizedShort2<br>9 = NormalizedShort4<br>10 = HalfVector2<br>11 = HalfVector4 |
| Int32                       | Element usage  | 0 = Position  |

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

|        |             |  |
|--------|-------------|--|
|        |             | 1 = Color<br>2 = TextureCoordinate<br>3 = Normal<br>4 = Binormal<br>5 = Tangent<br>6 = BlendIndices<br>7 = BlendWeight<br>8 = Depth<br>9 = Fog<br>10 = PointSize<br>11 = Sample<br>12 = TessellateFactor |
| UInt32 | Usage index |  |
| }      |             |  |

### Effect

*Target type:* Microsoft.Xna.Framework.Graphics.Effect

*Type reader name:* Microsoft.Xna.Framework.Content.EffectReader

|             |                 |                       |
|-------------|-----------------|-----------------------|
| UInt32      | Size            |                       |
| Byte [size] | Effect bytecode | A compiled XNA effect |

### EffectMaterial

*Target type:* Microsoft.Xna.Framework.Graphics.EffectMaterial

*Type reader name:* Microsoft.Xna.Framework.Content.EffectMaterialReader

|                                    |            |  |
|------------------------------------|------------|--|
| ExternalReference                  | Effect     | Pointer to a separate .xnb file which contains an object of type Effect  |
| Object: Dictionary<String, Object> | Parameters | Named parameter values. Supported types: <ul style="list-style-type: none"> <li>• Int32</li> <li>• Boolean</li> <li>• Single</li> <li>• Vector2</li> <li>• Vector3</li> <li>• Vector4</li> <li>• Matrix</li> <li>• Arrays of any of the above</li> </ul> |

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.



|  |  |  |
|--|--|--|
|  |  | <ul style="list-style-type: none"> <li>Texture (commonly stored as an ExternalReference which points to a separate .xnb file)</li> <li>String</li> </ul> |
|--|--|--|

### BasicEffect

*Target type:* Microsoft.Xna.Framework.Graphics.BasicEffect

*Type reader name:* Microsoft.Xna.Framework.Content.BasicEffectReader

|                   |                      |  |
|-------------------|----------------------|--|
| ExternalReference | Texture              | Pointer to a separate .xnb file which contains an object of type Texture2D |
| Vector3           | Diffuse color        |  |
| Vector3           | Emissive color       |  |
| Vector3           | Specular color       |  |
| Single            | Specular power       |  |
| Single            | Alpha                |  |
| Boolean           | Vertex color enabled |  |

### AlphaTestEffect

*Target type:* Microsoft.Xna.Framework.Graphics.AlphaTestEffect

*Type reader name:* Microsoft.Xna.Framework.Content.AlphaTestEffectReader

|                   |                      |  |
|-------------------|----------------------|--|
| ExternalReference | Texture              | Pointer to a separate .xnb file which contains an object of type Texture2D   |
| Int32             | Compare function     | 0 = Always<br>1 = Never<br>2 = Less<br>3 = LessEqual<br>4 = Equal<br>5 = GreaterEqual<br>6 = Greater<br>7 = NotEqual |
| UInt32            | Reference alpha      |  |
| Vector3           | Diffuse color        |  |
| Single            | Alpha                |  |
| Boolean           | Vertex color enabled |  |

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

## DualTextureEffect

*Target type:* Microsoft.Xna.Framework.Graphics.DualTextureEffect

*Type reader name:* Microsoft.Xna.Framework.Content.DualTextureEffectReader

|                   |                      |  |
|-------------------|----------------------|--|
| ExternalReference | Texture 1            | Pointer to a separate .xnb file which contains an object of type Texture2D |
| ExternalReference | Texture 2            | Pointer to a separate .xnb file which contains an object of type Texture2D |
| Vector3           | Diffuse color        |  |
| Single            | Alpha                |  |
| Boolean           | Vertex color enabled |  |

## EnvironmentMapEffect

*Target type:* Microsoft.Xna.Framework.Graphics.EnvironmentMapEffect

*Type reader name:* Microsoft.Xna.Framework.Content.EnvironmentMapEffectReader

|                   |                  |  |
|-------------------|------------------|--|
| ExternalReference | Texture          | Pointer to a separate .xnb file which contains an object of type Texture2D   |
| ExternalReference | Environment map  | Pointer to a separate .xnb file which contains an object of type TextureCube |
| Single            | Env map amount   |  |
| Vector3           | Env map specular |  |
| Single            | Fresnel factor   |  |
| Vector3           | Diffuse color    |  |
| Vector3           | Emissive color   |  |
| Single            | Alpha            |  |

## SkinnedEffect

*Target type:* Microsoft.Xna.Framework.Graphics.SkinnedEffect

*Type reader name:* Microsoft.Xna.Framework.Content.SkinnedEffectReader

|                   |                    |  |
|-------------------|--------------------|--|
| ExternalReference | Texture            | Pointer to a separate .xnb file which contains an object of type Texture2D |
| UInt32            | Weights per vertex | 1, 2, or 4   |
| Vector3           | Diffuse color      |  |
| Vector3           | Emissive color     |  |
| Vector3           | Specular color     |  |

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

|        |                |  |
|--------|----------------|--|
| Single | Specular power |  |
| Single | Alpha          |  |

## SpriteFont

*Target type:* Microsoft.Xna.Framework.Graphics.SpriteFont

*Type reader name:* Microsoft.Xna.Framework.Content.SpriteFontReader

|                         |                       |  |
|-------------------------|-----------------------|--|
| Object: Texture2D       | Texture               | Texture containing multiple packed glyph images  |
| Object: List<Rectangle> | Glyphs                | Location of each glyph image within the texture  |
| Object: List<Rectangle> | Cropping              | Blank border space that was cropped from glyph images prior to packing (to save space), but which should still be respected when laying out text for rendering |
| Object: List<Char>      | Character map         | Unicode character code points corresponding to each rectangle in the glyph and cropping list (guaranteed sorted into ascending order)                          |
| Int32                   | Vertical line spacing |  |
| Single                  | Horizontal spacing    |  |
| Object: List<Vector3>   | Kerning               | ABC character layout data for each glyph   |
| Nullable<Char>          | Default character     |  |

## Model

*Target type:* Microsoft.Xna.Framework.Graphics.Model

*Type reader name:* Microsoft.Xna.Framework.Content.ModelReader

|                                  |                  |
|----------------------------------|------------------|
| UInt32                           | Bone count       |
| Repeat <bone count><br>{         |                  |
| Object: String                   | Bone name        |
| Matrix                           | Bone transform   |
| }                                |                  |
| Repeat <bone count><br>{         |                  |
| <i>BoneReference</i> (see below) | Parent bone      |
| UInt32                           | Child bone count |
| Repeat <child bone count><br>{   |                  |

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

|                               |                  |
|-------------------------------|------------------|
| <i>BoneReference</i>          | Child bone       |
| }                             |                  |
| }                             |                  |
| UInt32                        | Mesh count       |
| Repeat <mesh count><br>{      |                  |
| Object: String                | Mesh name        |
| <i>BoneReference</i>          | Mesh parent bone |
| BoundingBox                   | Mesh bounds      |
| Object                        | Mesh tag         |
| UInt32                        | Mesh part count  |
| Repeat <mesh part count><br>{ |                  |
| UInt32                        | Vertex offset    |
| UInt32                        | Num vertices     |
| UInt32                        | Start index      |
| UInt32                        | Primitive count  |
| Object                        | Mesh part tag    |
| Shared resource: VertexBuffer | Vertex buffer    |
| Shared resource: IndexBuffer  | Index buffer     |
| Shared resource: Effect       | Effect           |
| }                             |                  |
| }                             |                  |
| <i>BoneReference</i>          | Model root bone  |
| Object                        | Model tag        |

The *BoneReference* type varies in size depending on the number of bones in the model. If bone count is less than 255 this value is serialized as a Byte, otherwise it is UInt32. If the reference value is zero the bone is null, otherwise (bone reference - 1) is an index into the model bone list.

## Media Types

### SoundEffect

**Target type:** Microsoft.Xna.Framework.Audio.SoundEffect

**Type reader name:** Microsoft.Xna.Framework.Content.SoundEffectReader

|        |             |  |
|--------|-------------|--|
| UInt32 | Format size |  |
|--------|-------------|--|

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

|                    |             |  |
|--------------------|-------------|--|
| Byte [format size] | Format      | WAVEFORMATEX structure                         |
| UInt32             | Data size   |  |
| Byte [data size]   | Data        | Audio waveform data                            |
| Int32              | Loop start  | In bytes (start must be format block aligned)  |
| Int32              | Loop length | In bytes (length must be format block aligned) |
| Int32              | Duration    | In milliseconds                                |

## Song

*Target type:* Microsoft.Xna.Framework.Media.Song

*Type reader name:* Microsoft.Xna.Framework.Content.SongReader

|               |                    |                              |
|---------------|--------------------|------------------------------|
| String        | Streaming filename | Relative path to a .wma file |
| Object: Int32 | Duration           | In milliseconds              |

## Video

*Target type:* Microsoft.Xna.Framework.Media.Video

*Type reader name:* Microsoft.Xna.Framework.Content.VideoReader

|                |                    |   |
|----------------|--------------------|---|
| Object: String | Streaming filename | Relative path to a .wmv file                    |
| Object: Int32  | Duration           | In milliseconds                                 |
| Object: Int32  | Width              |   |
| Object: Int32  | Height             |   |
| Object: Single | Frames per second  |   |
| Object: Int32  | Soundtrack type    | 0 = Music<br>1 = Dialog<br>2 = Music and dialog |

## ReflectiveReader

*Target type:* T

*Type reader name:* Microsoft.Xna.Framework.Content.ReflectiveReader`1[[T]]

This reader is selected as a default fallback for types that do not provide their own custom `ContentTypeWriter` and `ContentTypeReader` implementations. It uses .NET reflection to examine the type T, and recursively calls into other type readers to load its fields and properties.

The deserialization process is:

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

- If T has a base class other than System.Object or System.ValueType, first call the type reader for that base class
- Load all valid properties
- Load all valid fields

Fields and properties are valid for automatic serialization if:

- They are declared directly by the type T (not inherited from a base class)
- They are instance members (not static)
- They are not decorated with ContentSerializerIgnoreAttribute
- They are either public, or decorated with ContentSerializerAttribute
- They are gettable
- They are either settable, or the type reader for the type of that member specifies CanDeserializeIntoExistingObject = true
- They are either not marked as shared resources, or the declaring type T is not a value type
- They are not indexer properties

To deserialize a field or property:

- Load as a shared resource if the member is decorated with ContentSerializerAttribute.SharedResource = true
- Otherwise, If the member is a value type, load as a raw value
- Otherwise, load as a polymorphic object

This document is provided “as-is” for informational purposes only. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it. Microsoft gives no express warranties, guarantees or conditions.

You may copy and use this document for your internal, reference purposes. You may modify this document for your internal, reference purposes.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.