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Microsoft

Automatic Content Serialization with XNA Game Studio 3.1

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Content Pipeline Stages

1. Artists and designers create awesome content

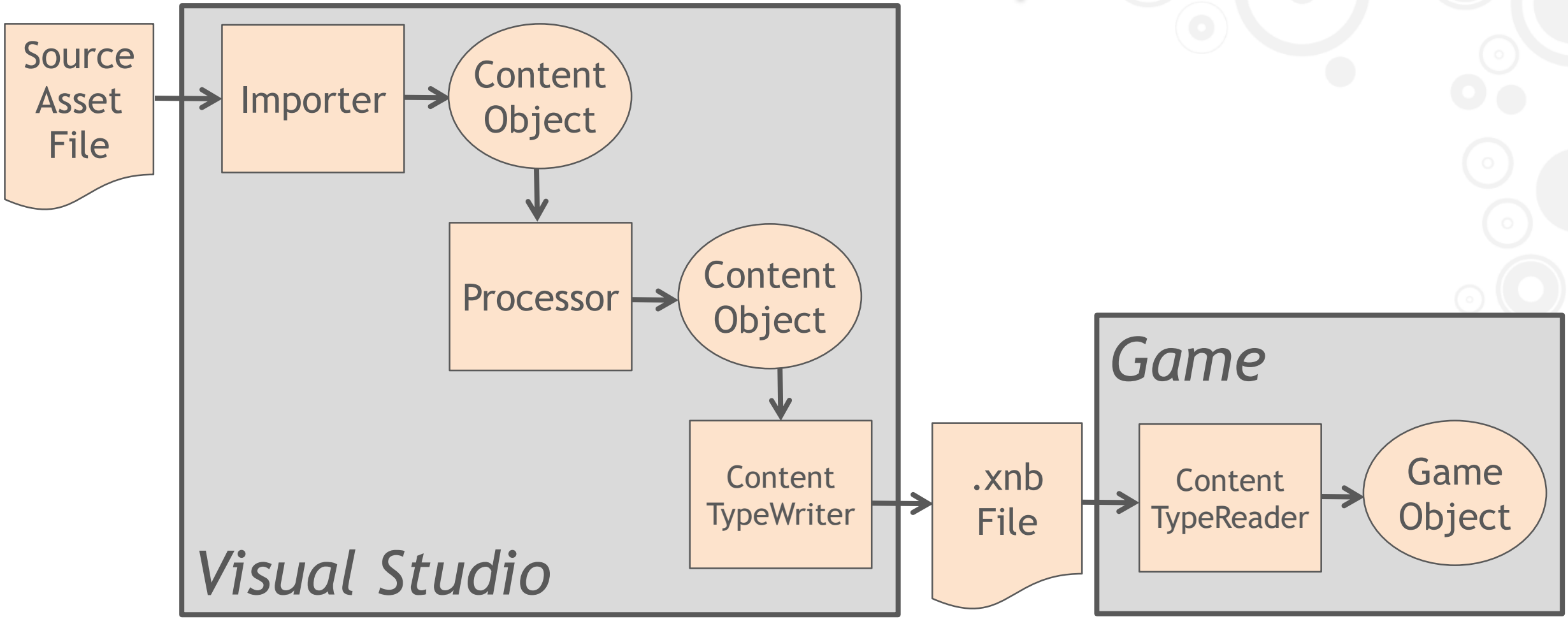
   …

3. Profit!

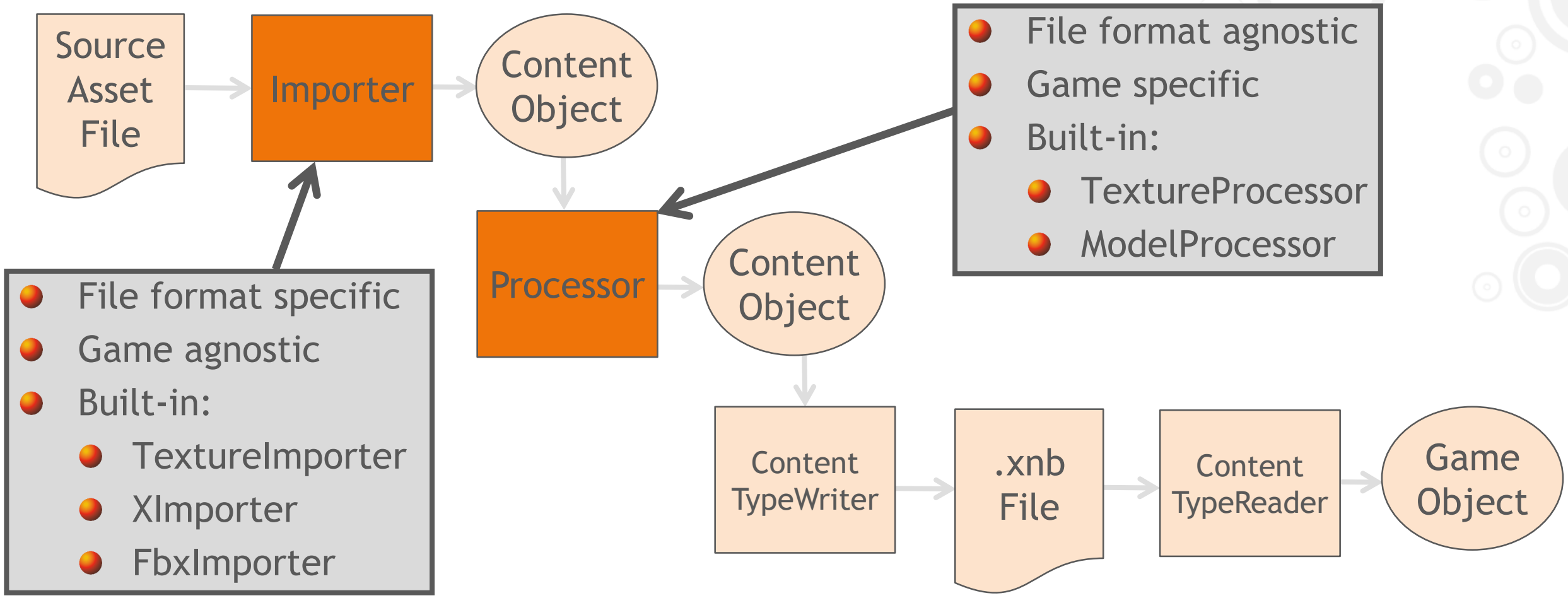
Common Content Operations

- Import data from editor file formats
- Validate
- Preprocess / optimize
- Save data into game engine file format
- Track dependencies

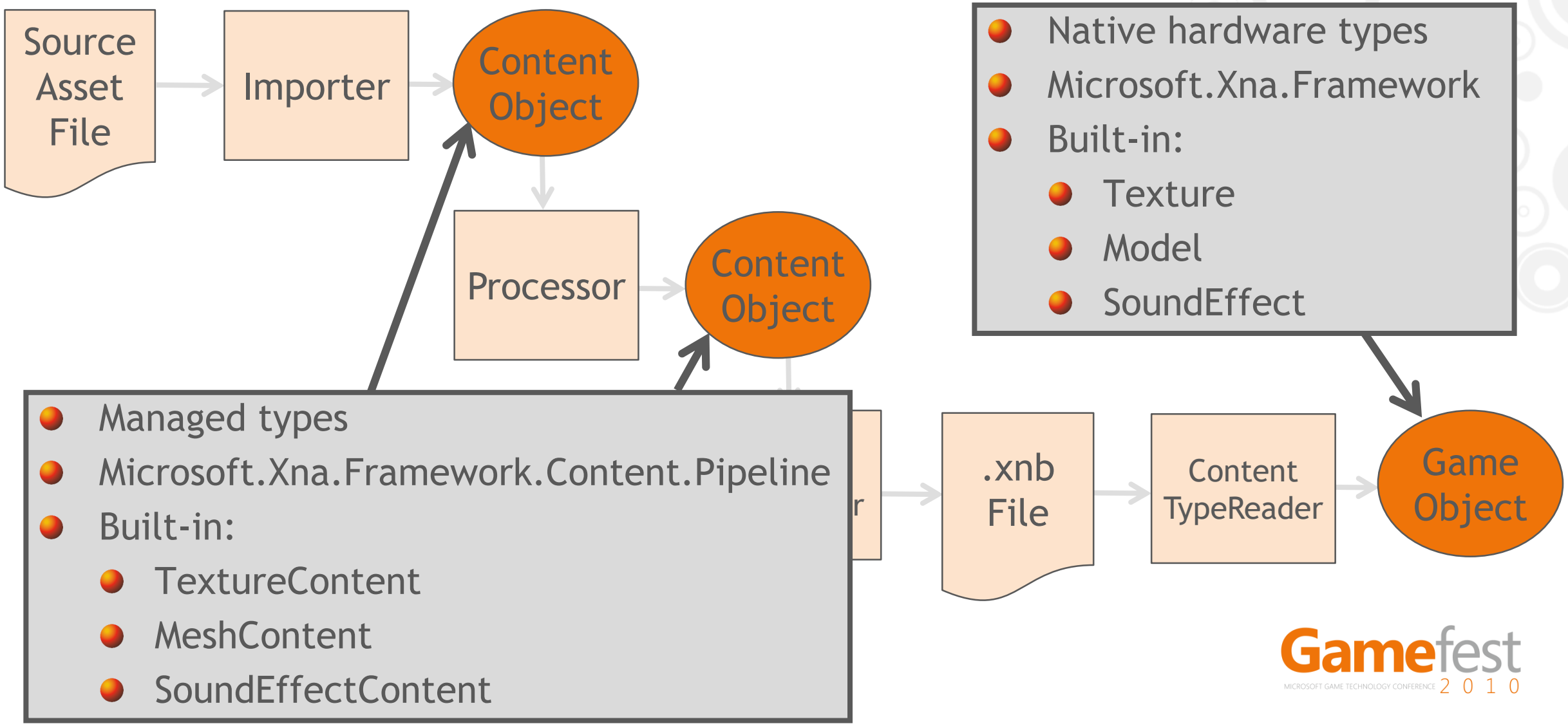
XNA Framework Content Pipeline



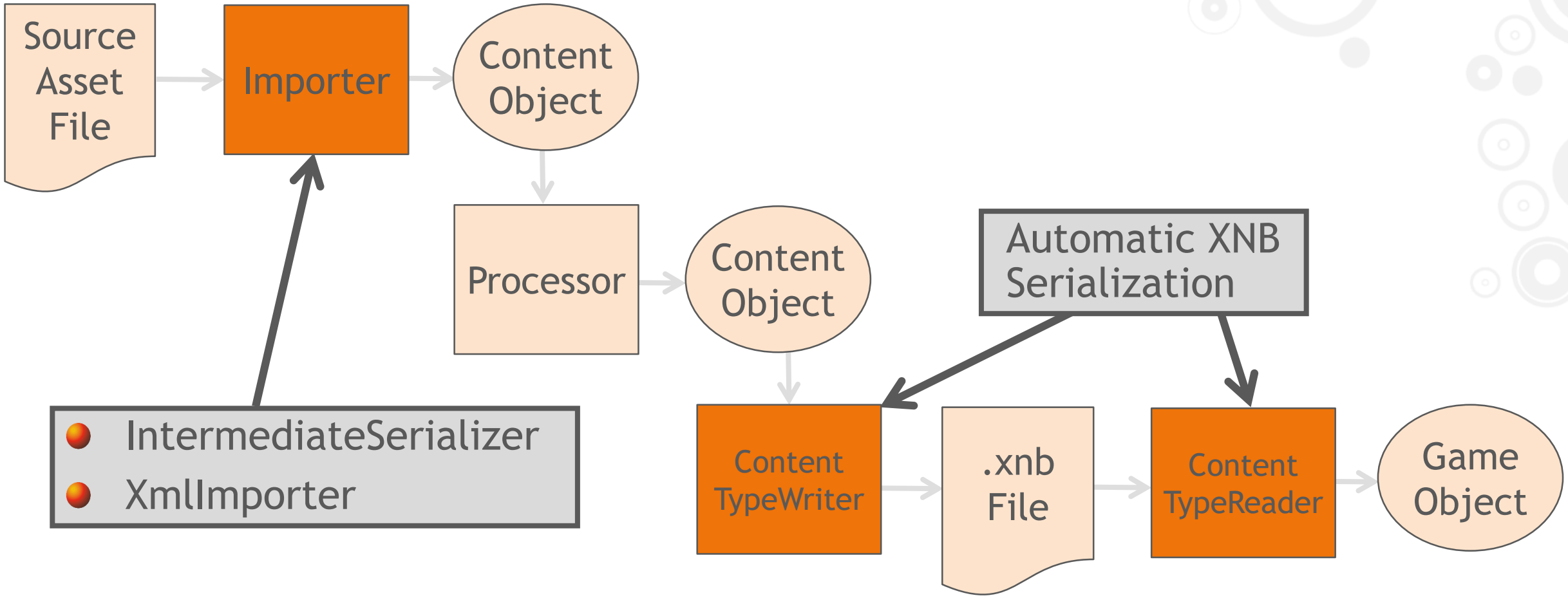
XNA Framework Content Pipeline



XNA Framework Content Pipeline



XNA Framework Content Pipeline



XML vs XNB

- XML and XNB are not the same thing!
  - But follow similar patterns
- IntermediateSerializer
  - Reads and writes XML
- XNB
  - Optimized for efficient loading
  - Type header, followed by whatever binary data the type desires

Manual XNB Serialization

- Saving

```
writer = new ContentTypeWriter<T>();
WriteTypeHeader(writer.GetRuntimeReader());
writer.Write(value);
```

- Loading

```
string readerName = ReadTypeHeader();
ContentTypeReader reader = Activator.CreateInstance(readerName);
return reader.Read();
```

Automatic XNB Serialization

- Generates ContentTypeWriter and ContentTypeReader using reflection
- Only works for “simple” types
  - Default public constructor
  - All interesting data accessible via fields or properties
- Recursive
  - Calls into other ContentTypeWriter/Reader as needed

Demo

- Automatic XNB Serialization

IntermediateSerializer

- To see how a type is represented in XML

```
XmlWriterSettings settings = new XmlWriterSettings();
settings.Indent = true;

using (XmlWriter writer = XmlWriter.Create("test.xml", settings))
{
   IntermediateSerializer.Serialize(writer, testObject, null);
}
```

IntermediateSerializer Attributes

- Default is to serialize public fields and properties
  - Properties before fields
  - In the order they are declared
- To include private members: [ContentSerializer]
- To exclude public members: [ContentSerializerIgnore]

ContentSerializerAttribute Properties

- ElementName
- CollectionItemName
- FlattenContent
- Optional
- AllowNull

http://blogs.msdn.com/shawnhar/archive/2008/08/12/everything-you-ever-wanted-to-know-about-intermediateserializer.aspx

Shared Resources

- Cyclic data structures must be explicitly marked
  - [ContentSerializer(SharedResource = true)]
- Collections of shared resources are tricky

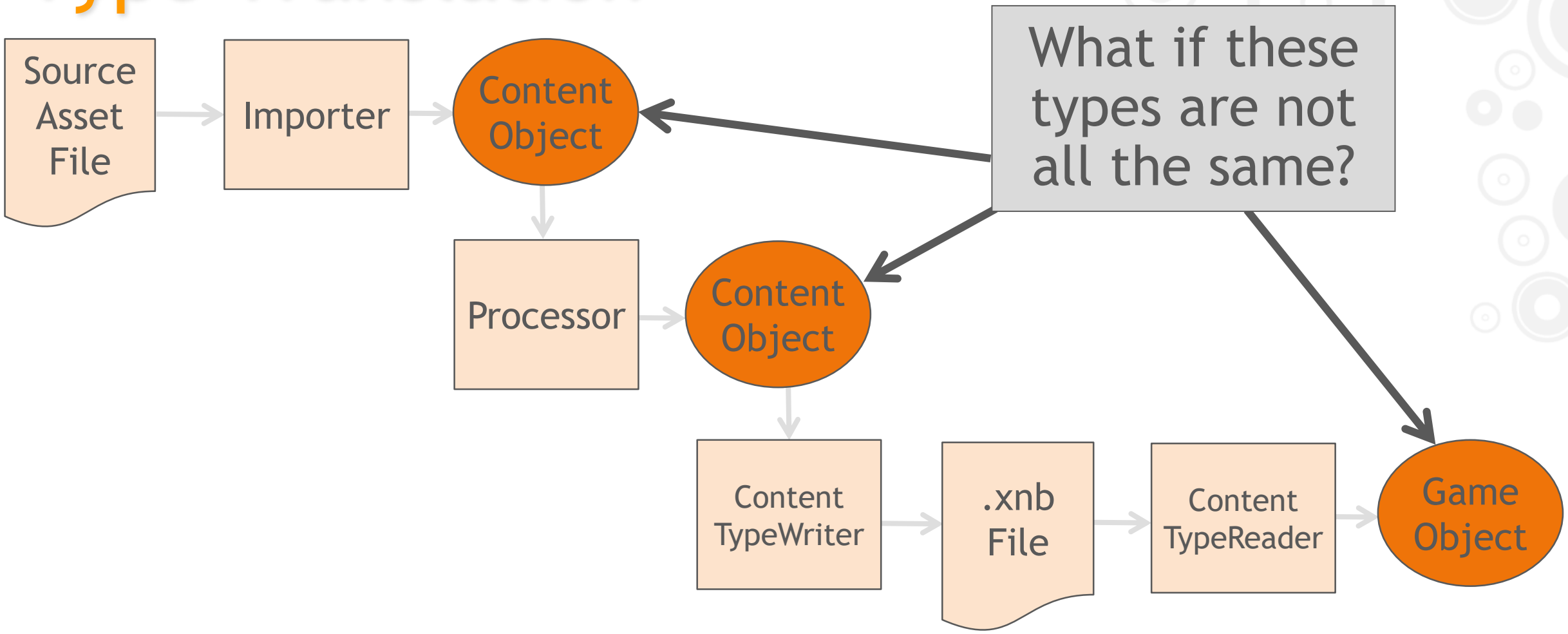
  http://blogs.msdn.com/shawnhar/archive/2008/11/20/serializing-collections-of-shared-resources.aspx

Serialization Helper Properties

```
[ContentSerializerIgnore]
public int Elf { get; set; }

[ContentSerializer(ElementName = "Elf")]
private string ElfSerializationHelper
{
    get { return Elf.ToString("X8"); }
    set { Elf = int.Parse(value, NumberStyles.HexNumber); }
}
```

Type Translation



Type Translation

- Design time and runtime types may differ
  - Defined in different assemblies
  - Different member types (Texture2DContent vs. Texture2D)
- Design time type declares its runtime equivalent
  - [ContentSerializerRuntimeType("Foo.Bar, MyAssembly")]
- Generic content types
  - http://blogs.msdn.com/shawnhar/archive/2009/07/02/automatic-xnb-serialization-and-content-classes.aspx

Demo

- Type Translation

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