



PRESENTING THE MOST FLEXIBLE GAME ENGINE
EVER SOLD!

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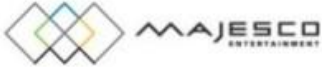
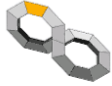


Proven Technology

- **Full-featured 3D game engine**
- **Used in numerous titles since 1998**
- **10 years in the Korean market**
- **Long history of product improvements and customer-focused development**



Our Customers



Proven Technology

Gamebryo used in numerous titles



- 10 years in Korea
- Long history of customer-focused development



PLAYSTATION 3



Satisfied Customers

- **300+ titles shipped since 1998**
 - Many recognized for brilliant graphics
 - Nearly every genre: single player, FPS, MMO and casual
 - PC & Consoles



Development History

1997 – NetImmerse 1.0

2003 – Gamebryo 1.0

2007 – Gamebryo 2.3 – Floodgate & Multi-Core

2007 – Gamebryo 2.5 – DX10 & Basic Terrain

2008 – Gamebryo 2.6 – Animation Perf

2009 – Gamebryo LightSpeed 3.x:

Rapid Iteration, Toolbench, Entity Modeling & Scripting



Gamebryo 4.0

- **Large Scale Streamable Environments**
- **Faster Load Times**
- **Improved Asset Pipeline**
- **Deferred Lighting**
- **Improved Material System & Shader Support**
- **Rendering Performance Enhancements**



Gamebryo 4.0 – Environment

- **Configuration stored in XML files**
- **Simpler to configure:**
 - **Max & Maya paths**
 - **Project directory structure**
 - **Etc.**
- **Game Creator configures initial project**
 - **Based on Sample Game demo**



Gamebryo 4.0 – Asset Pipeline

- **NIF format not suitable for streaming**
- **Gamebryo GBF & GSF asset file formats**
- **Embeds related assets such as DDS files**
- **Optimized for fast loading**
- **Enables streaming**
- **Can contain references to external assets**
- **Smaller per-NiObject memory footprint**



Gamebryo 4.0 – Tools

- **Animation Tool**
- **Asset Viewer**
- **Max & Maya Plugins**
- **Asset Builder / Plugins**
- **Material Editor**
- **Level Editor**

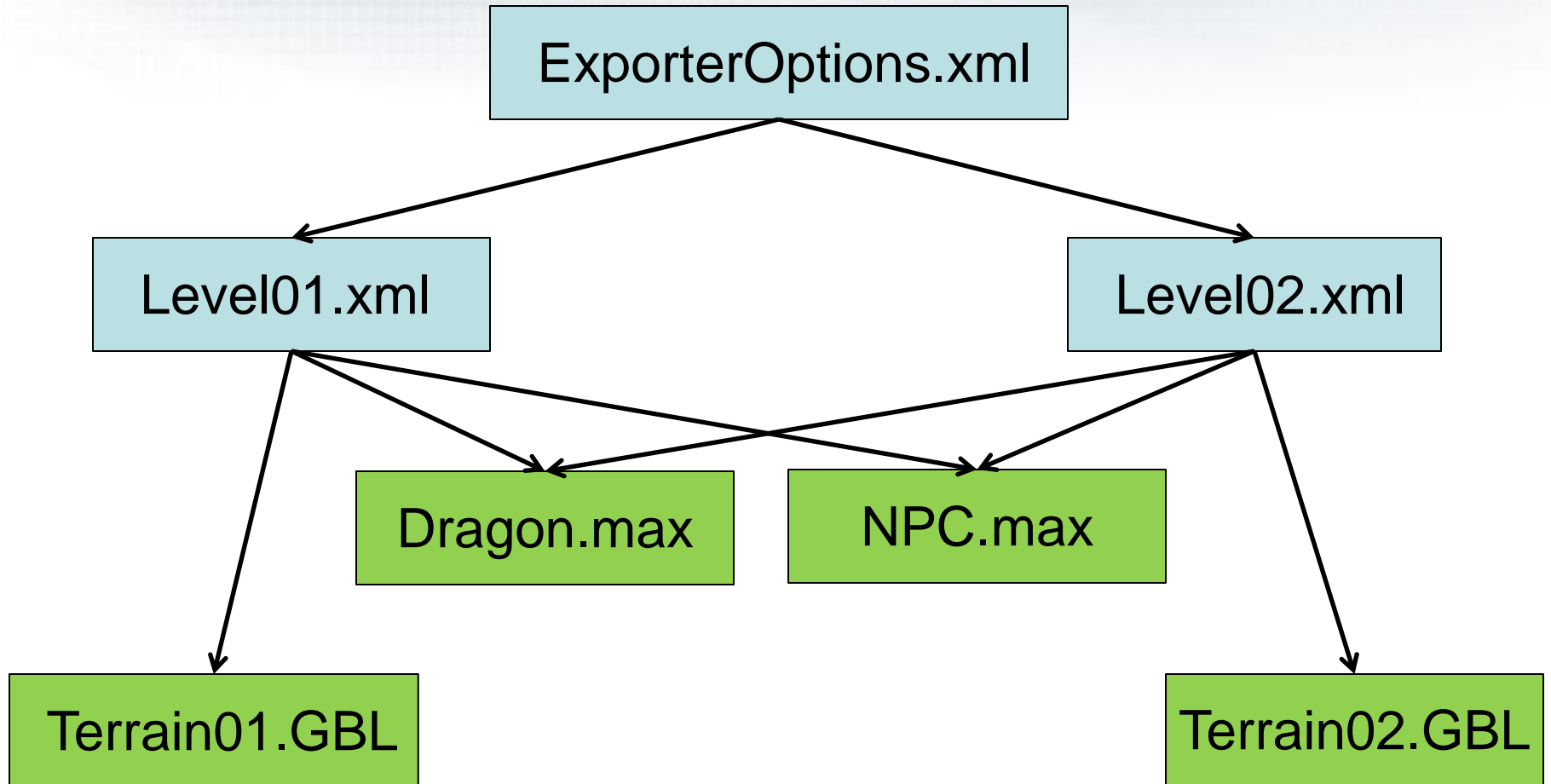


Gamebryo 4.0 – Asset Builder

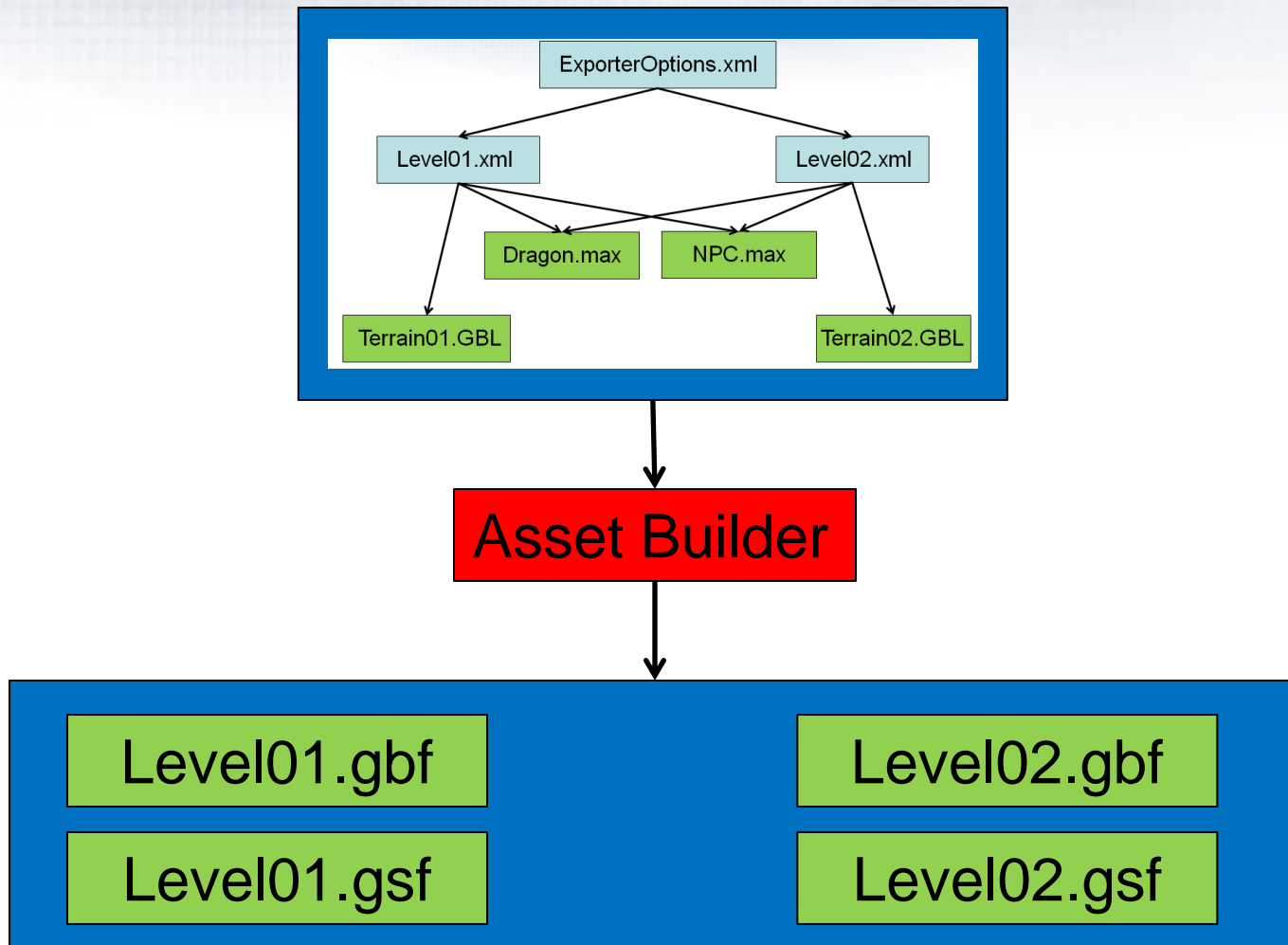
- **Compiles source assets into GBF and GSF files loaded by the runtime**
- **XML files list and place assets in level**
- **Asset Builder invokes Max or Maya and compiles optimized content into per-level GSF files**
- **GSF files are streamable: content baked into sectors and nearby meshes combined**
- **Customizable plugin system**



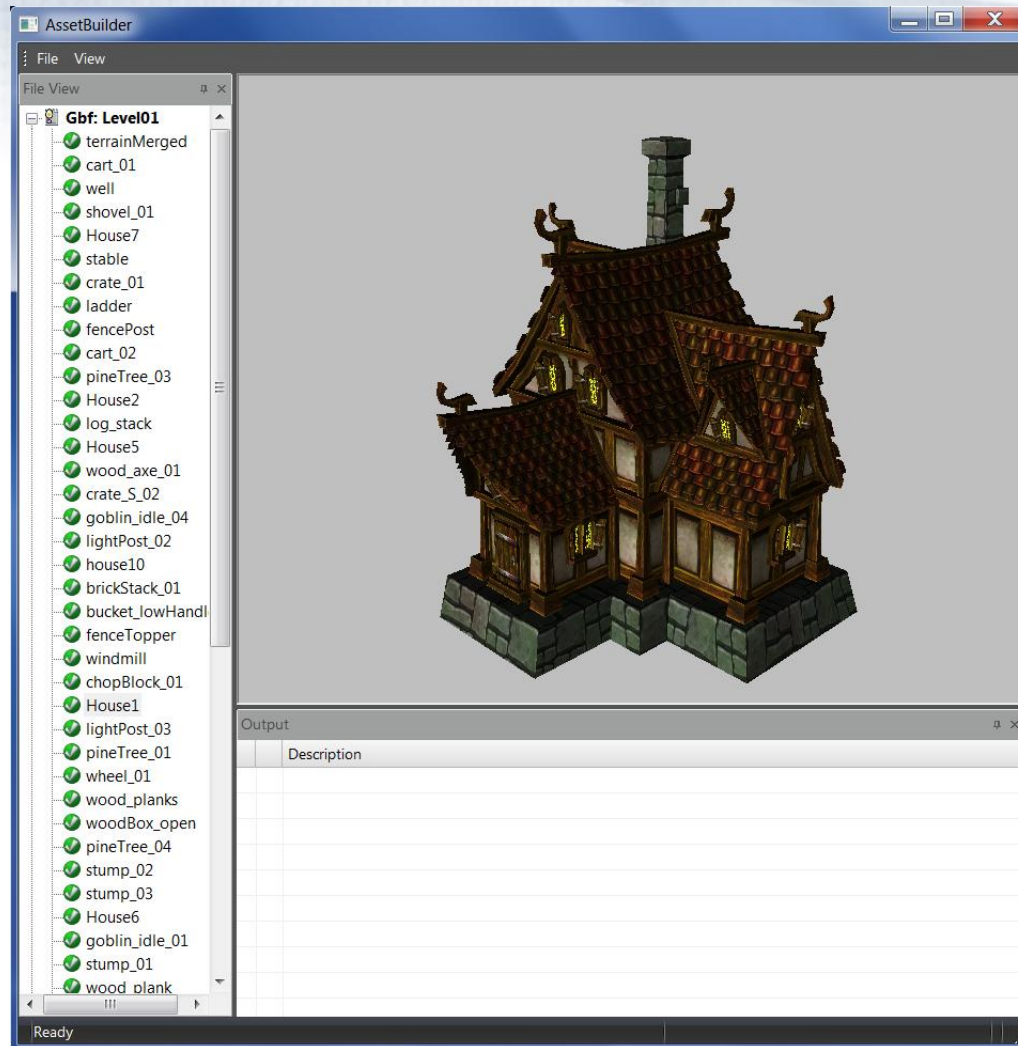
Gamebryo 4.0 – Asset Structure



Gamebryo 4.0 – Asset Structure



Gamebryo 4.0 – Asset Builder



DEMO – Level Editing



Gamebryo 4.0 – Streaming

- **Streaming also supported on non-terrain content**
- **Supports very large terrain sizes**
- **System developed by the authors of Rockstar's Midnight Club:**
 - **10 km x 12 km map of Los Angeles**
 - **Coarsest LOD only occupies 10MB**
 - **40 m x 40 m blocks**



Gamebryo 4.0 – Streaming

- **Coarse LOD must always be resident in memory**
 - **Not very limiting**
 - **Baked textures**
- **High LOD is streamed in on demand depending on distance from viewer**
- **Low mesh/low texture; high mesh/low texture; high mesh/high texture**



Gamebryo 4.0 – Streaming

- **Coarsest LOD stored in stub GBF; typically 200 – 500 triangles for a 40m x 40m sector**
- **GSF contains higher resolution LODs; typically 20000 – 50000 triangles**
- **Resolution and size of sectors user configurable**
- **GBF must load before entering level**
- **GSF backs load requests from streaming system**

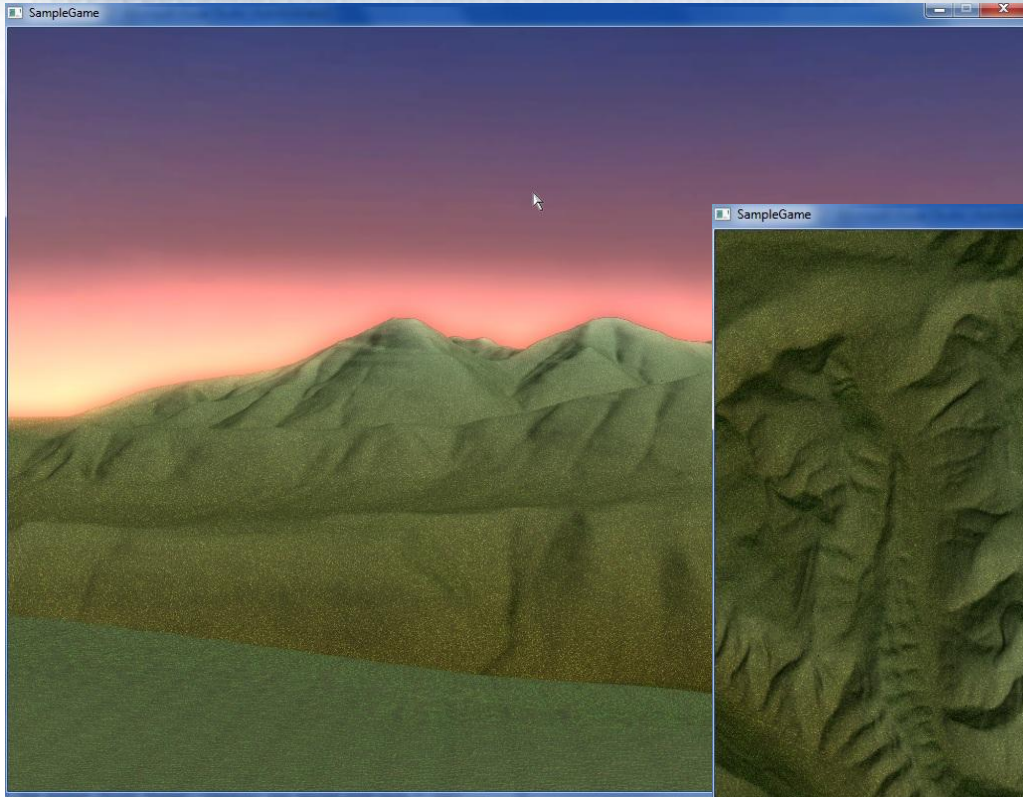


Gamebryo 4.0 – Streaming

- **Tag often repeated objects to keep all LODs resident**
- **User defined memory budget for common objects**
- **Improves performance by avoiding frequent reloading of common objects**



DEMO – Streaming



Gamebryo 4.0 – Deferred Rendering

- **Enables many simultaneous dynamic lights**
- **Screen space effects: bloom, HDR**
- **Three passes avoid use of MRT**
 - **First pass: normals and depth to G-Buffer**
 - **Second pass: per-light**
 - **Third pass: diffuse, textures, pixel shaders**
- **Optimizations**
- **Initial performance testing promising**



Gamebryo 4.0 – Material System

- **NiStandardMaterial**
 - **Same functionality**
 - **Pre-compiled shaders for performance**
 - **Deferred rendering**
 - **Runtime compilation remains possible**
- **Terrain and water shaders**
- **Library of sample shaders**



DEMO – Sample Game



Gamebryo 4.0 – Performance

- **Deferred lighting and dynamic lights**
- **Light pre-pass reduces shader complexity thereby enabling better material sorting**
- **Loading speed**
- **Asset build speed**



Gamebryo 4.0 – Performance

- **Asset builder packages level into sectors and LODs for fast loading and streaming**
- **Nearby static objects of similar materials can be combined during pre-processing**
- **Animation**
 - **Exporters create more efficient rigs**
 - **Dummy bones are no longer generated**
 - **Memory improvements**



Gamebryo 4.0 – Core Runtime

- **Similar to Gamebryo 2.6 and LightSpeed 3.3 Core Runtime**
- **Familiar to existing Gamebryo developers**
- **Enhancements primarily in loading, streaming and rendering**
- **Can continue to leverage existing custom tools and code built on previous Gamebryo versions**
- **Some porting required**



Questions or Suggestions?

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