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Scaleform®



Developing Next-Gen UI with Scaleform 4

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What is Scaleform?



Scaleform is the leading Flash-based user interface (UI) middleware for the video game industry.

Scaleform combines the performance of hardware accelerated 3D graphics technology with the proven productivity and workflow of Adobe® Flash® tools to help you rapidly create highly immersive 3D UI and casual game experiences.

What is Scaleform?



Scaleform Runtime

Enables Playback of
Adobe Flash® Content

Allows User to Manipulate
Content at Runtime via
ActionScript / C++

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Scaleform Renderer

Hardware (GPU)
Accelerated
Vector Graphics
Engine

Optimized for Video
Game UI Rendering

What is Scaleform?

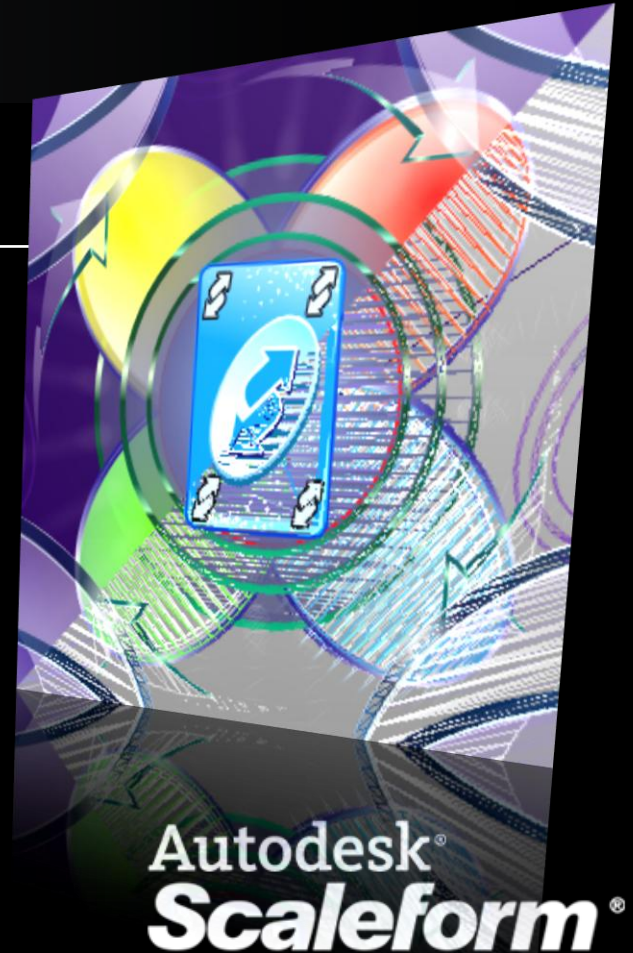


Key Features and Technology

What is Scaleform?

Key Features and Technology

- Anti-Aliased Vector Graphics Renderer



What is Scaleform?

Key Features and Technology

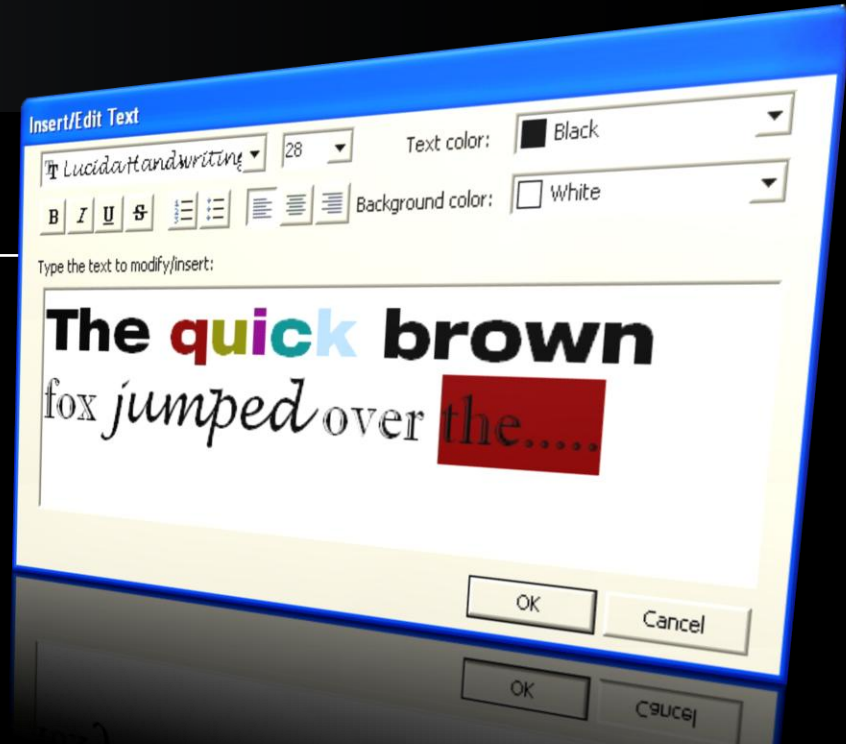
- Anti-Aliased Vector Graphics Renderer
- High Quality Dynamic Font System

Scaleform Fonts

What is Scaleform?

Key Features and Technology

- Anti-Aliased Vector Graphics Renderer
- High Quality Dynamic Font System
- Rich Text Support (HTML in TextFields)



What is Scaleform?

Key Features and Technology

- Anti-Aliased Vector Graphics Renderer
- High Quality Dynamic Font System
- Rich Text Support (HTML in TextFields)
- Masks for Arbitrary Shape Clipping



Scaleform



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What is Scaleform?

Key Features and Technology

- Anti-Aliased Vector Graphics Renderer
- High Quality Dynamic Font System
- Rich Text Support (HTML in TextFields)
- Masks for Arbitrary Shape Clipping
- Blend Modes and Filter Effects

Glow

Blur

Drop Shadow

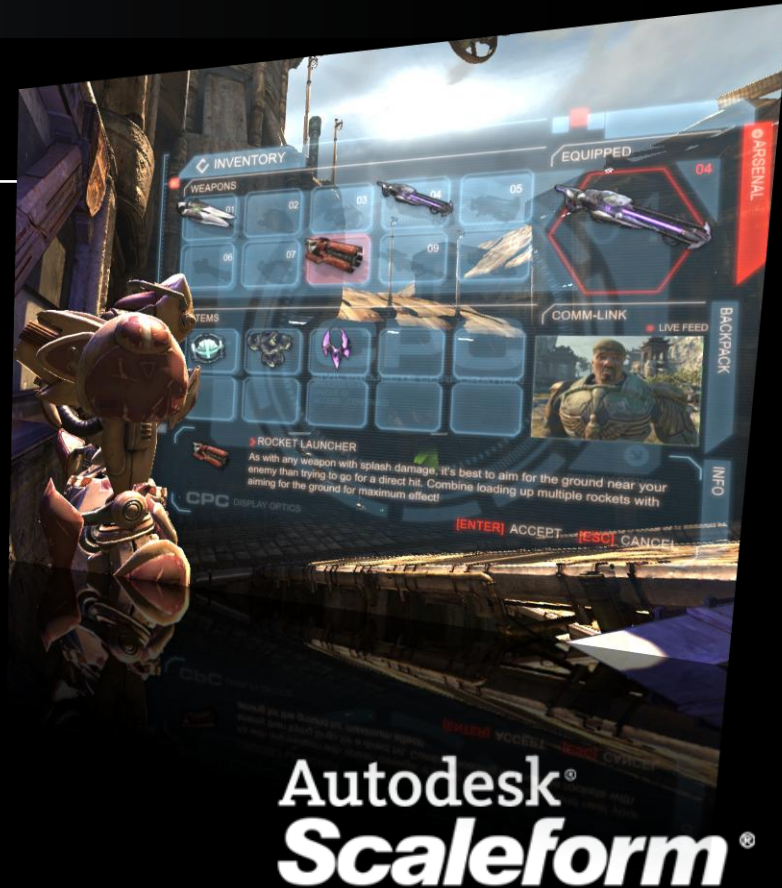
Add Blend Mode

Multiply Blend Mode

What is Scaleform?

Key Features and Technology

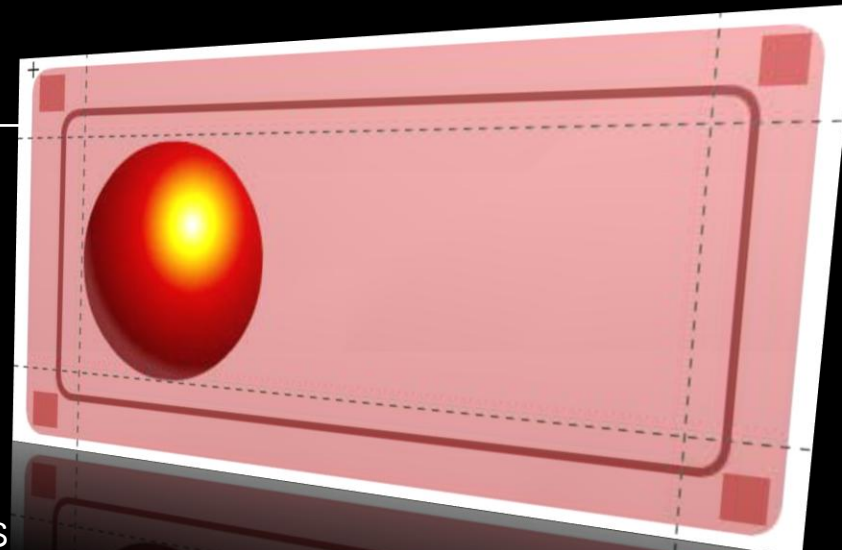
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- 3D Transformations on Display Elements



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- 3D Transformations on Display Elements
- Scale9Grid (Slicing) for Resizable UI



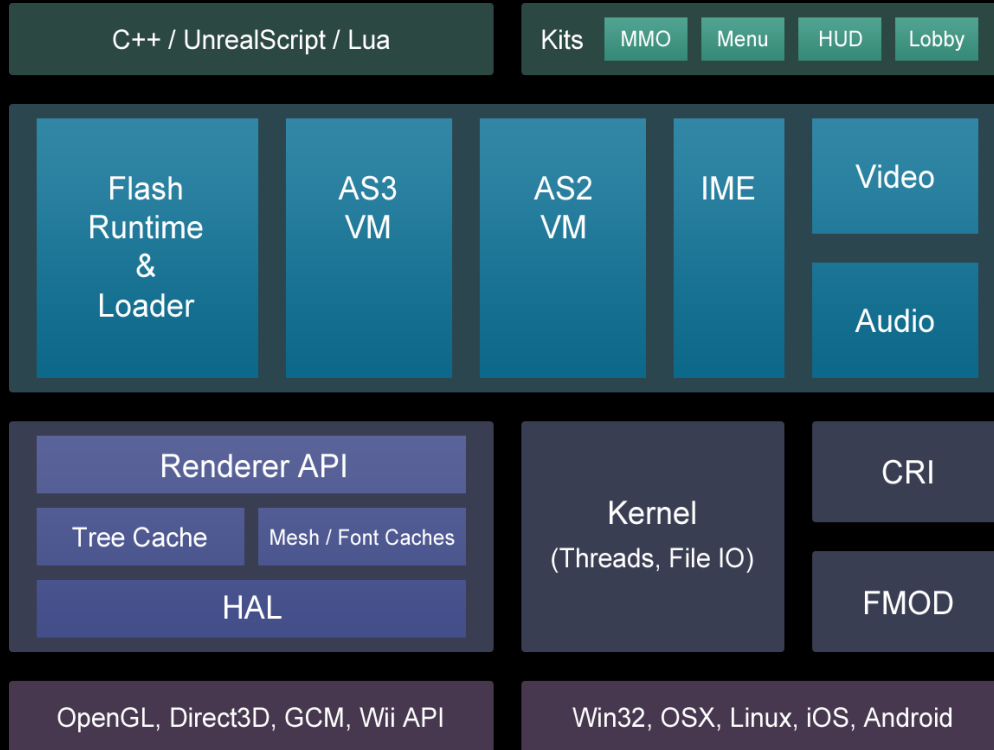
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- Scale9Grid (Slicing) for Resizable UI
- Multi-threaded Engine Architecture



Scaleform Core



Scaleform Add-Ons

Scaleform Video



- Leverages CRI Codec
- HD Resolution and Compression
- Multi-track 5.1 Audio
- Subtitle Support

The image shows a screenshot of the Scaleform 4.0 software interface. The top right corner features the CRIWARE logo. The main window is titled "Scaleform 4.0" and contains several sections:

- Input Settings:** Includes fields for "Input Name" (set to "C:\test\input"), "Output Name" (*.wmv), "Cue Point File" (*.txt), "Subtitle Text" (Track 0), and "Other Audio" (Track 0). There are checkboxes for "Use Audio Track" and "Use Alpha Channel".
- Video Settings:** Includes "Bitrate" (10000 kbps), "Framerate" (29.97 fps), and "Resize" options (W, H, On). A checkbox for "Use framerate from input file" is present.
- Encoding:** Shows "Progress: 0%" and a "Cancel" button.

Below the settings is a large preview window displaying a 3D rendered scene of a planet with a bright, glowing crack. The text "Scaleform Presents" is visible in the bottom right of the preview. To the right of the preview is the CRIWARE logo and the text "CRIWARE™". At the bottom right, the Autodesk Scaleform logo is prominently displayed.

Scaleform Add-Ons

Scaleform Video



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- HD Resolution and Compression
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Scaleform IME

- Asian Language Input Method Editor
- Language Bar & Status Window
- Closely replicates Window's IME



Scaleform Add-Ons



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Scaleform IME

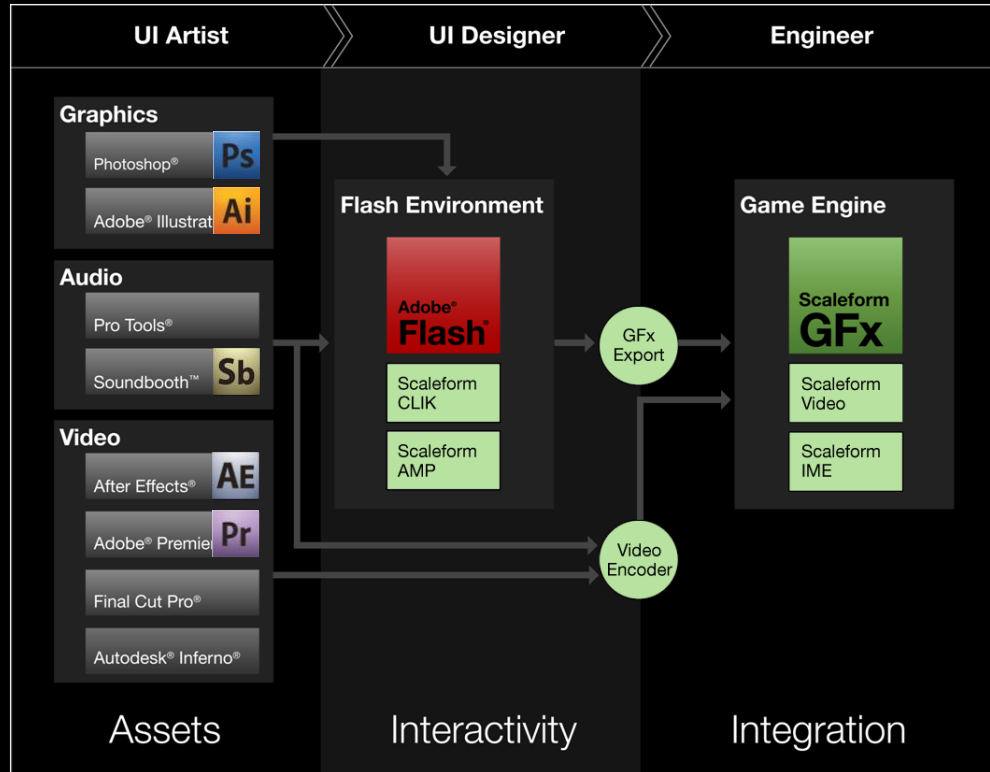
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Scaleform Audio



- Plays back embedded MP3s and other formats
- Plug-in back-ends; uses FMOD by default
- Hook-based sound playback possible through Wwise

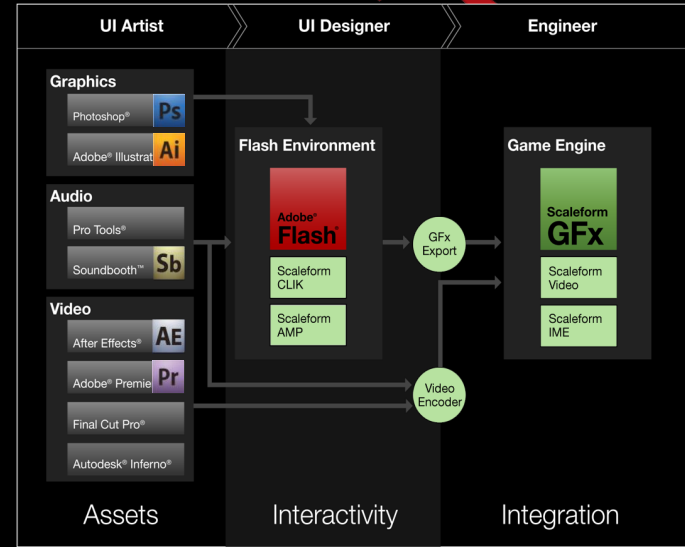
Scaleform Workflow



Scaleform Workflow

Workflow Benefits

- Artist & Designer Driven Pipeline
 - Familiar Toolset
 - Rapid Iteration
- Happy Artists == Happy Engineers & Producers
- Higher Quality UI for Less Work in Less Time



Why Autodesk Scaleform?



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Why Autodesk Scaleform?



Over 900 Licensed Titles



Crisis 2



Mass Effect 2



Starcraft II



Dragon Age 2



Mortal Kombat



ModNation Racers

Why Autodesk Scaleform?



- Over 900 Licensed Titles and Counting...
- Support for All Major Platforms



Why Autodesk Scaleform?



- Over 900 Licensed Titles and Counting...
- Support for All Major Platforms
- Integrated into Existing Game Engines



Why Autodesk Scaleform?



- Over 900 Licensed Titles and Counting...
- Support for All Major Platforms
- Integrated into Existing Game Engines
- Plugin Architecture for Easy Integration with Proprietary Engines
 - File IO
 - Image Loading & Creation
 - Translation
 - Fonts
 - HAL Renderer

Using Scaleform



Scaleform Extensions

Extending Flash® to Make Game UI Development Easier

- Multiple Controllers
- Multiplayer Split-Screen Support
- Mouse Extensions for Right-Click
- Font and Localization System
- Scaleform 3Di

...and more!

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Using Scaleform



- Profiling tool for analyzing and optimizing Scaleform content running anywhere
 - Frame by frame, real-time tracking for:
 - CPU Usage
 - GPU Rendering
 - Memory Consumption
- gameware.autodesk.com



Using Scaleform



Scaleform CLIK

Component Lightweight Interface Kit

- Scaleform's ActionScript Component Set

- Button, List, TextArea, etc...

- Features:

- Low Memory Footprint
- High Performance
- Easily Skinnable
- Highly Extendable

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Scaleform CLIK AS3

Demo Events AutoSize AutoRepeat Visible & Enabled

Button

- CheckBox
- DropdownMenu
- OptionStepper
- RadioButton
- TextInput
- ScrollBar
- ScrollingList
- Window

Button: Demo

Clicking this button will cause the CLIK logo to play a "ping" animation.

This is achieved by adding an event listener for `MouseEvent.CLICK` on the Button and tying that to a function that calls `gotoAndPlay()` on the CLIK logo MovieClip.

Play Ping Animation

Clicking this Button will toggle the rotation animation for the CLIK logo.

This Button is setup as a "toggle" Button. The `Button.selected` property can be checked to discover whether the Button is currently toggled on or off.

There exists an eventListener that listens for a `ButtonEvent.SELECTED` from the Button. This listener then starts or stops the rotation based on the Button's current `selected` property.

Start Rotation

Double-clicking this Button will cause the CLIK logo to change colors.

This is achieved by adding an event listener for `MouseEvent.DOUBLE_CLICK` on the Button and tying that to a function that calls `gotoAndPlay()` on the CLIK logo MovieClip.

Double Click

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Using Scaleform



Direct Access API

- Native C++ API for Accessing Flash Elements
- Highly Efficient Communication with Flash Content
- Ideal for Performance Critical UI

- Familiar Syntax to ActionScript, eg:
 - GotoAndPlay() [set keyframe]
 - SetX(), SetY
 - SetText()
 - Invoke() [call an ActionScript function]

Using Scaleform

Scaleform UI Kits

- HUD Kit
 - Menu Kit
 - MMO Kit
-
- Integrate into Game, Skin, and Go!
 - Great Reference / Samples to Learn From
 - Best Practice Construction of Assets
 - Production Level Source Code (AS & C++)
 - Detailed Documentation



The slide features the Scaleform logo and the text "Scaleform MMO Kit" at the top. Below this, a paragraph describes the kit as an out-of-the-box UI framework for MMO games, highlighting its CLIK-based interface elements and drag-and-drop functionality. The central part of the slide shows a screenshot of a game's user interface with various elements numbered 1 through 10. At the bottom right, the Autodesk Scaleform logo is prominently displayed.

Scaleform
MMO Kit

The Scaleform MMO Kit, designed for optimum performance and memory savings, provides an out-of-the-box UI framework for massively multiplayer online games. The kit includes CLIK-based interface elements as well as drag and drop, icon resource management, and data binding functionality. Developers can utilize this kit as a game ready solution with minimal customization or simply as a best practices guide when designing an MMO UI from the ground-up.

1 2 3 4 5 6 7 8 9 10

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Autodesk Scaleform 4



New Features in Scaleform 4

Flash 10.1, ActionScript 3

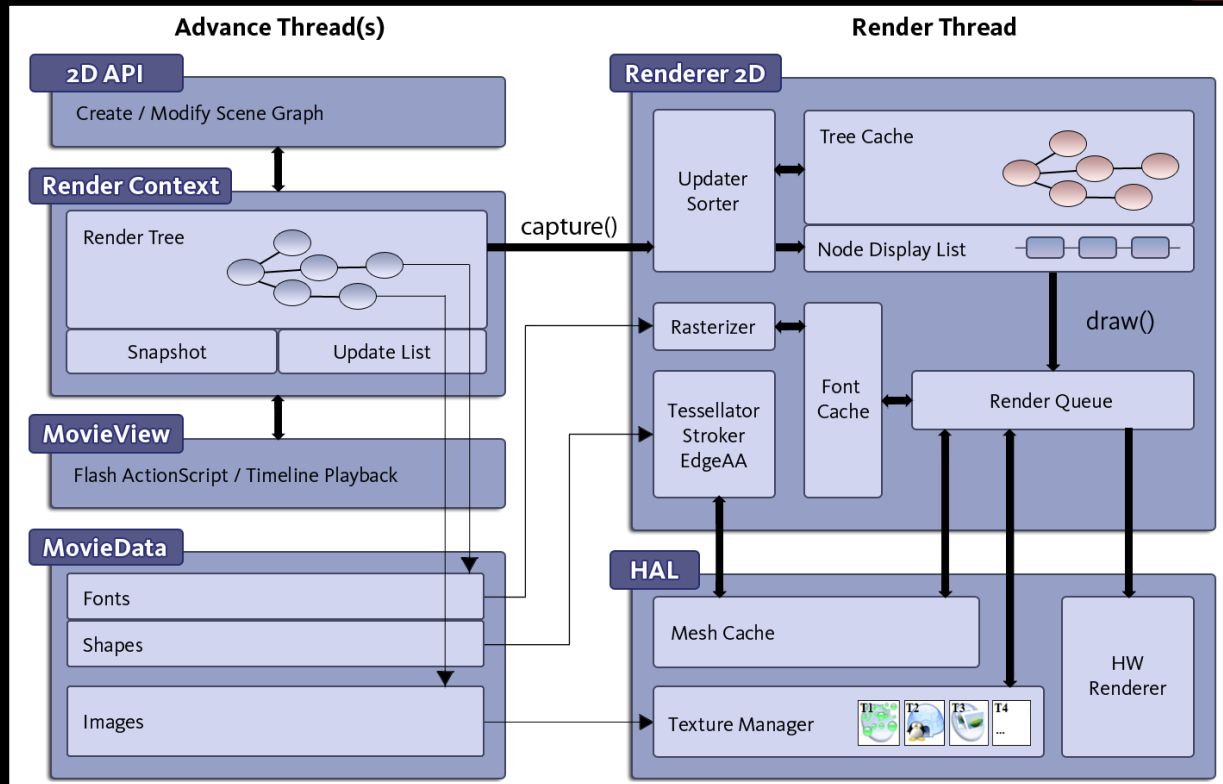
ActionScript 3

- Order of Magnitude Faster than ActionScript 2
- Better Language for Development
 - Strongly-typed
 - Scalable
 - Easier to Understand
- Flash 10.1 Features
 - Multi-touch
 - 2.5D UI Elements (z-depth)

Note: AS2 and AS3 VMs are optional. Only need to link one.



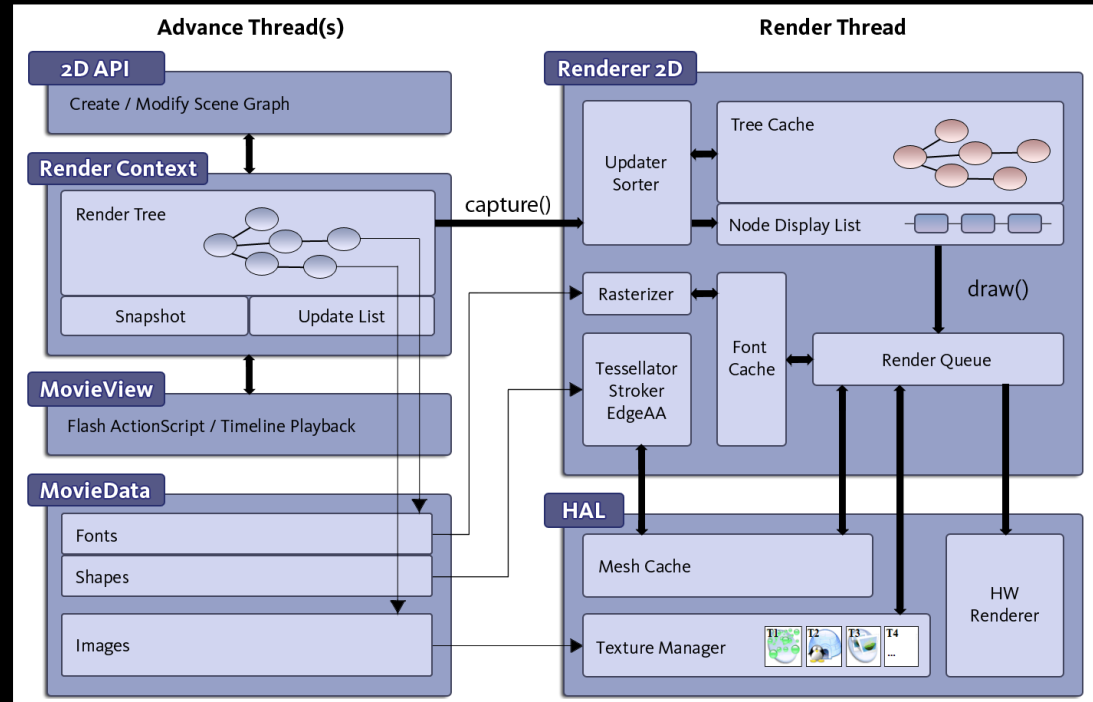
Scaleform 4 New Renderer



Scaleform 4 New Renderer



- Architected from scratch to be truly multi-threaded
- Desynchronized calls to Advance() and Display() from multiple threads
- 2x-10x performance gain rendering existing Scaleform 3 content.

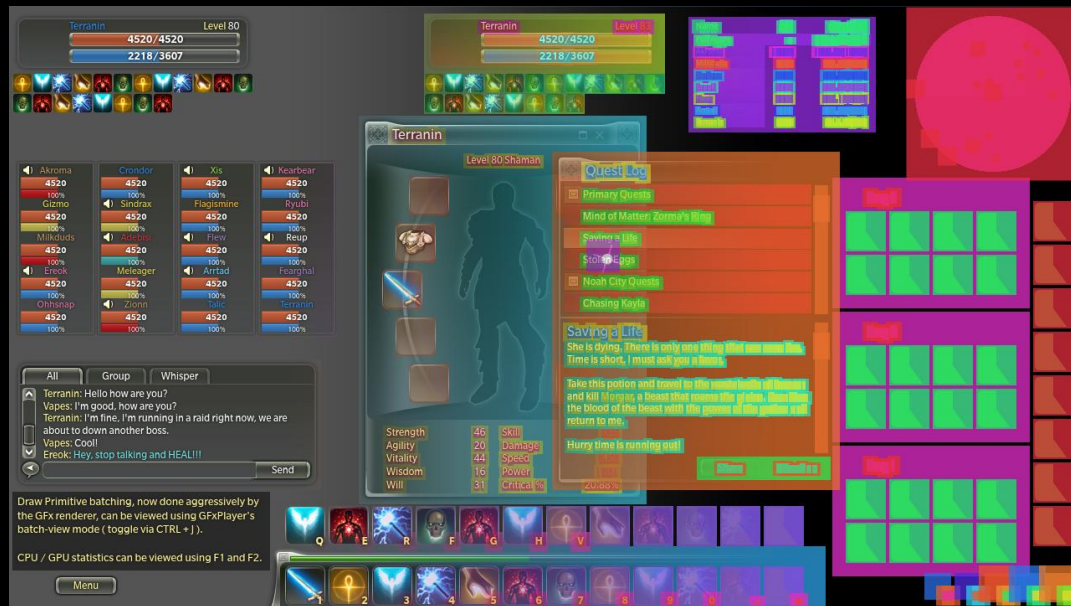


Scaleform 4 New Renderer



Intelligent Batching of Draw Primitives

- Automatically combines draw primitives into draw() calls on GPU at runtime based on region, fill style, and geometry.
- Significantly reduces draw() calls, particularly for complex content.



Scaleform 4 New Renderer



Textures should be packed for most efficient GPU batching.

Atlasing Options:

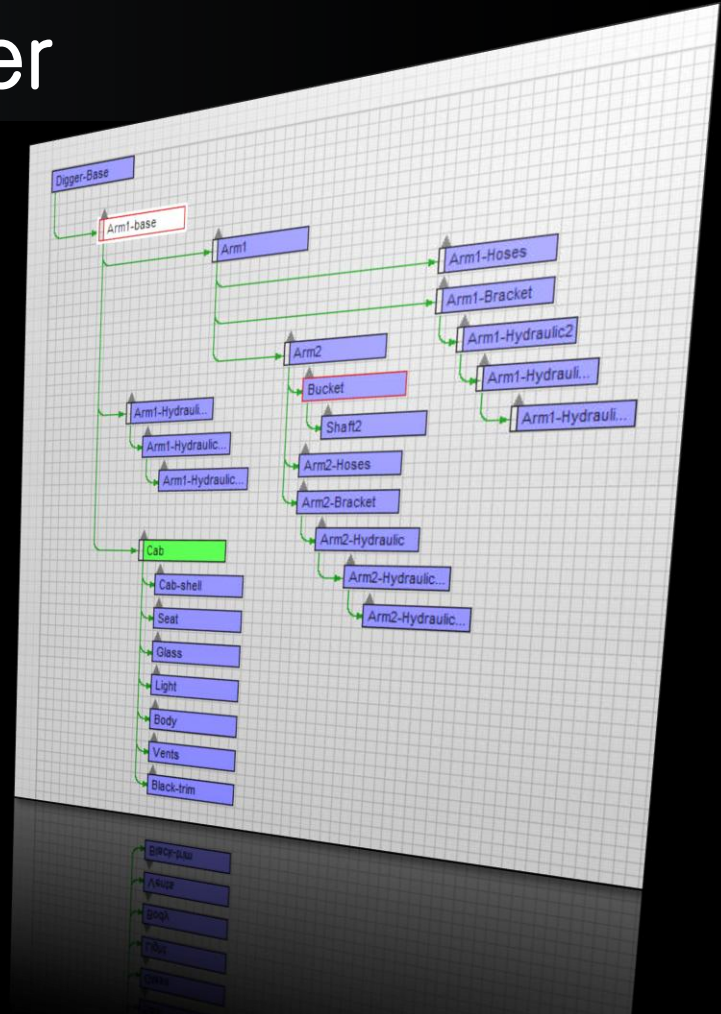
- GfxExport
- Runtime Atlasing
- Custom Engine Tool
- Atlas Created by Artist



Scaleform 4 New Renderer

Intelligent Caching of Render States

- Scaleform 4 walks the display tree once, caches it.
- Monitors changes in the tree.
- Sends changes to GPU as they occur.



Scaleform 4 New Renderer



Display CPU Improvement
2x min, 4-5x avg, 10x max

Display GPU Improvement
1.3-2.5x avg, 5x+ max

Draw Primitive (dp) Reduction
2-4x avg, 10x max

FPS HUD

Scaleform 3: 1-5ms*, 100+ dp

Scaleform 4: <0.5ms*, 30 dp

MMO

Scaleform 3: 5-10ms*, 600+ dp

Scaleform 4: <2ms*, 150 dp

Scaleform for MMOs



Considerations and Strategies

Scaleform for MMOs



Considerations for MMO UI Development

- Performance and Memory
- Communication between UI and Backend
 - Client \leftrightarrow Server
- UI Editing
- UI Scripting Language
- International IME and Localization
- Cross-Platform Capabilities (PC, Mac, Console, Mobile)

Scaleform for MMOs



Scaleform 4 Features for MMOs


- Efficient Rendering of Large and Complex UI
- WYSIWYG UI Editor (Adobe Flash Studio®)
- Rapid Iteration
- ActionScript 3 for Scalable UI Scripting Codebase
- Robust Font and Localization System
- Scaleform IME (Input Method Editor)
- Cross Platform (PC, Mac, Linux / Consoles / Mobiles)

Scaleform for MMOs

MMO Kit

- Reusable Widgets
 - Inventory, Action Bars, Chat Window
- Reusable Frameworks
 - Drag and Drop
- Databinding Framework
- Reusable AS & C++ Code for Communication
 - Client \leftrightarrow Server

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Scaleform for MMOs



Strategies

- Optimize, test content as it's developed
 - Iterate early and often
 - Use CLIK for rapid development and prototyping
- Minimize per-frame ActionScript execution during gameplay
 - Build event-driven UI
- Use Direct Access API for performance critical UI!

Scaleform for MMOs



Strategies

- Test and debug content in FxPlayer before integrating with game
- Plan for localization from the beginning of UI development
 - Scaleform IME for international players
- Compressed texture atlases of images for lower draw primitives
 - Use GFxExport!
- Consider sizes, layouts for UIs on Mobiles from the beginning

Scaleform for MMOs



Strategies

- Avoid instantiating too many MovieViews
- Use separate MovieViews for content that needs to be completely unloaded
 - Main Menu, Pause Menu
- Share Flash® Symbols and Components between .FLAs to minimize ActionScript footprint of each .SWF
 - Minimizes number of .FLAs required to republish
 - Minimizes memory footprint of redundant ActionScript

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Questions?

Nate Mitchell
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