Ingredients of Great Games

Session 602
Geoff Stahl
Director, Games and Graphics Software
130 Million
Monthly active players
Apple Design Award 2014
Honoring Outstanding Design and Innovation
Ingredients of Great Games

Allan Schaffer
Graphics and Game Technologies Evangelist
Great Games
Great Games

Go the extra mile  Play tested  Immersive  Fun core loop

Rewarding  Compelling story  Engaging  Designed for touch

Entertaining  Connected

Sticky  Localized

Innovative  Challenging

Optimized  Balanced

Rich content  Awesome graphics  Attention to detail  Social

Delighting  Polished  Competitive  Intuitive  Beautiful
Remove Friction
WELCOME TO

Paddle Mania 3000
Remove Friction
Reduce load time

Get interactive quickly
Only load what’s needed now
Move work off main thread
Use Time Profiler to analyze
Remove Friction
Reduce load time

Get interactive quickly
Only load what’s needed now
Move work off main thread
Use Time Profiler to analyze
Paddle Mania 3000

Downloading assets...
Paddle Mania 3000
Register now!

Would you like a Paddle Mania account?

[No Thanks] [Register]
Remove Friction

Registration

Provide a bypass
Automate by using Vendor ID
Clearly explain benefits
Defer until needed
Remove Friction
Registration

Provide a bypass
Automate by using Vendor ID
Clearly explain benefits
Defer until needed
<table>
<thead>
<tr>
<th>Configurable Parameter</th>
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<tbody>
<tr>
<td>Name</td>
<td>Sir Bounce-a-Lot</td>
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<tr>
<td>Color</td>
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<tr>
<td>Elasticity</td>
<td>Super Bouncy</td>
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<tr>
<td>Friction</td>
<td>Like Butter</td>
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<tr>
<td>Shape</td>
<td>Rectangle (low points)</td>
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<tr>
<td>Bounce Blink</td>
<td>Extreme Blinkitude</td>
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<tr>
<td>Bounce sound level</td>
<td>Deafening</td>
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<tr>
<td>Bounce sound type</td>
<td>Bloop-Blop</td>
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Welcome to
Paddle Mania 3000

Like what you see?
Leave us a rating on the
App Store

No Thanks  Rate Now
Remove Friction
Make a great first impression

Reduce load time
Move blocking updates
Streamline registration
Provide escape from intros
Don’t force decisions
Wait to ask for feedback
Remove Friction
Be a Good Teacher
Slide your finger to cut the rope

Deliver candy to Om Nom
Slide your finger to cut the rope

Deliver candy to Om Nom
Slide your finger to cut the rope

Deliver candy to Om Nom
The bubble will lift the candy up.
Pop the bubble with your finger
You can restart the level by pressing the button.
Be a Good Teacher
Maximize enjoyment

Teach by playing
Show the primary mechanic
Introduce concepts one-at-a-time
Provide tips in context
Give help along the way
Be a Good Teacher
Maximize enjoyment

Teach by playing
Show the primary mechanic
Introduce concepts one-at-a-time
Provide tips in context
Give help along the way
1. Remove Friction
2. Be a Good Teacher
## Related Sessions

- **Making a Great First Impression with Strong Onboarding Design**
  - **Mission**
  - **Thursday 2:00PM**
3
Tune Your Core Loop
Core Loop

Action

Reward

Expansion
Core Loop

Fantasy/RPG

Fight enemies → Get treasure → Gain experience → Level up → Buy things
Core Loop
Platformer

- Run and jump
- Complete level
- Unlock next stage
Core Loop

Multiple loops

Fight monsters → Gain experience → Level up → Collect clues → Solve puzzle → Unlock door
Tune Your Core Loop

Key takeaways

Center on target audience
Tune Your Core Loop

Key takeaways

Center on target audience
Make it easy to understand

- Action
- Reward
- Expansion
Tune Your Core Loop

Key takeaways

Center on target audience
Make it easy to understand
Steer each phase into the next
Tune Your Core Loop

Key takeaways

Center on target audience
Make it easy to understand
Steer each phase into the next
Make iteration meaningful
Tune Your Core Loop

Key takeaways

Center on target audience
Make it easy to understand
Steer each phase into the next
Make iteration meaningful
Question your assumptions
Tune Your Core Loop

Key takeaways

- Center on target audience
- Make it easy to understand
- Steer each phase into the next
- Make iteration meaningful
- Question your assumptions
- Don’t get boxed in
THIS IS BILLY.
HE FISHES LIKE A CHAMP.
ON THE WAY UP
CATCH ALL THE FISH YOU CAN.
NOW GRAB YOUR GUN & SHOOT THE GILLS OFF 'EM!
1. Remove Friction
2. Be a Good Teacher
3. Tune Your Core Loop
Design for Touch
Monument Valley
IT'S OVER WHEN THE BOARD FILLS UP
Direct Interaction

Instantaneous Feedback
Design for Touch

Direct interaction
- Touches, taps
- Gestures, swipes
- Panning, paths
Design for Touch

Direct interaction
- Touches, taps
- Gestures, swipes
- Panning, paths

Instantaneous feedback
- Visual cues
- Audio cues
1. Remove Friction
2. Be a Good Teacher
3. Tune Your Core Loop
4. Design for Touch
Foster Engagement
Engagement
Engagement

Interaction mechanic

Action

Reward

Expansion mechanic

Expansion

Progression mechanic
Engagement
Holding the player’s interest

Provide layers
- Parallel goals and challenges
- Multiple paths for risk vs. reward
Engagement

Holding the player’s interest

Provide value for everyone
- Paying and non-paying players
Engagement

Holding the player’s interest

Incentivize repeat play
- Motivate “One more try”
- Motivate “See what’s next”
- Motivate “See how it ends”
Re-Engagement

Updates

Provide fresh content
- Continuing storyline
- New game levels
- New challenges
- Seasonal content

Plan your updates before launch
### Paddle Mania 3000

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<tr>
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</tbody>
</table>
1. Remove Friction
2. Be a Good Teacher
3. Tune Your Core Loop
4. Design for Touch
5. Foster Engagement
Use Background Transfers
In the Bundle
Paddle Mania 3000

Thousands of image assets
- Retina and non-retina
- iPad and iPhone

Sounds
- AAC, MP3, LPCM

Localizations
- EFIGS+8

Binary
- armv7, armv7s, arm64
This item is over 100MB.

Paddle Mania 3000 will not download until you connect to Wi-Fi.
“One size fits all!”
“One size fits all!”
Don’t Sacrifice Quality
Use Background Transfers
Background Transfers

Strategy

Segment your assets
  - Bundled content
  - Content to download after first launch

For example
  - First set of levels at full quality
  - More levels as player progresses
Background Transfers
With NSURLSession

Service to upload and download data
Transfer done out of process
App relaunched when transfer completes
Background Transfers
With NSURLSession

Service to upload and download data
Transfer done out of process
App relaunched when transfer completes
Adds complexity
Background Transfers
With NSURLSession

Service to upload and download data
Transfer done out of process
App relaunched when transfer completes
Adds complexity
Follow the iOS Data Storage Guidelines
1. Remove Friction
2. Be a Good Teacher
3. Tune Your Core Loop
4. Design for Touch
5. Foster Engagement
6. Use Background Transfers
Optimize Graphics Performance
Optimize Graphics Performance

OpenGL ES

Most common issue
- Too many draw calls
- Too few triangles per draw call
Optimize Graphics Performance

OpenGL ES

Most common issue
- Too many draw calls
- Too few triangles per draw call

Worst-case scenario
- Bind a texture
- Draw one quad
- Repeat
Optimize
Optimize

- Eliminate redundant state changes
- Maximize triangles per batch
- Modify state lazily
- Join short strips
- Cull offscreen objects
- Minimize small batches
- Hoist work upstream
- Flatten transformations
- Provide longer vertex arrays
- Prewarm shaders
- Use instancing
- Combine textures into atlases
- Sort rendering by state
- Discard buffers
```c
lowp vec4 light = texture2DProj(light_texture, v_lightcoord);

lowp vec3 diffuse = light.rgb;
lowp vec3 specular = vec3(light.a);
// lowp vec3 specular = light.rgb * max(light.a / length(light.rgb), 0.0);

mediump vec3 n_s = texture2DProj(gbuffer_texture, v_lightcoord).rgb;
float sun_atten = shadow2DProjE(shadow_texture, v_shadowcoord);
float sun_diffuse = max(dot(n_s * 2.0 - 1.0, sun_direction), 0.0) * sun_atten;

diffuse += sun_color * sun_diffuse;

diffuse = texture2D(diffuse_texture, v_texcoord).rgb;
specular = texture2D(specular_texture, v_texcoord).rgb;

diffuse += diffuse;
specular += specular;

gl_FragColor = vec4(diffuse + specular, 1.0);
```
## Program Performance

<table>
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<tr>
<th>Program</th>
<th>Frame %</th>
<th>Current ms</th>
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<tbody>
<tr>
<td>Program #14 &quot;Light&quot;</td>
<td>42.2%</td>
<td>9.72</td>
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<td>Program #3 &quot;Material&quot;</td>
<td>42.0%</td>
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<tr>
<td>Program #2 &quot;GBuffer&quot;</td>
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<tr>
<td>Program #6 &quot;Skybox&quot;</td>
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<td>Program #5 &quot;Fairy&quot;</td>
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<td>Program #1 &quot;ZOnly&quot;</td>
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<tr>
<td><strong>Total</strong></td>
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<td><strong>23.04</strong></td>
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</table>

- Current ms:
  - 2
  - 4
  - 6
  - 8
  - 10

---

**Graphics Report**

- **Frames Per Second**: 43
- **Utilization**
  - TILER: 17%
  - RENDERER: 100%
  - DEVICE: 100%
- **Frame Time**
  - CPU: 12 ms
  - GPU: 23 ms
varying highp vec4 v_lightcoord;
varying highp vec4 v_shadowcoord;
varying highp vec4 v_texcoord;

void main()
{
  lowp vec4 light = texture2DProj(light_texture, v_lightcoord);
  lowp vec3 diffuse = light.rgb;
  lowp vec3 specular = vec3(light.a);
  medium vec3 n_s = texture2DProj(gbuffer_texture, v_lightcoord).rgb;
  float sun_atten = shadow2DProjEXT(shadow_texture, v_shadowcoord);
  float sun_diffuse = max(dot(n_s * 2.0 - 1.0, sun_direction), 0.0) * sun_atten;
  diffuse := sun_color * sun_diffuse;
  diffuse := texture2D(diffuse_texture, v_texcoord.xy).rgb;
  specular := texture2D(specular_texture, v_texcoord.xy).rgb;
  diffuse := diffuse;
  specular := specular;
  gl_FragColor = vec4(diffuse + specular, 1.0);
}
varying highp vec4 v_lightcoord;
varying highp vec4 v_shadowcoord;
varying highp vec4 v_texcoord;

void main()
{
    lowp vec4 light = texture2DProj(light_texture, v_lightcoord);

    lowp vec3 diffuse = light.rgb;
    lowp vec3 specular = vec3(light.a);

    mediump vec3 n_s = texture2DProj(gbuffer_texture, v_lightcoord).rgb;

    float sun_atten = shadow2DProjEXT(
        shadow_texture, v_shadowcoord);

    float sun_diffuse = max(dot(n_s * 2.0 - 1.0, sun_direction), 0.0) * sun_atten;

    diffuse += sun_color * sun_diffuse;

    diffuse *= texture2D(diffuse_texture, v_texcoord.xy).rgb;
    specular *= texture2D(specular_texture, v_texcoord.xy).rgb;

    diffuse += diffuse;
    specular += specular;

    gl_FragColor = vec4(diffuse + specular, 1.0);
}
1. Remove Friction
2. Be a Good Teacher
3. Tune Your Core Loop
4. Design for Touch
5. Foster Engagement
6. Use Background Transfers
7. Optimize Graphics Performance
Make a Great Preview Video
Best New Apps

- VSCO Cam® Photo & Video
  - FREE
- Mint Personal Finance
  - FREE
- Soundcloud: stream music...
  - Music
  - FREE
- Infiniti Games
  - $2.99

Get in SHAPE

TRAVERS
App Previews

Gameplay video
Up to 30 seconds
Deliver in H.264 MPEG4
Capture directly from iOS 8
Edit with iMovie on OS X 10.10
App Previews
Enhance App Store presence

Icon
Name
Screenshots
App Previews
Localizations
Description
Keywords
1. Remove Friction
2. Be a Good Teacher
3. Tune Your Core Loop
4. Design for Touch
5. Foster Engagement
6. Use Background Transfers
7. Optimize Graphics Performance
8. Make a Great Preview Video
155 countries
More than 40 languages
Think Globally
Act Locally
Localize App Store metadata

Name
Description
Keywords
Screen snapshots
Act Locally

Localize app content

Structure for internationalization
Translate assets, user interface
Culturalize as appropriate
Recommended Languages

*English, French, Italian, German, Spanish*

*Japanese, Korean, Traditional Chinese, Simplified Chinese*

*Brazilian Portuguese, Russian, Turkish, Arabic*
Build Apps for the World

Your app deserves a global audience. Distribute apps in more than 150 countries. Localize apps for more than 40 languages. iOS and OS X make it easy.

Worldwide Distribution

The App Store and Mac App Store are available in over 150 countries, support 40 languages, and have the ability to handle international payment, currency conversion, taxation, and global distribution — making it easy for you to expand your business by selling apps to millions of users around the world.

A Solid Foundation

iOS and OS X are multilingual operating systems designed to work for users in their language of choice. Both operating systems are built on technologies which make using and localizing multilingual apps easy, including high quality extended fonts, support for typographic features, language specific input methods and auto-correction dictionaries, and keyboards that are customized for more than 50 languages.
1. Remove Friction
2. Be a Good Teacher
3. Tune Your Core Loop
4. Design for Touch
5. Foster Engagement
6. Use Background Transfers
7. Optimize Graphics Performance
8. Make a Great Preview Video
9. Localize
10

Target the State of the Art
State of the Art

Take advantage of the latest iOS devices
State of the Art

Take advantage of the latest iOS devices
Target the latest iOS release
State of the Art

Take advantage of the latest iOS devices
Target the latest iOS release
Provide fallbacks for iOS 7
State of the Art

Take advantage of the latest iOS devices
Target the latest iOS release
Provide fallbacks for iOS 7
Integrate with built-in game technologies
1. Remove Friction
2. Be a Good Teacher
3. Tune Your Core Loop
4. Design for Touch
5. Foster Engagement
6. Use Background Transfers
7. Optimize Graphics Performance
8. Make a Great Preview Video
9. Localize
10. Target the State of the Art
Go to Eleven
1. Remove Friction  
2. Be a Good Teacher  
3. Tune Your Core Loop  
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11. Go to Eleven
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8. Make a Great Preview Video
9. Localize
10. Target the State of the Art
11. Go to Eleven
Wrap-Up

Geoff Stahl
Director, Games and Graphics Software
Get Together

- Game Developer Get Together
  Broadway
  Thursday 4:30PM
More Information

Allan Schaffer
Graphics and Game Technologies Evangelist
aschaffer@apple.com

Filip Iliescu
Graphics and Game Technologies Evangelist
filiescu@apple.com

Apple Developer Forums
http://devforums.apple.com