

# Windows Phone 8 Native C/C++ Game Development

- Tim Lavery

- [timl@microsoft.com](mailto:timl@microsoft.com)

- @timlavery

- Principal Program Manager

- Windows Phone

Microsoft®

**TechEd**  
China 2012

# Platform Goals

- Support Existing Games (XNA)
- Reduce the Cost to Target Windows Phone
- Enable Cutting Edge Performance
- Make it Easy to Make Money

# How did we do?

# Reduce Costs

- **C++ Code Portability**

Reuse your own C++ code

Use open source C++ libraries

Cocos2D, SharpDx

- **Competitive Middleware Support**

Used by over 50% of games

Havok, Unity, FMOD, Scaleform, Wwise, Marmalade

- **Windows 8 Aligned Game Platform**

Direct3D app supported Windows 8 and Windows Phone 8

Large shared API set

# Cutting Edge Performance

- New Expansive C++ API Surface
- Graphics - Direct3D 11.1
- Audio - XAudio2 / WASAPI / IMFMediaEngine
- Video - IMFMediaEngine
- Networking
- All critical subsystems games need
  - File system, threading, input, sensors and more

# Make it easy to make money

- In-app purchasing
  - Consumables: gold coins, poker chips
  - Durables: additional game levels
  - 7.X Light Up
- New global marketplace support
  - 191 countries
  - 50 languages
  - MO billing, international credit cards, PayPal, local options

# Native games

- Demo



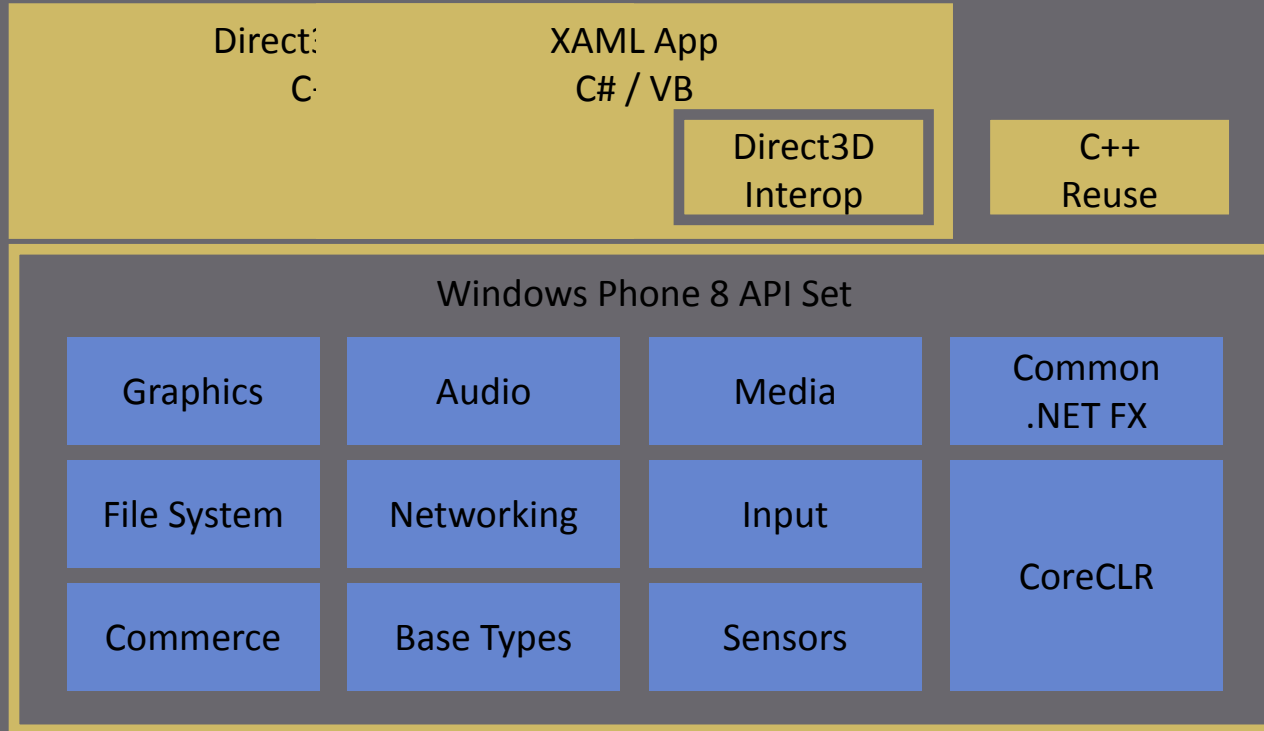


# Havok-powered titles



# App models & APIs

# Windows Phone 8 App Models



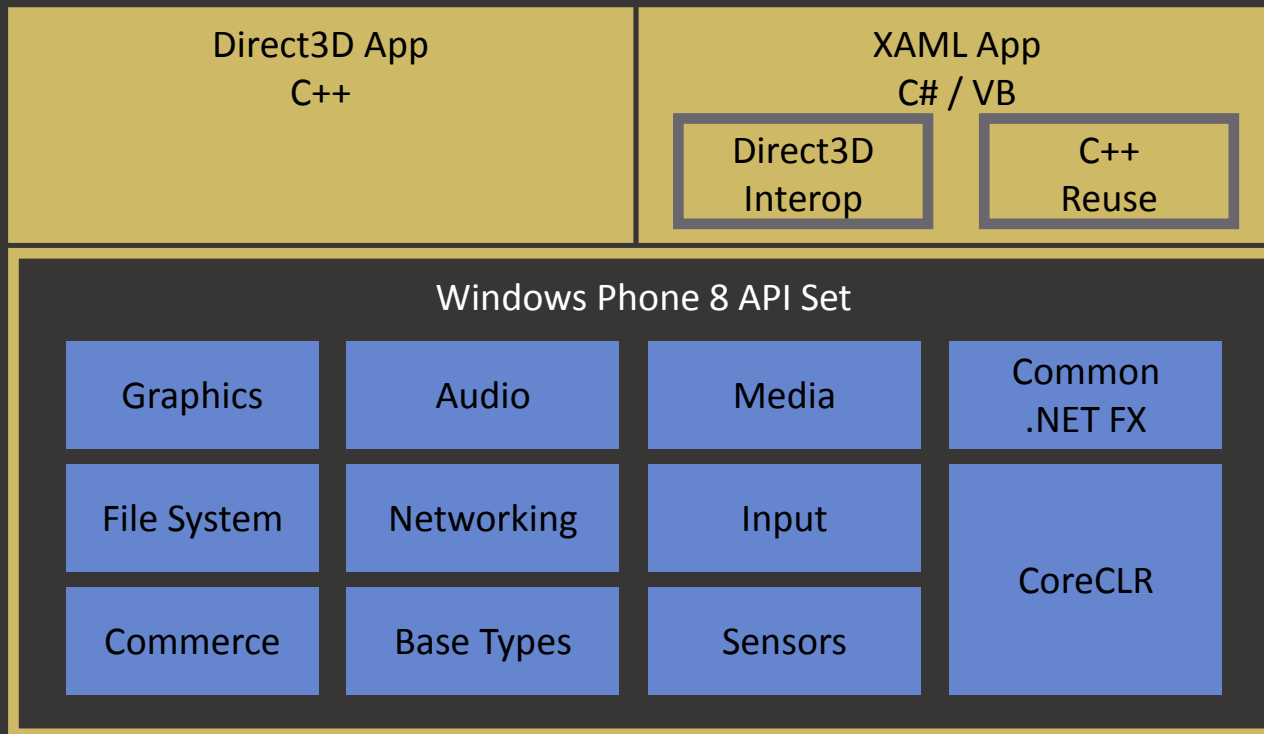
# Direct3D App Model

- C++ Only
- Access to the new Windows Phone 8 API surface  
Windows Runtime APIs, COM and Win32 style APIs
- Reuse your C++ code  
Statically linked or a dll
- Supports activation and app lifecycle  
CoreApplication, CoreWindow, CoreDispatcher

# Direct3D app

- Demo

# Application Models



# XAML App Model

- XAML App Model extended
- C++ Code Reuse
  - Your own or other C++ libraries
  - Call COM / Win32 style APIs from within Windows Runtime Components
- Full access to the new Windows 8 shared API surface
  - Windows Phone Runtime APIs, COM and Win32 style APIs
- Direct3D Composition
  - Render into a XAML scene from C++/Direct3D
  - New elements

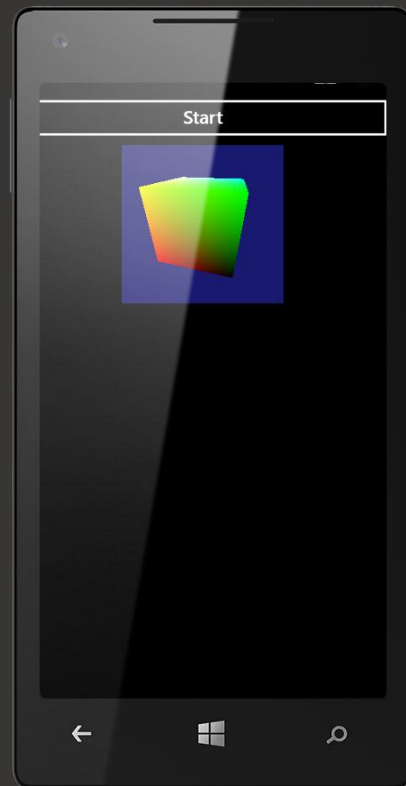
# DrawingSurface

- Place anywhere
- Draw to it from C++/Direct3D
- Composited automatically with other XAML elements
- Uses a Direct3D Swap Chain

```
<StackPanel>
```

```
    <Button Content="Start"/>
```

```
    <DrawingSurface Height="200"  
Width="200"/></StackPanel>
```

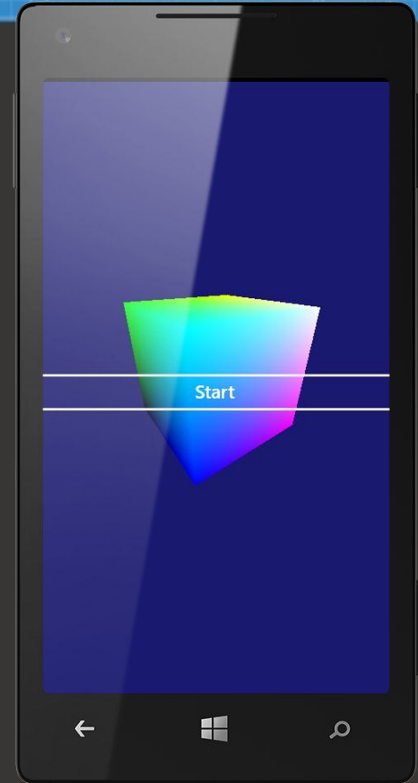




# DrawingSurfaceBackgroundGrid

- Must be the root element of a page
- You render to the background from C++/Direct3D
- Does **not** use a Direct3D Swap Chain
- Performs better
- Grid children are rendered on top

```
<DrawingSurfaceBackgroundGrid>  
  <StackPanel VerticalAlignment="Center">  
    <Button Content="Start"/>  
  </StackPanel>  
</DrawingSurfaceBackgroundGrid>
```



# XAML and Direct3D

- Demo

# Choosing App Models

- XAML App
  - You need access to Live Tiles, Notifications, Background Agents, XAML UI, etc
- Direct3D App
  - You need the absolute best performance
  - You don't need what the XAML App gives you
- How hard is it to switch?
  - It is very straightforward

# New APIs

# Input & Sensors

- Windows Runtime APIs
- Input
  - PointerPressed, PointerMoved, PointerReleased
  - KeyDown, KeyUp, CharacterReceived, Show/Hide Onscreen Keyboard
- Windows.Devices.Sensors
  - Accelerometer
  - Gyrometer
  - Orientation
  - Compass
  - Inclinometer
  - Supports Polling and Events

# Input

- Demo

# Graphics

- API
  - Direct3D 11.1
- Hardware capabilities
  - Feature level 9.3
- Subset of Windows 8
  - No Direct2D or DWrite
  - No Windows Imaging Component (WIC)
- Removed legacy features
  - No GDI
  - No D3DX
  - No fixed function
  - No runtime shader compilation

Use DirectXTex

(<http://codeplex.com/directxtex>)

Use DirectX Tool Kit

(<http://codeplex.com/directxtk>)

# Feature Level 9.3

## Included

- DX11 API, Feature level 9\_3
- Shader model 2.0b
- Max texture size = 4096
- Conditional non-pow-2 textures
- BC1-BC3 texture compression
- Floating point textures
- Multiple rendertargets
- Hardware instancing
- Occlusion queries
- Separate alpha blend

## Not Included

- Geometry shaders
- Hull/domain shaders
- DirectCompute
- Resource arrays
- BC4–BC7 compression
- Vertex texture fetch



# Shaders

- Demo

# Audio Support

- Effects
- Looping, 3D positioning, DSP effects, etc
- Many at once
- In-memory PCM or ADPCM data

XAudio2

## Background music

- One at a time
- Compressed (MP3, WMA)
- Asynchronously streamed from the filesystem or URI

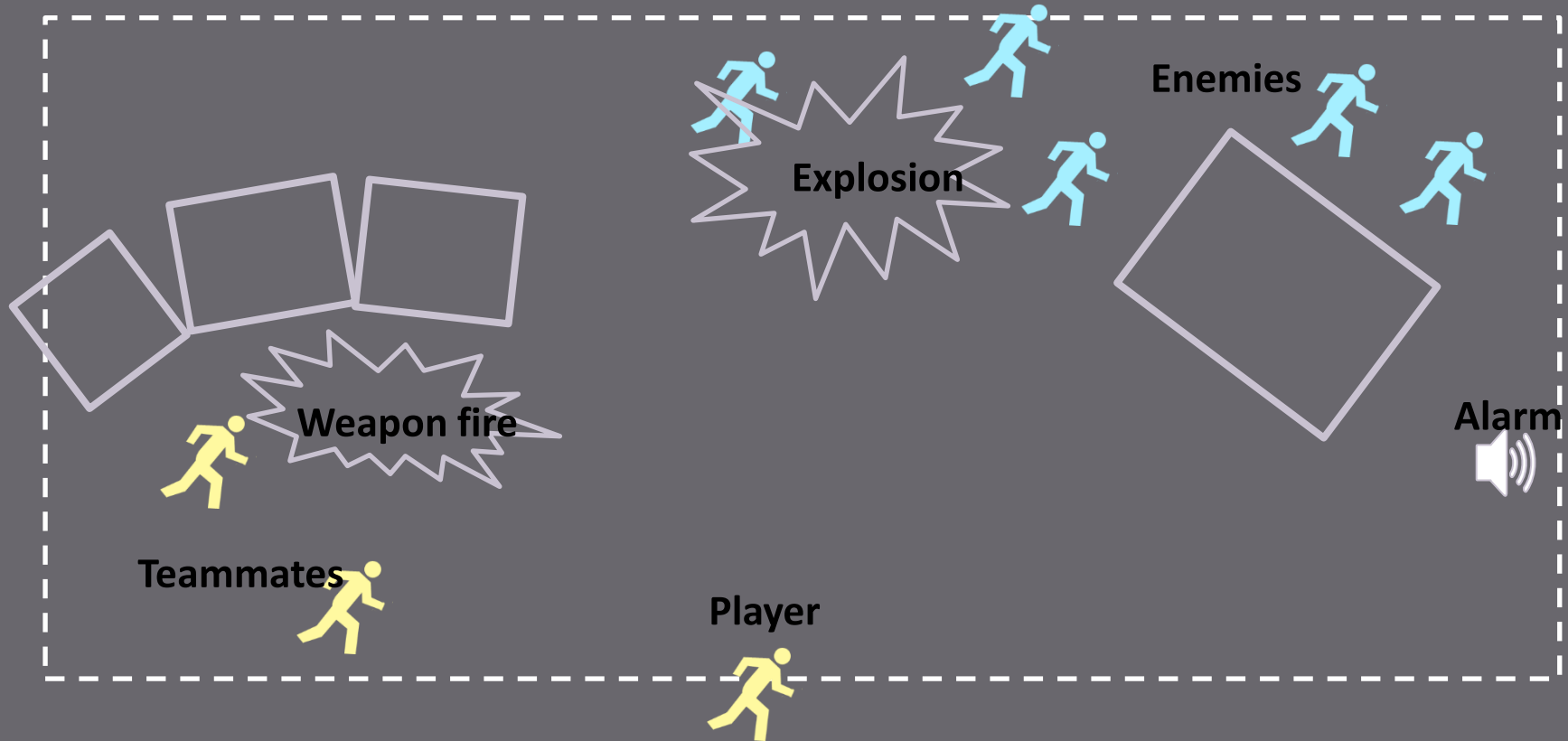
IMFMediaEngine

## PCM streams

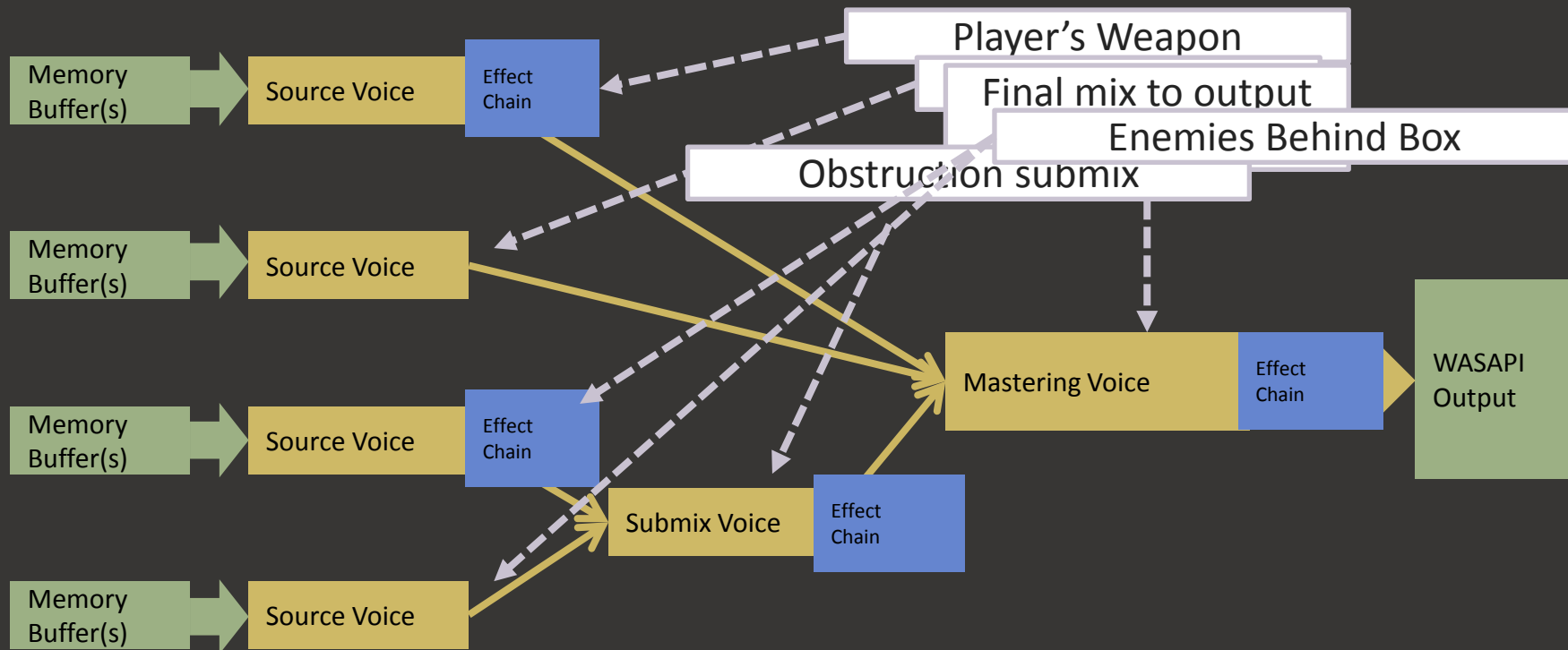
- Render & capture
- Low level API

WASAPI

# Audio in the Game World



# XAudio2 Audio Graph



# Music: IMFMediaEngine

- COM based
- Initialize and set source
  - Source can be URI or IMFByteStream
- Control playback
  - Play, Pause, Stop
  - Loop, Seek

# Background Music

- Demo

# Video Support: IMFMediaEngine

- Initialize and set source
- Control playback
- Render video
  - Game retrieves video frame and renders video frame on the texture of an object in the game
  - Game uses OnVideoStreamTick to find out whether a new video frame is ready
  - Game uses TransferVideoFrame to copy video frame to DXGI surface
  - OS can render RGB / NV12 formats

# Networking

- Covered extensively in Networking talk
- StreamSocket/StreamSocketListener
  - TCP Sockets with SSL Support
    - DatagramSocket
  - UDP Sockets
    - PeerFinder
  - Bluetooth & NFC
  - Supports App->Device and App->App
    - XmlHttpRequest2
  - C++ HTTP Support
    - WinSock



# Storage

- Windows Runtime APIs

StorageFile, StorageFolder, ApplicationData

Supports “ms-appx” & “ms-appdata” loading URI

- Win32 Style APIs

CopyFile2, CreateDirectoryW, CreateFile2, DeleteFileW, FindClose, FindFirstFileExW, FindNextFileW, FlushFileBuffers, GetDiskFreeSpaceExW, GetFileAttributesExW, GetFileInformationByHandleEx, GetOverlappedResultEx, LockFileEx, MoveFileExW, ReadFile, RemoveDirectoryW, SetEndOfFile, SetFileAttributesW, SetFileInformationByHandle, SetFilePointerEx, UnlockFileEx, WriteFile

# Launchers and Choosers

- Windows Runtime APIs
  - Launch Marketplace Details Page
  - Launch Application Review Page
  - Launch Marketplace Search
  - Launch Browser
  - Launch Connection Settings
  - Launch Email Compose
  - Sharing: Social Networks, Email, SMS
  - Choose Photo
- Other Windows Phone L&C not supported... yet

# Visual Studio 2012

- New Templates For C++ Apps & Components
  - Direct3D App
  - Direct3D with XAML App
  - Windows Phone Runtime Components
  - DLLs and Static Libraries
- Command line tools
  - Build/deploy/debug
- CPU Profiling
  - C++ or C#
  - ETL based profiling
- Tools for game assets
  - Mesh viewer
  - Texture editor
  - HLSL editor

Q&A

# THANK YOU!