



unity

Seminario per Sistemi Multimediali A.A. 2016-2017

Ing. Gabriele Piantadosi (gabriele.piantadosi@unina.it)

What is a Game Engine?

“A game engine is a software framework (ensemble of tools) designed for the creation and development of video games.”

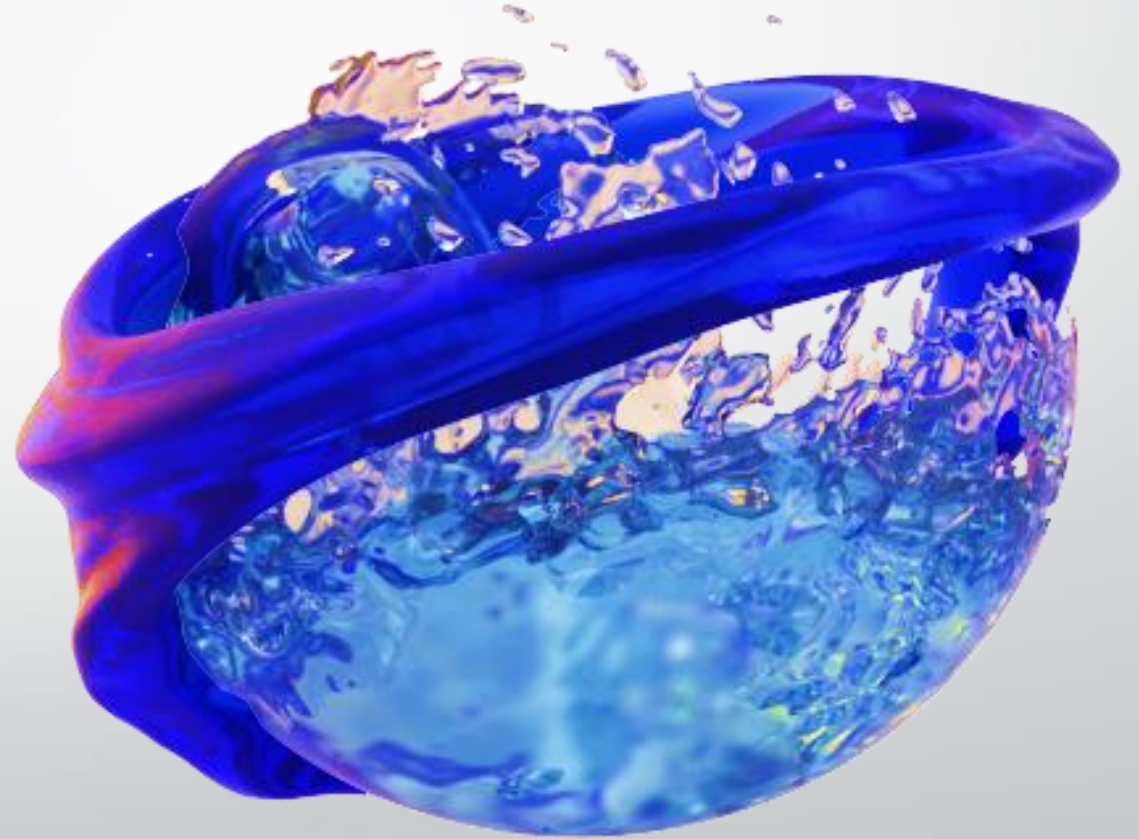
Game Engine Functions

- Basics
 - Rendering
 - 2D/3D
 - OpenGL/DirectX
 - CPU/GPU



Game Engine Functions

- Basics
 - Rendering
 - 2D/3D
 - OpenGL/DirectX
 - CPU/GPU
- Media
 - Sound/Video
 - Animations
 - Assets
 - Models
 - Materials/Textures
 - Shading/Lighting



Game Engine Functions

- Basics
 - Rendering
 - 2D/3D
 - OpenGL/DirectX
 - CPU/GPU
- Media
 - Sound/Video
 - Animations
 - Assets
 - Models
 - Materials/Textures
 - Shading/Lighting
- High Level funs.
 - Collision Detection
 - Physics
 - Artificial Intelligence
 - Scripting

Game Engine Functions

- Basics
 - Rendering
 - 2D/3D
 - OpenGL/DirectX
 - CPU/GPU
 - Media
 - Sound/Video
 - Animations
 - Assets
 - Models
 - Materials/Textures
 - Shading/Lighting
- High Level funs.
 - Collision Detection
 - Physics
 - Artificial Intelligence
 - Scripting



Game Engine Functions

- Basics
 - Rendering
 - 2D/3D
 - OpenGL/DirectX
 - CPU/GPU
 - Media
 - Sound/Video
 - Animations
 - Assets
 - Models
 - Materials/Textures
 - Shading/Lighting
- High Level funs.
 - Collision Detection
 - Physics
 - Artificial Intelligence
 - Scripting



Game Engine Functions

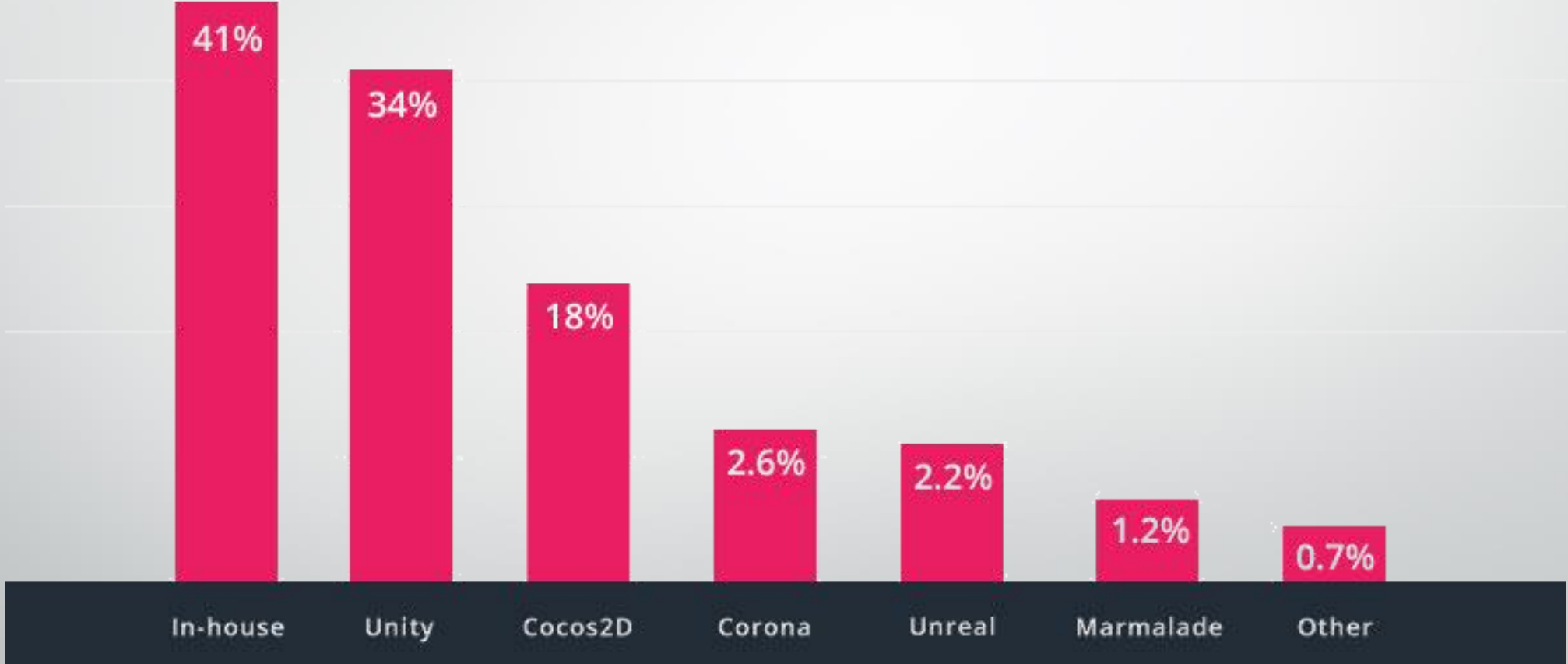
- Basics
 - Rendering
 - 2D/3D
 - OpenGL/DirectX
 - CPU/GPU
- Media
 - Sound/Video
 - Animations
 - Assets
 - Models
 - Materials/Textures
 - Shading/Lighting
- High Level funs.
 - Collision Detection
 - Physics
 - Artificial Intelligence
 - Scripting
- Other
 - Networking
 - Level Editor
 - Custom Tools
 - Multiplayer
 - Advertising

World of Game Engines



And 300 more... https://en.wikipedia.org/wiki/List_of_game_engines

Distribution of Game Engines (today)



What is Unity?

- Is a cross-platform game engine (developed by Unity Technologies)
- Used to develop video games for
 - PC
 - Consoles
 - mobile devices
 - websites
- Can be freely downloaded from: <https://unity3d.com>
- Documentation: <https://docs.unity3d.com>
- Last Version is 5.6.0 (31/03/2017)

Brief history of Unity

- **2005** Announced only for OS X at Apple's Worldwide Developers Conf.
- **2012** *Game Developer* magazine: top game engine for mobile platforms
- **2015** 27 platforms
- **2016** Nintendo provides free licenses within their SDKs for Wii U and 3DS
- **2016** 5 Billion Downloads

PRO and CONS



- Cons:

- Less performant in general than an in-house game engine
- More suited for cross-platform games

- Pros:

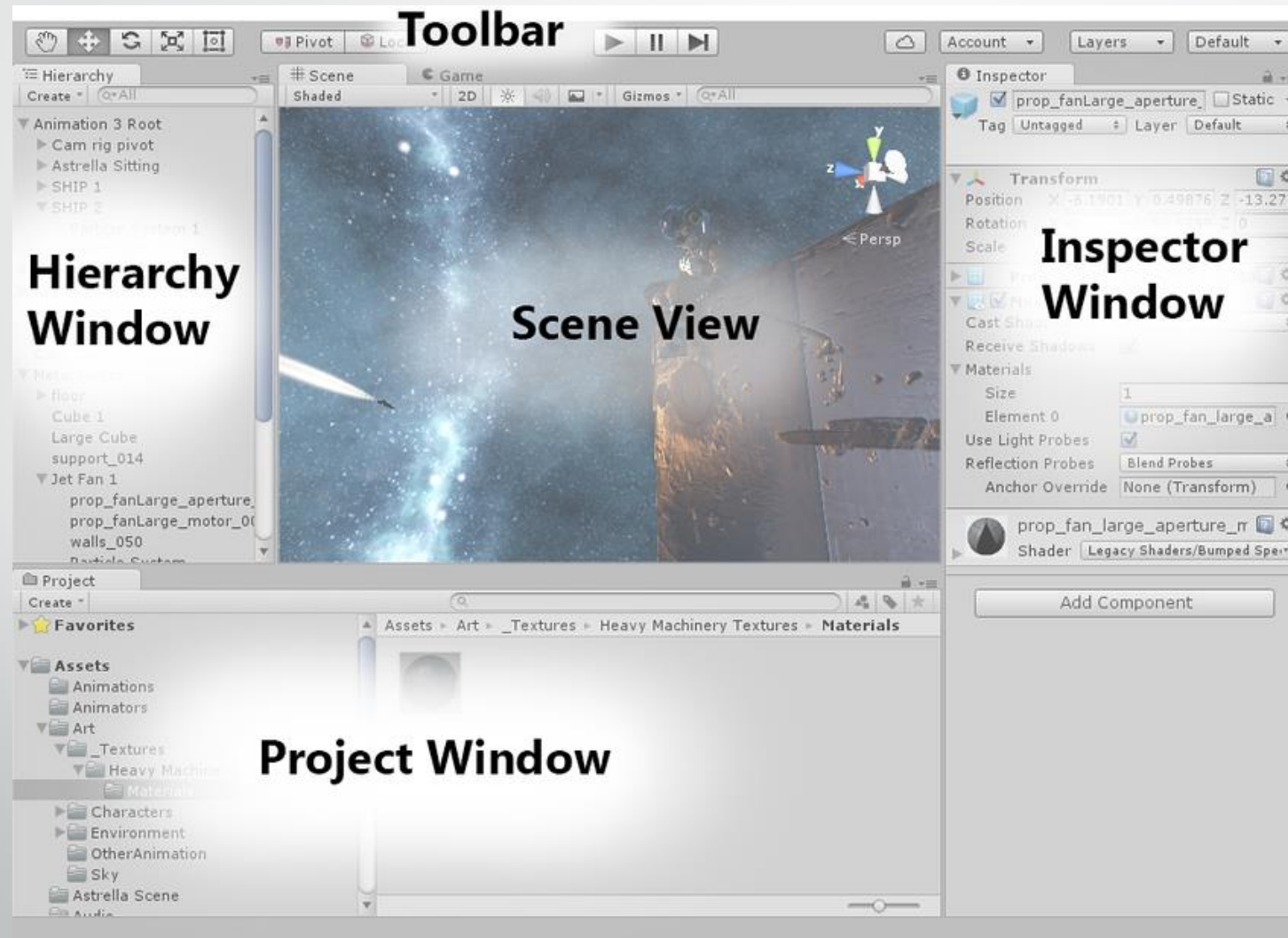
- Portability!
- Easy to learn
- Make dev <-> graphists interactions easier
- Fast prototyping (no need to recompile everything to tune values)
- Unity Editor allows creation of house-made tools
- .NET power
- Services like Unity Purchasing making it easier to interface with common stores



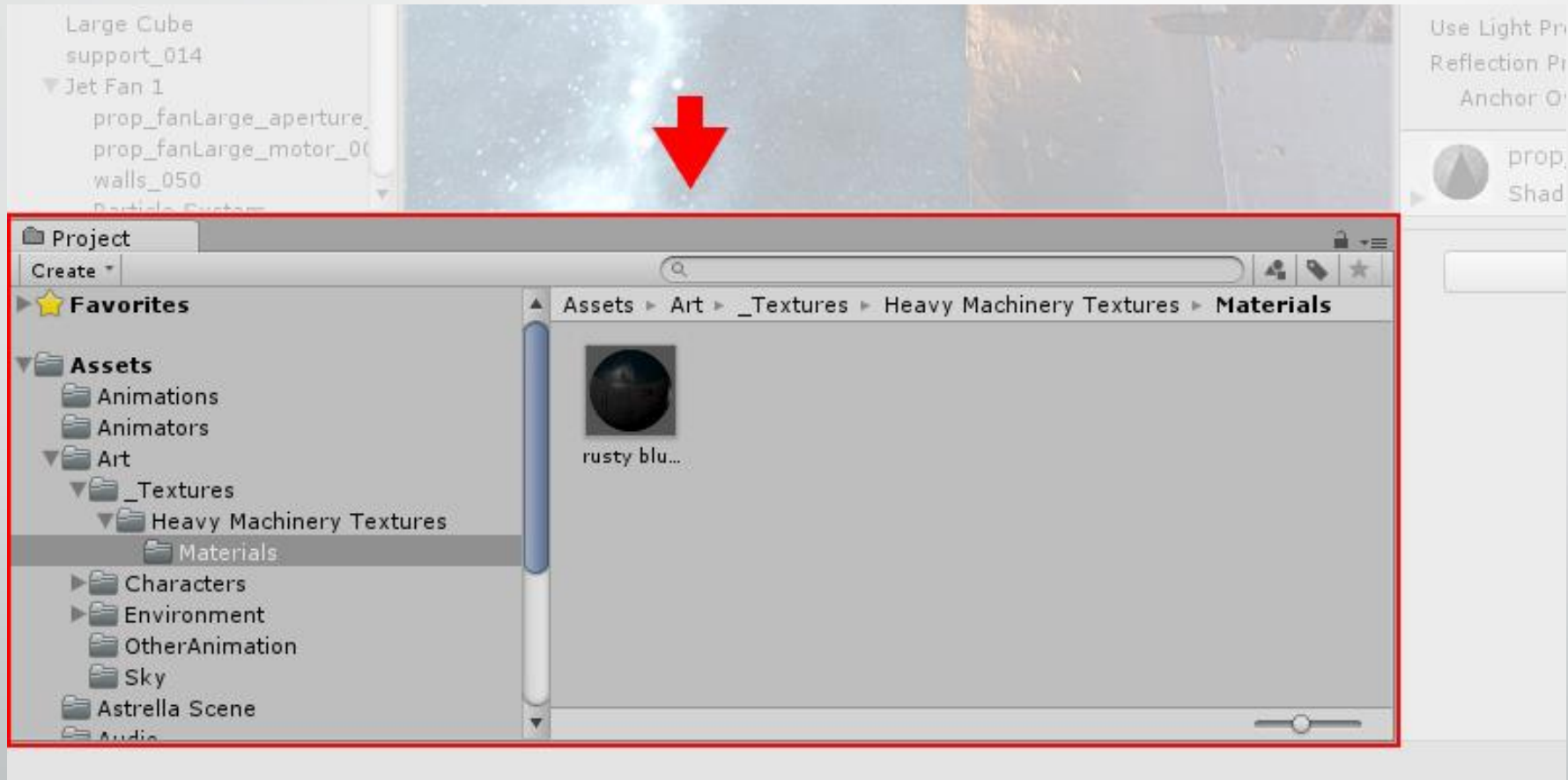
Licensing

- Unity (Free)
- Unity Pro (\$1,500)
- iOS Basic (Free)
- iOS Professional (\$1,500)
- Android Basic (Free)
- Android Professional (\$1,500)
- BlackBerry Basic (Free)
- BlackBerry Professional (\$1,500)
- Windows Store Basic (Included in Unity Pro)
- Windows Store Professional (Included in Unity Pro)

Unity IDE Interface

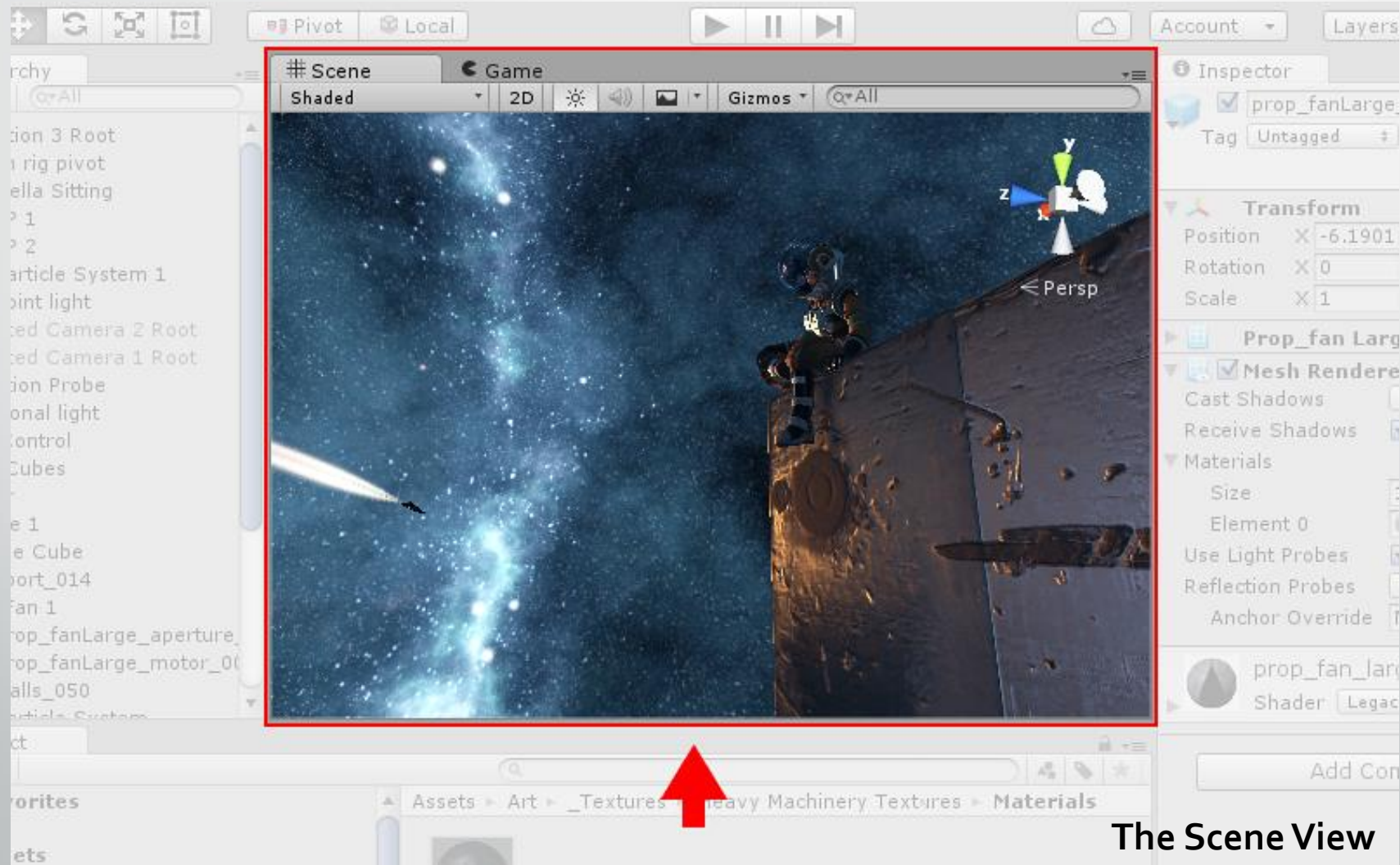


Unity IDE Interface

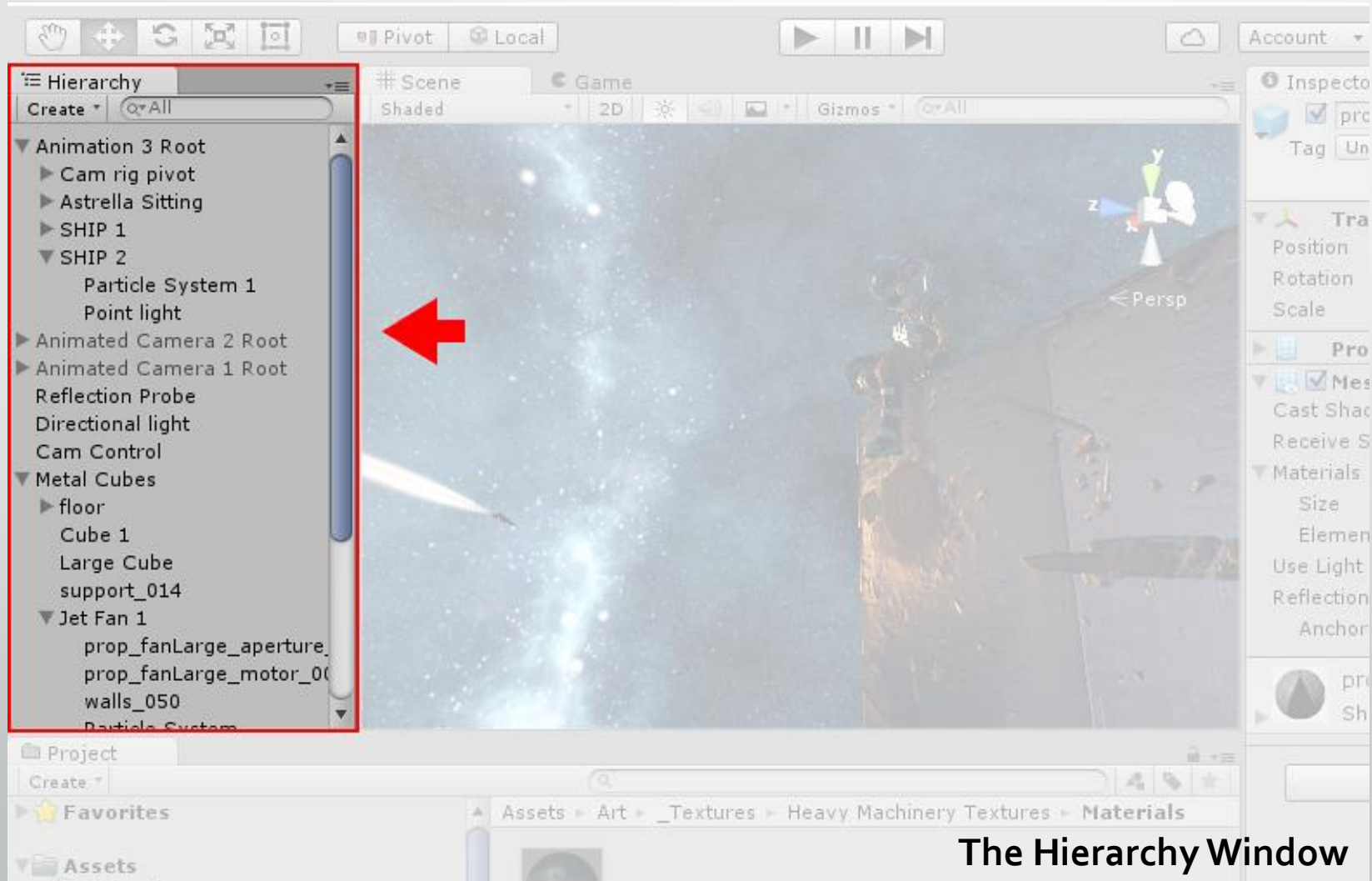


Project Window

Unity IDE Interface

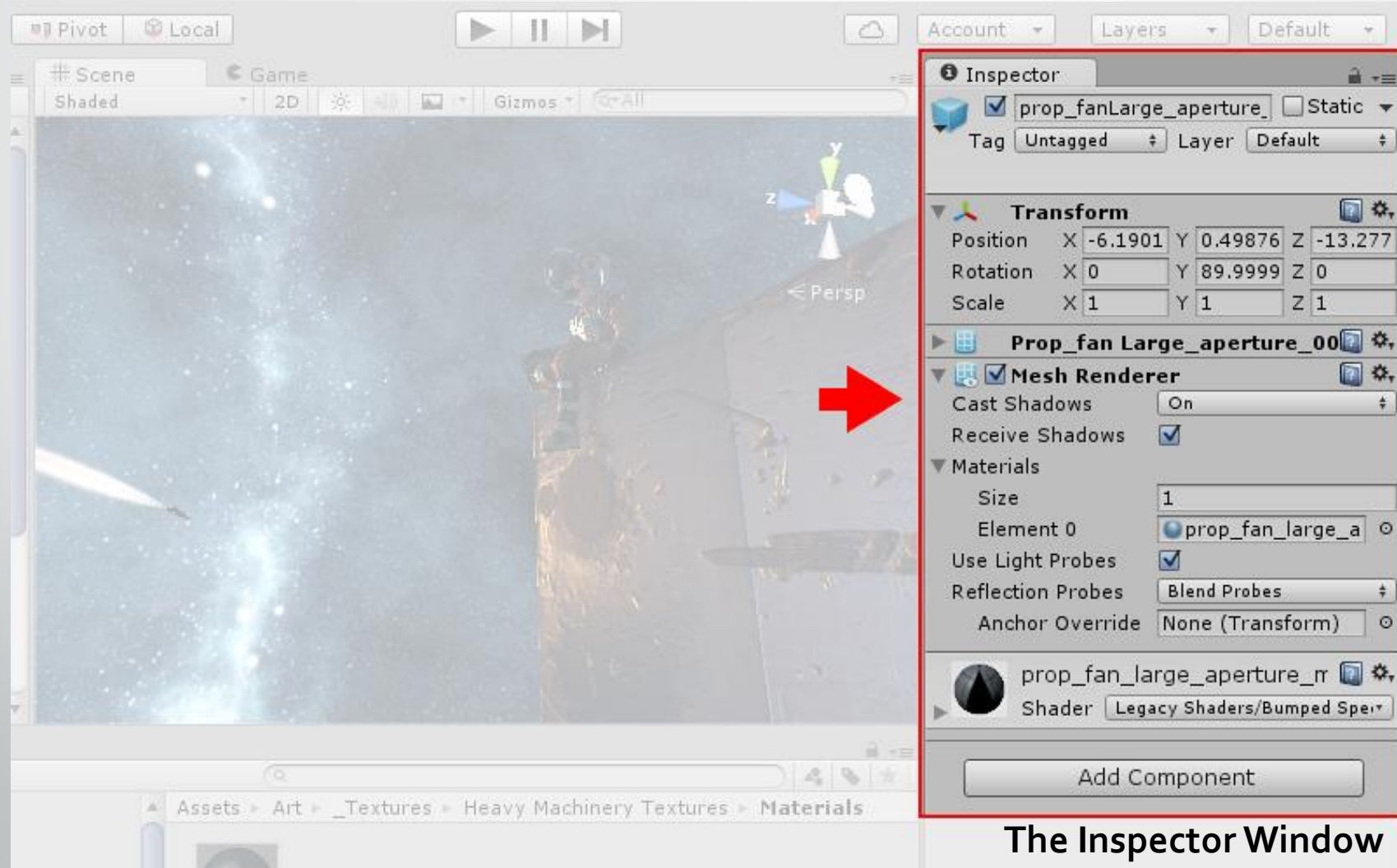


Unity IDE Interface



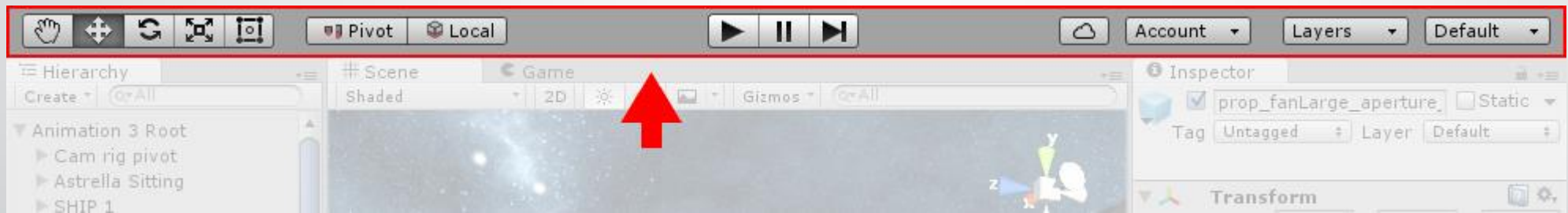
The Hierarchy Window

Unity IDE Interface



The Inspector Window

Unity IDE Interface



The Toolbar

Not just 2D and 3D!

- Full 3D



- Full 2D



- Orthographic 3D

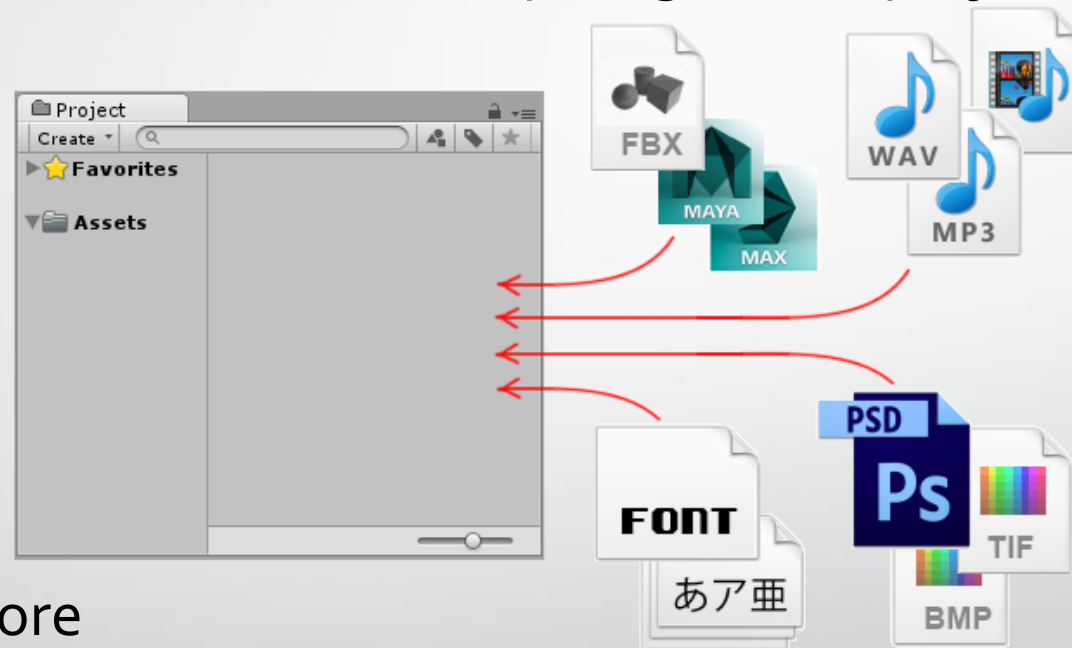


- 2D gameplay with 3D graphics



The Assets

- Asset: any item that can be used in your game or project.



- Online Asset Store

- Free /Priced
- <https://www.assetstore.unity3d.com/en/>

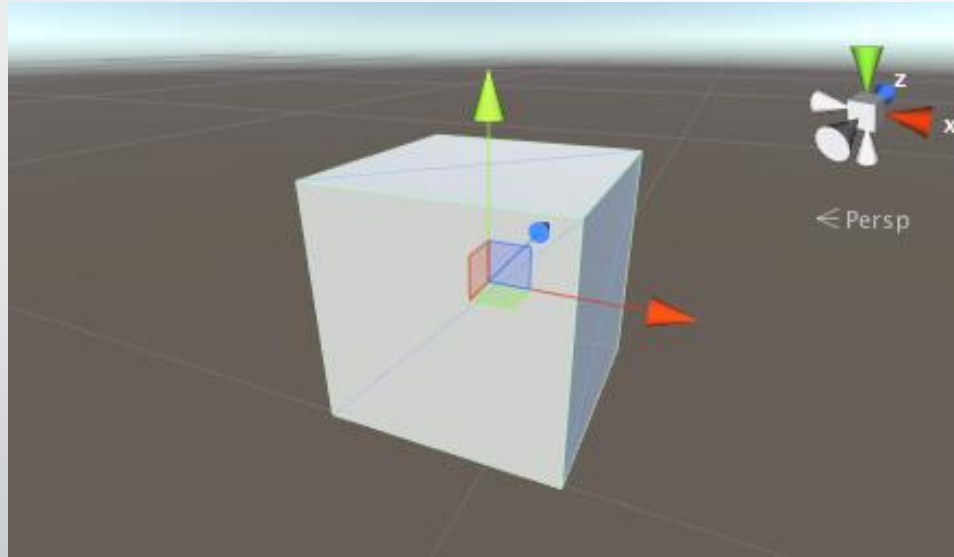
Asset Store

- 🏠 Home
- ▶ 3D Models
- ▶ Animation
- ▶ Applications
- ▶ Audio
- ▶ Complete Projects
- ▶ Editor Extensions
- ▶ Particle Systems
- ▶ Scripting
- ▶ Services
- ▶ Shaders
- ▶ Textures & Materials
- ▶ Unity Essentials

Unity Philosophy

Philosophy: [*GameObject* -> *Component* -> *Variable*] can be a *prefab*

- Empty GameObject
- Primitive
 - Cube
 - Sphere
 - Capsule
 - Cylinder
 - Plane
 - Quad

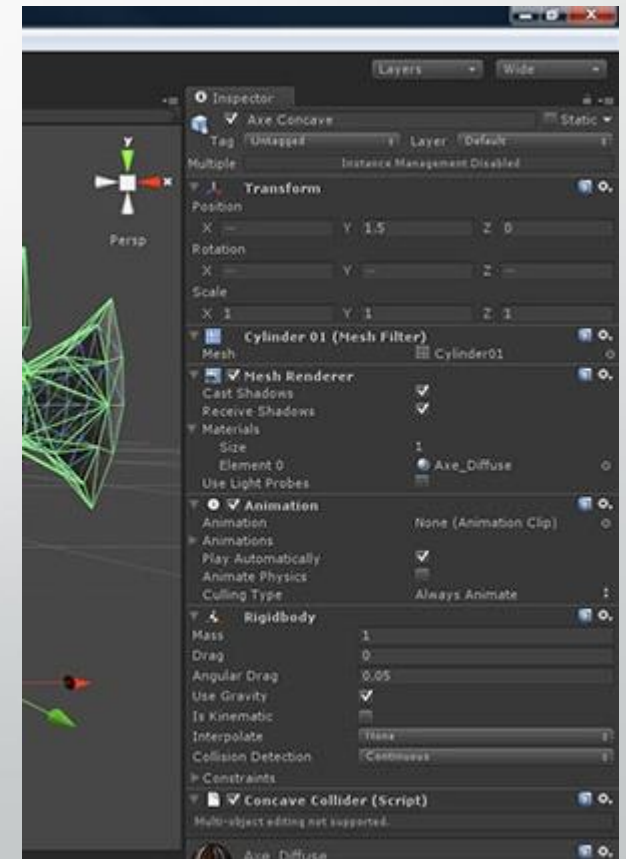


- Light
- Audio
- Video
- UI
 - Canvas
 - Text
 - Button
- Camera

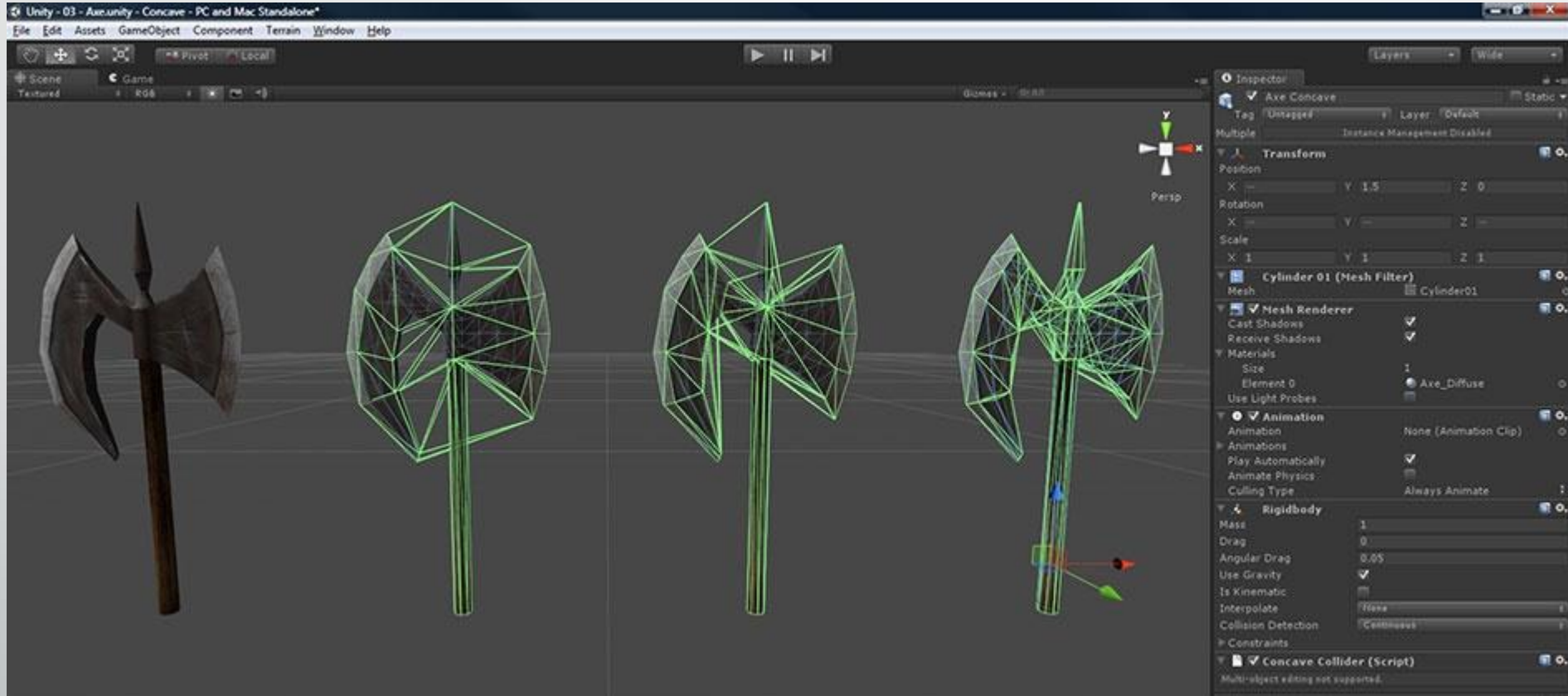
Unity Philosophy

Philosophy: [*GameObject* -> *Component* -> *Variable*] can be a *prefab*

- Each **GameObject** can have different **components**
- A component can be:
 - A script
 - A physic effect
 - Rigidbody property
 - Colliders
 - An audio effect
 - Etc...

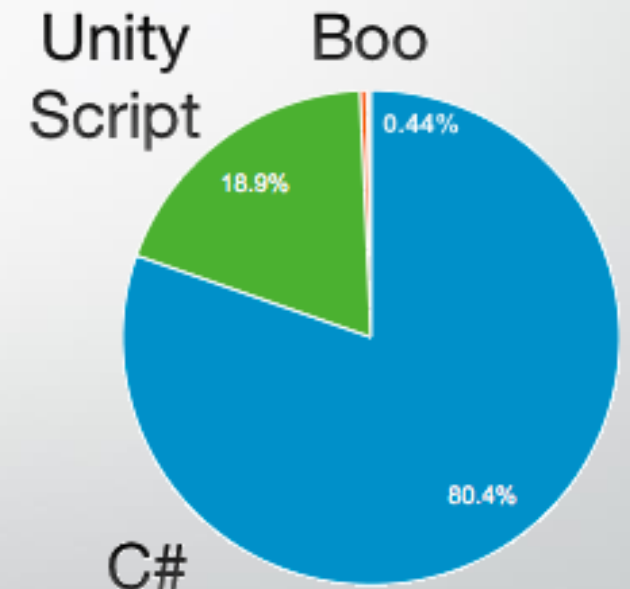
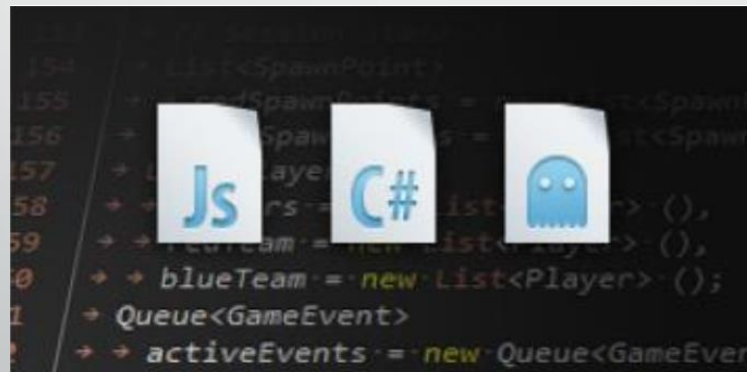


The Colliders



~~Programming~~ Scripting Unity

- Main Unity Scripting Languages:
 - Unity Script (JavaScript)
 - Mono (C#) [www.mono-project.com]
 - Boo (Python dialect) [boo-lang.org]
 - Deprecated from 2014.



~~Programming~~ Scripting Unity

Unity Script (JavaScript)

Mono (C#) [www.mono-project.com]



- 20x Faster than web JS
- Flexible coding
 - no data type declaration
 - No class body explicit required
- Well documented



- No explicit types declaration required
- iPhone builds are bigger (more libs)
- Many restrictions
 - No multi-dimensional arrays
 - No value-by-reference args.
 - No Chars
 - One interface per class to be extended

- C family (fast adaption for devs)
- Strong typing
- Robust .NET framework
- Portability
- DLL libs support

- Partial Implementation of .NET
 - No virtual classes
 - No namespaces
- Less documented

~~Programming~~ Scripting Unity

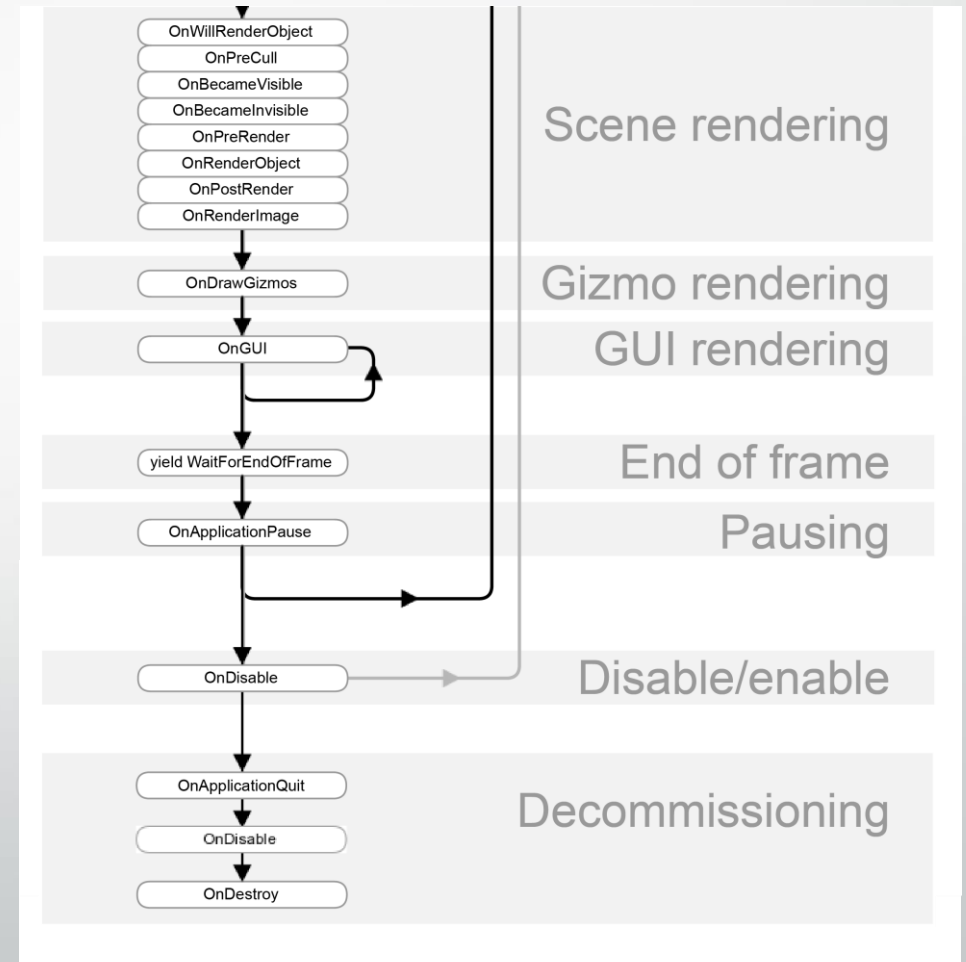
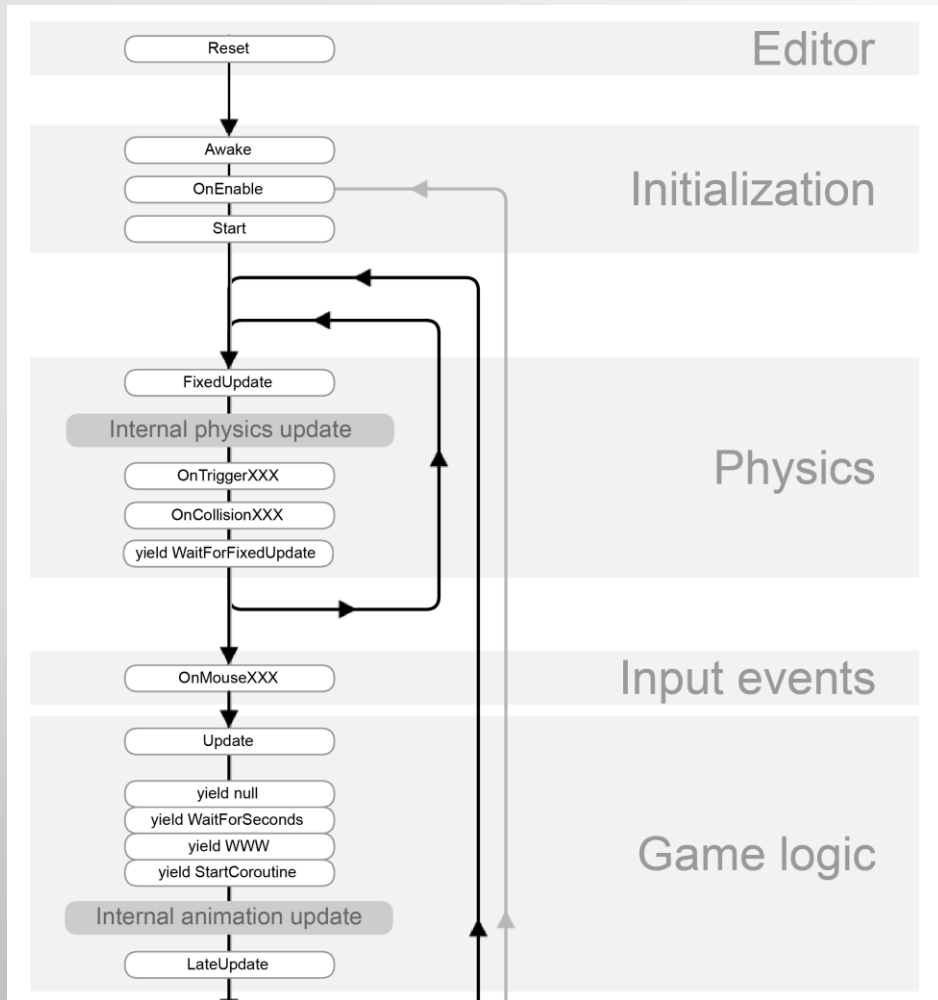
Java Script

```
class MyClass extends MonoBehaviour {  
  
    var myVar = 1;  
  
    function Start() {  
        Debug.Log("hello world!");  
    }  
  
}
```

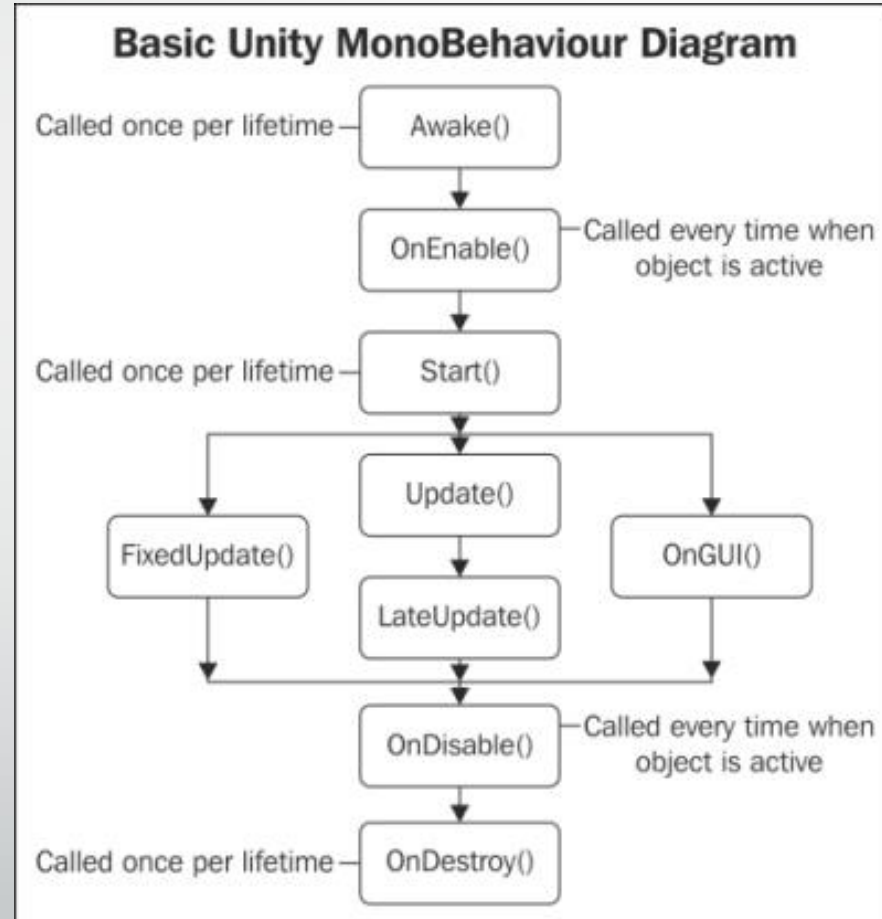
C#

```
class MyClass : MonoBehaviour {  
  
    public int myVar = 1;  
  
    void Start() {  
        Debug.Log("hello world!");  
    }  
  
}
```

Events



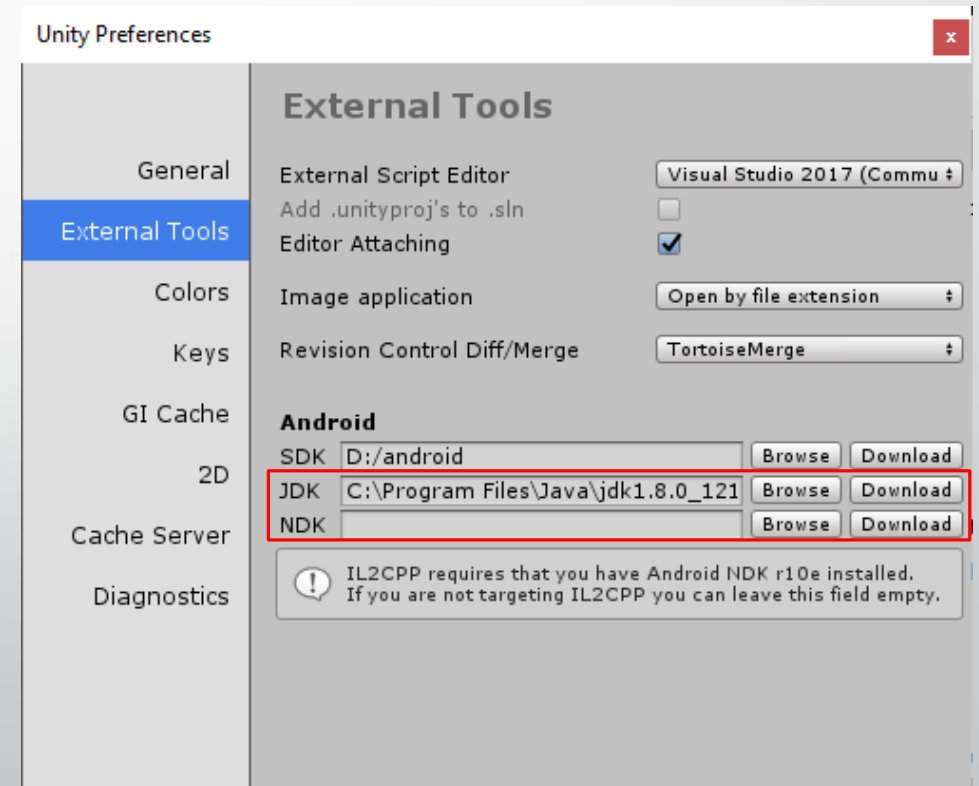
Most Used Events



Enabling Android Developing

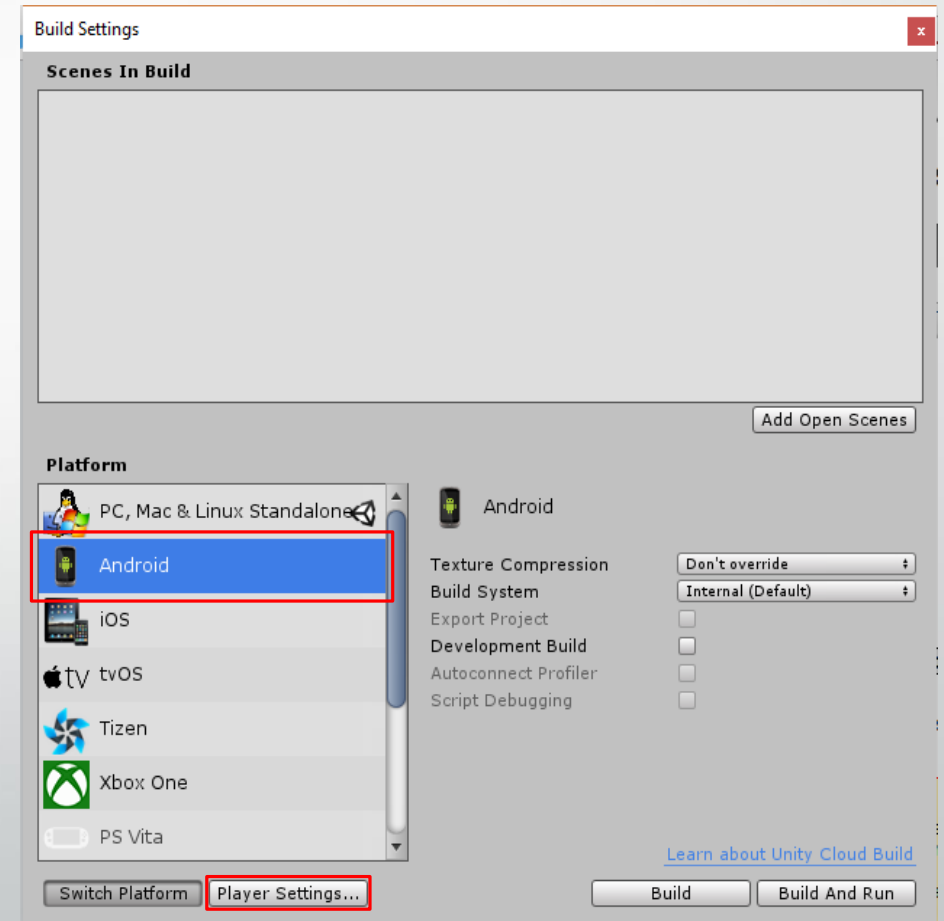
- You need (in general):
 - Java Development Kit (JDK)
 - Download at <http://www.oracle.com/technetwork/java/javase/downloads>
 - Install it.
 - Android Software Development Kit (SDK)
 - only “command line tools”
 - Download at <https://developer.android.com/studio>
 - Extract it in your preferred folder.
 - Upgrade via SDK Packet Manager

- Configure Unity Preferences according to the paths:



Enabling Android Developing

- Switch Platform (for your specific project)
 - in file -> build settings...
- Fix your details (for your specific project)
 - In Player Settings...
 - Add your AppName
 - Add your "Company"
- Enable USB-Debug on your Phone
 - If you want real-time run/debug



Mobile Game Dev (Best Practices)

- Do not “annoy” the user
 - Invasive advertising
 - Poorly structured GUI
 - Invasive or premature rating requests
 - Social ready but not social compulsory
 - Audio in casual games
- Prevent uninstalls
 - Daily duties
 - Virtual Currency
 - Notifications
- Acquire new users
 - Social features
 - Competition
- Encourage positive actions only
 - 5 stars review...
 - At the right time