

A large, abstract cluster of 3D geometric shapes, primarily white with blue diagonal stripes, is positioned on the left side of the slide. It includes various facets, pyramids, and triangles, creating a sense of depth and motion.

WebGL & WebSockets for 3D Multi-Platform Multiplayer Gaming

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2013
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3D Multiplayer Multi-Platform Games



@multiplayio

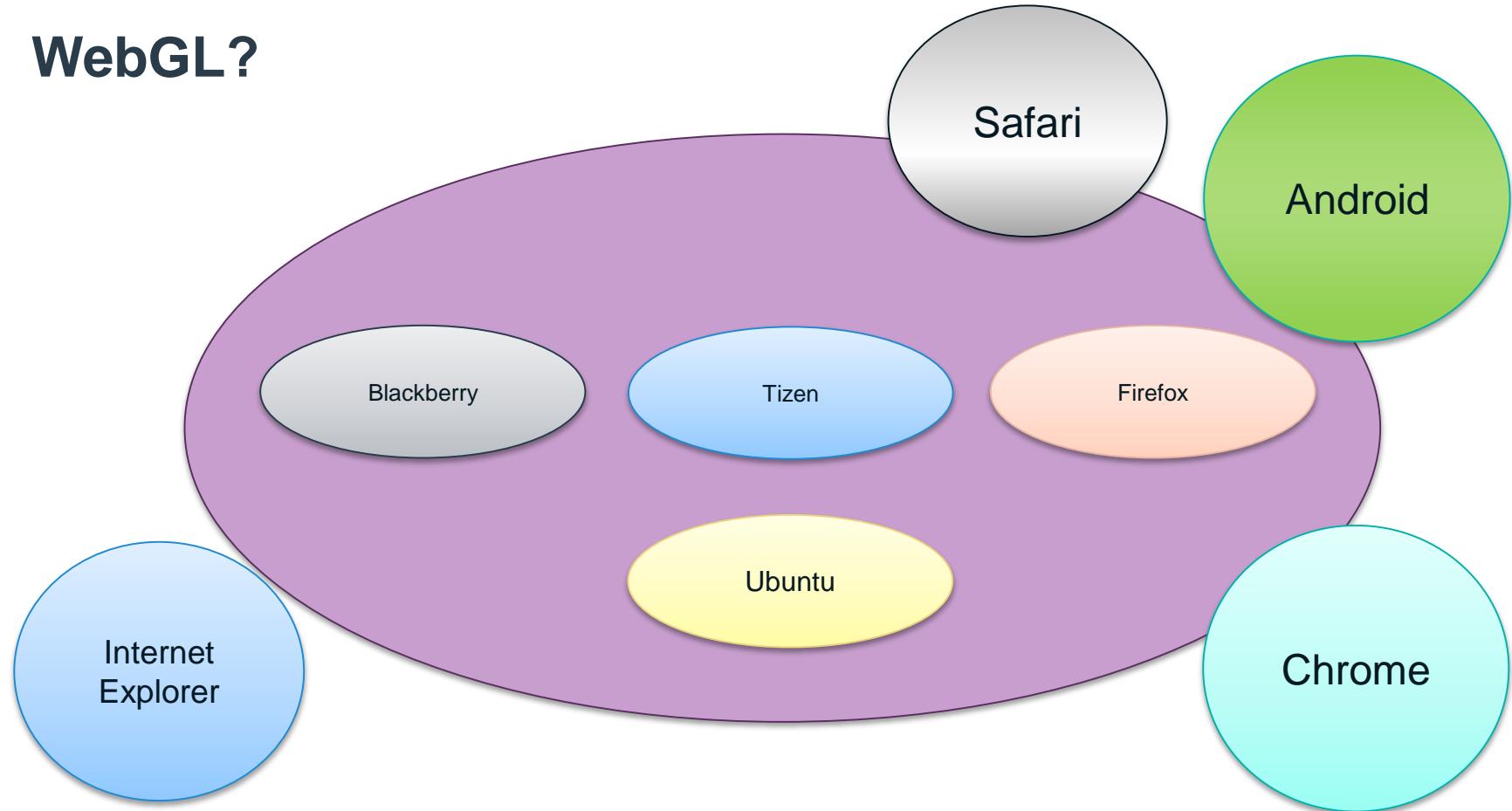


@multiplayio

Agenda

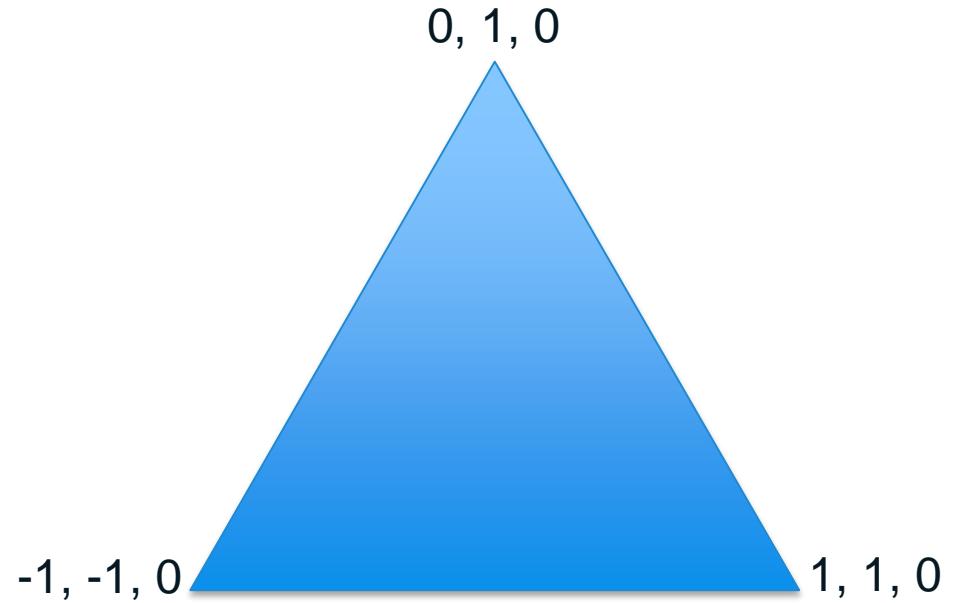
- **Going 3D**
 - WebGL?
 - How to draw a cube (source code dive)
- **Going Multiplayer**
 - WebSockets?
 - How to move
- **Going Multi-platform**
 - Supporting Tizen
 - Supporting iOS, Android, Windows Phone...

WebGL?



Everything is a triangle

- Vertices
- UVs
- Indices
- Normals



How to draw a cube



learningwebgl.com

```
function drawScene()
{
    gl.viewport(0, 0, gl.viewportWidth, gl.viewportHeight);
    gl.clear(gl.COLOR_BUFFER_BIT | gl.DEPTH_BUFFER_BIT);
    mat4.perspective(45, gl.viewportWidth / gl.viewportHeight, 0.1, 100.0, pMatrix);

    mat4.identity(mvMatrix);
    mat4.translate(mvMatrix, [x, y, z]);
    mat4.rotate(mvMatrix, degToRad(xRot), [1, 0, 0]);
    mat4.rotate(mvMatrix, degToRad(yRot), [0, 1, 0]);

    gl.bindBuffer(gl.ARRAY_BUFFER, cubeVertexPositionBuffer);
    gl.vertexAttribPointer(shaderProgram.vertexPositionAttribute,
        cubeVertexPositionBuffer.itemSize, gl.FLOAT, false, 0, 0);

    gl.bindBuffer(gl.ARRAY_BUFFER, cubeVertexTextureCoordBuffer);
    gl.vertexAttribPointer(shaderProgram.textureCoordAttribute,
        cubeVertexTextureCoordBuffer.itemSize, gl.FLOAT, false, 0, 0);
    gl.bindBuffer(gl.ELEMENT_ARRAY_BUFFER, cubeVertexIndexBuffer);
    setMatrixUniforms();

    gl.activeTexture(gl.TEXTURE0);
    gl.bindTexture(gl.TEXTURE_2D, crateTexture);
    gl.uniform1i(shaderProgram.samplerUniform, 0);

    gl.drawElements(gl.TRIANGLES, cubeVertexIndexBuffer.numItems, gl.UNSIGNED_SHORT, 0);
}
```

```

function drawScene()
{
    gl.viewport(0, 0, gl.viewportWidth, gl.viewportHeight);
    gl.clear(gl.COLOR_BUFFER_BIT | gl.DEPTH_BUFFER_BIT);
    mat4.perspective(45, gl.viewportWidth / gl.viewportHeight, 0.1, 100.0, pMatrix); } •Setup view

    mat4.identity(mvMatrix);
    mat4.translate(mvMatrix, [x, y, z]);
    mat4.rotate(mvMatrix, degToRad(xRot), [1, 0, 0]);
    mat4.rotate(mvMatrix, degToRad(yRot), [0, 1, 0]); } •Position and rotate

    gl.bindBuffer(gl.ARRAY_BUFFER, cubeVertexPositionBuffer);
    gl.vertexAttribPointer(shaderProgram.vertexPositionAttribute,
        cubeVertexPositionBuffer.itemSize, gl.FLOAT, false, 0, 0); } •Set buffers

    gl.bindBuffer(gl.ARRAY_BUFFER, cubeVertexTextureCoordBuffer);
    gl.vertexAttribPointer(shaderProgram.textureCoordAttribute,
        cubeVertexTextureCoordBuffer.itemSize, gl.FLOAT, false, 0, 0);
    gl.bindBuffer(gl.ELEMENT_ARRAY_BUFFER, cubeVertexIndexBuffer);
    setMatrixUniforms(); } •Set texture

    gl.activeTexture(gl.TEXTURE0);
    gl.bindTexture(gl.TEXTURE_2D, crateTexture);
    gl.uniform1i(shaderProgram.samplerUniform, 0); } •Draw

    gl.drawElements(gl.TRIANGLES, cubeVertexIndexBuffer.numItems, gl.UNSIGNED_SHORT, 0); }
}

```

Phone Wars WebGL Demo



<http://multiplay.io/play>



TODO://

- Collisions
- Loading obj, fbx, 3ds...
- Helper libraries (three.js)

```
Var BasicBoxCollisionCheck = function(sourceMin, sourceMax, targetMin, targetMax)
{
    if( sourceMax[2] >= targetMin[2] && sourceMin[2] <= targetMax[2] )
    {
        if( sourceMax[0] >= targetMin[0] && sourceMin[0] <= targetMax[0] )
        {
            if( sourceMax[1] >= targetMin[1] && sourceMin[1] <= targetMax[1] )
            {
                return true;
            }
        }
    }
};
```

Going Multiplayer



WebSockets?

- TCP
- Persistent
- Bi-directional
- Not UDP

```
var exampleSocket = new WebSocket("ws://www.example.com/socketserver",
    "protocol");

// On connect
exampleSocket.onopen = function (event) {
    exampleSocket.send("Send a message to the server");
};

// Receive message from server
exampleSocket.onmessage = function (event) {
    console.log(event.data);
}
```

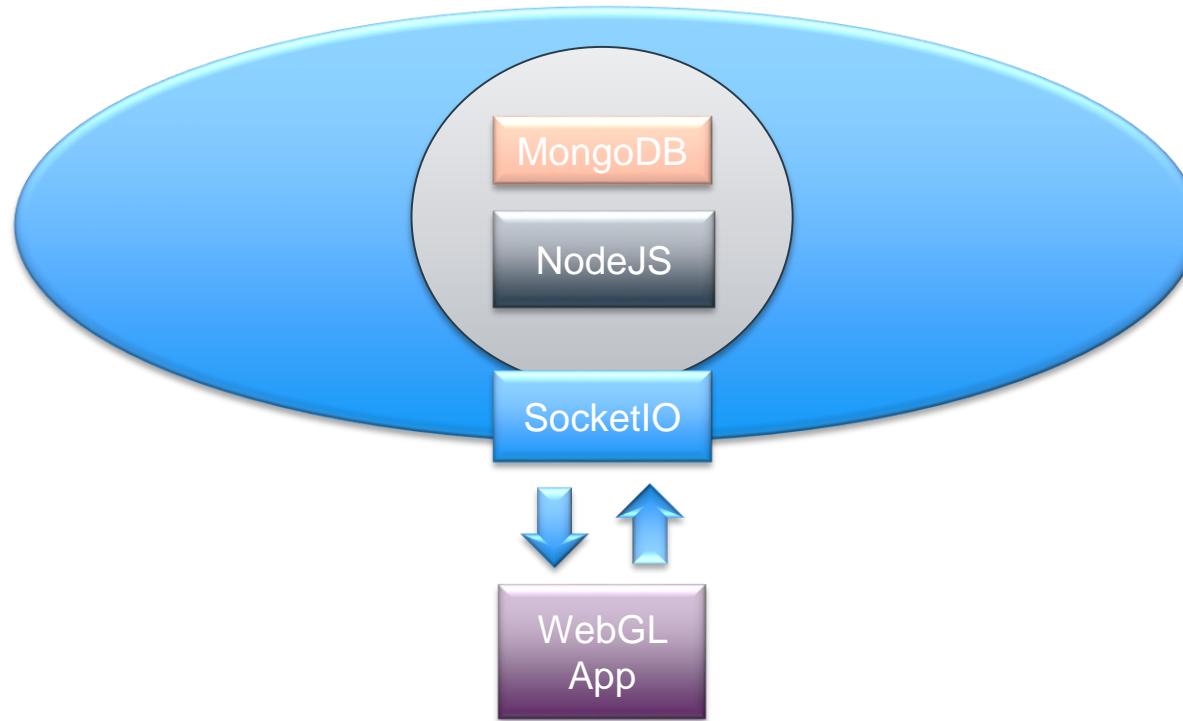


WebSockets?

	IE	Firefox	Chrome	Safari	Opera	iOS Safari	Opera Mini	Android Browser	Blackberry Browser	Opera Mobile	Chrome for Android	Firefox for Android
10 versions back		11.0	17.0		9.0							
9 versions back		12.0	18.0		9.5-9.6							
8 versions back		13.0	19.0		10.0-10.1							
7 versions back		14.0	20.0		10.5							
6 versions back		15.0	21.0		10.6			2.1		10.0		
5 versions back	5.5	16.0	22.0	3.1	11.0			2.2		11.0		
4 versions back	6.0	17.0	23.0	3.2	11.1	3.2		2.3		11.1		
3 versions back	7.0	18.0	24.0	4.0	11.5	4.0-4.1		3.0		11.5		
2 versions back	8.0	19.0	25.0	5.0	11.6	4.2-4.3		4.0		12.0		
Previous version	9.0	20.0	26.0	5.1	12.0	5.0-5.1		4.1	7.0	12.1		
Current	10.0	21.0	27.0	6.0	12.1	6.0	5.0-7.0	4.2	10.0	14.0	25.0	19.0
Near future	11.0	22.0	28.0									
Farther future		23.0	29.0									

caniuse.com

Popular Web Multiplayer Stack



How do I shoot? - Client

```
var socket = io.connect( serverURL );
socket.on( 'connected', function (userID)
{
    socket.userID = userID;
});

function shootAt(thatDamnUserID)
{
    socket.emit( 'shoot', thatDamnUserID );
}
```

How do I shoot? - Server

```
var sockets = [];
var io = socketio.listen( port );
io.sockets.on( 'connection', function (socket)
{
    sockets.push( socket );
    var userID = nextUserID++;
    socket.emit( 'connected', userID );
    socket.on( 'shoot', function (atUserID) )
    {
        for( var i=0; i<sockets.length; ++i )
        {
            sockets[i].emit( 'shoot', userID, atUserID );
        }
    };
});
```

Multiplayer Demo



<http://multiplay.io/play>



TODO://

- Server side validation
- Load balancing
- Latency hacks



Going Multi-platform



Supporting Tizen

- `<access origin="*"/>`
- `xhr.state === 0`
- Disable Android File Transfer app
- Simulator fast
- Emulator slow but accurate
- **Use circular icons**



HTML5 - IndexedDB

- **50mb+**
- **Is Slow**
- **Use a priority queue for your requests**
- **Timestamps lets you know which files to delete**

```
var transaction = db.transaction( "cache", 'readwrite' );
var objectStore = transaction.objectStore( "cache" );

// Get an item via it's key
var index = objectStore.index( "key" );
var request = index.get( key );
request.onsuccess = function(event)
{
    var item = event.target.result;
};
```

HTML5 - WebWorkers

- Is Awesome!
- json.async (<https://github.com/ashcairo/json.async>)
- Separate file, use inline webworker

```
var blob = new Blob([
  "self.addEventListener( 'message', function (e) {    \
    var json = JSON.parse( e.data ); \
    self.postMessage( json ); \
    self.close(); \
  }, false );"]);
// Obtain a blob URL reference to our worker 'file'.
var blobURL = window.URL.createObjectURL( blob );
var worker = new Worker( blobURL );
```

Supporting HTML5 Platforms

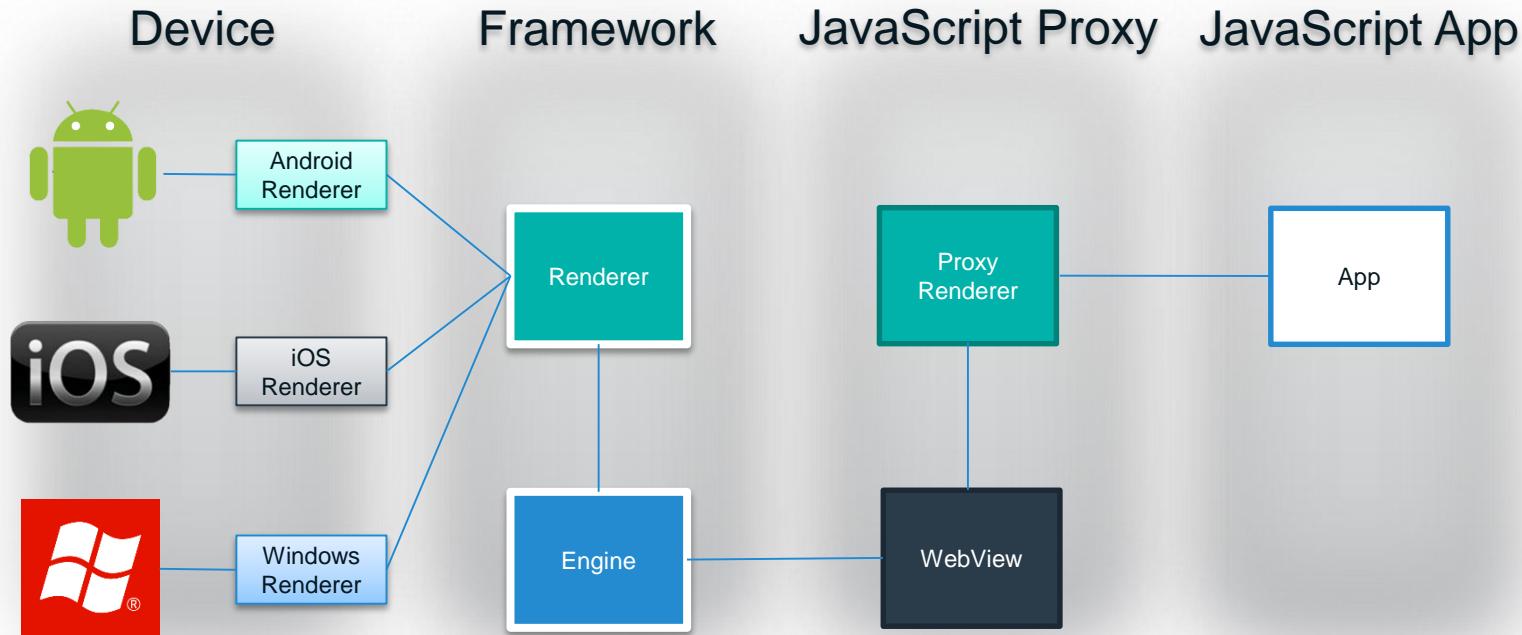
- **WebGL**
 - medium precision most compatible
- **IndexedDB**
 - Some devices require use of setVersion
 - Some devices fail on use of setVersion
 - Be ready to fallback to localStorage (~5mb)

Supporting iOS, Android, Windows Phone

- OpenGL
- Direct3D
- C++
- Java
- Objective C
- C#
- But it's possible!



Supporting iOS, Android, Windows Phone



Eval(isEvil)?



Real-time creation of games

Presenting and demoing

24th July 2013 Anaheim, California



@multiplayio



ash@multiplay.io
<http://multiplay.io>

**BE THE
GAMES
MASTER!**

The background features a dynamic, abstract graphic composed of numerous 3D-like geometric shapes. It includes large, white, curved, fan-shaped forms and several blue and white striped, ribbon-like shapes that curve and overlap. Smaller, scattered shapes consist of blue triangles, blue circles with white stripes, and blue and white diagonal-striped triangles. The overall effect is one of motion and digital complexity.

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