

# Deeper into GameplayKit with DemoBots

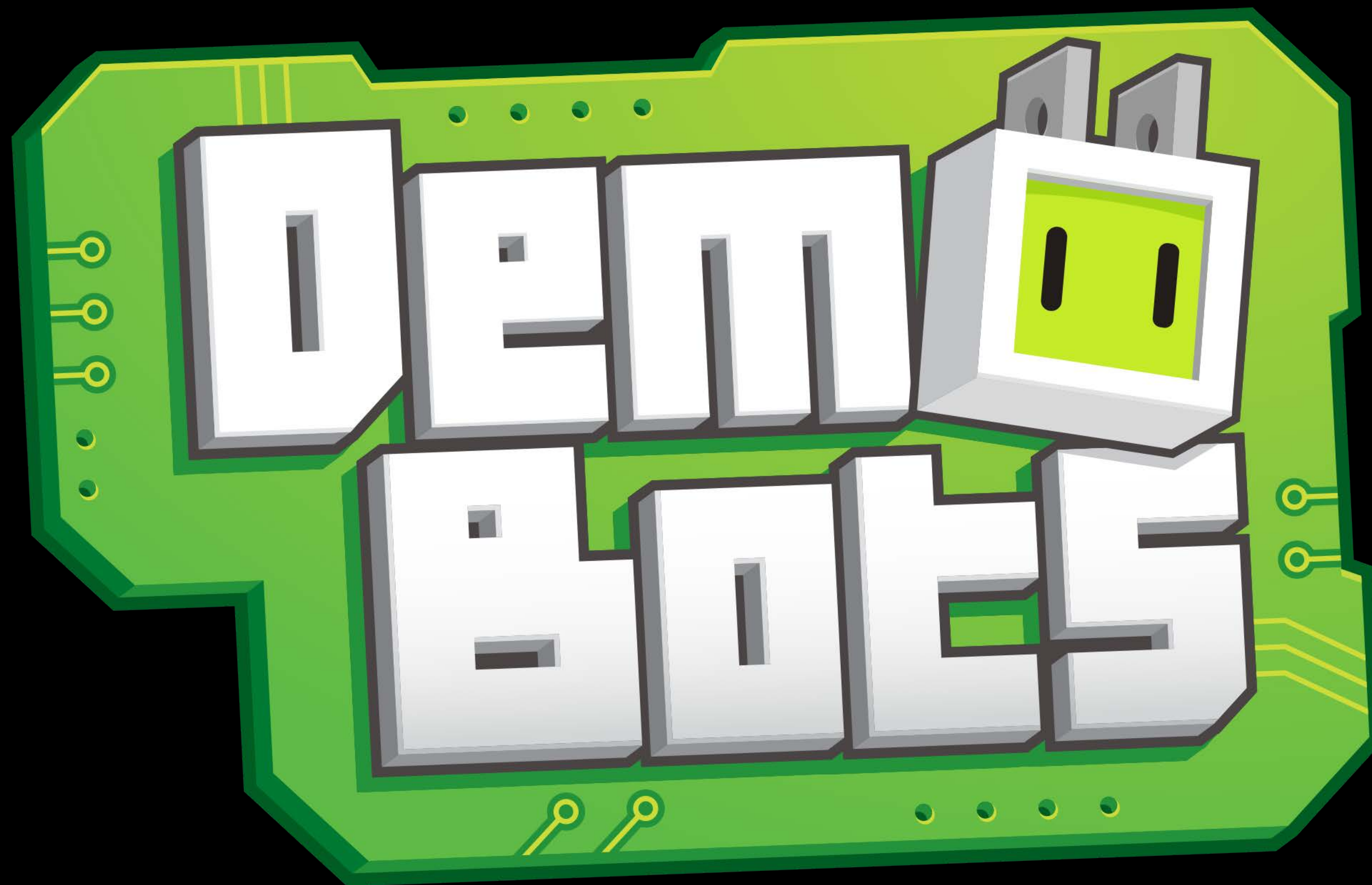
Session 609

Dave Addey Sample Code Engineer

Dave Schaefgen Sample Code Engineer

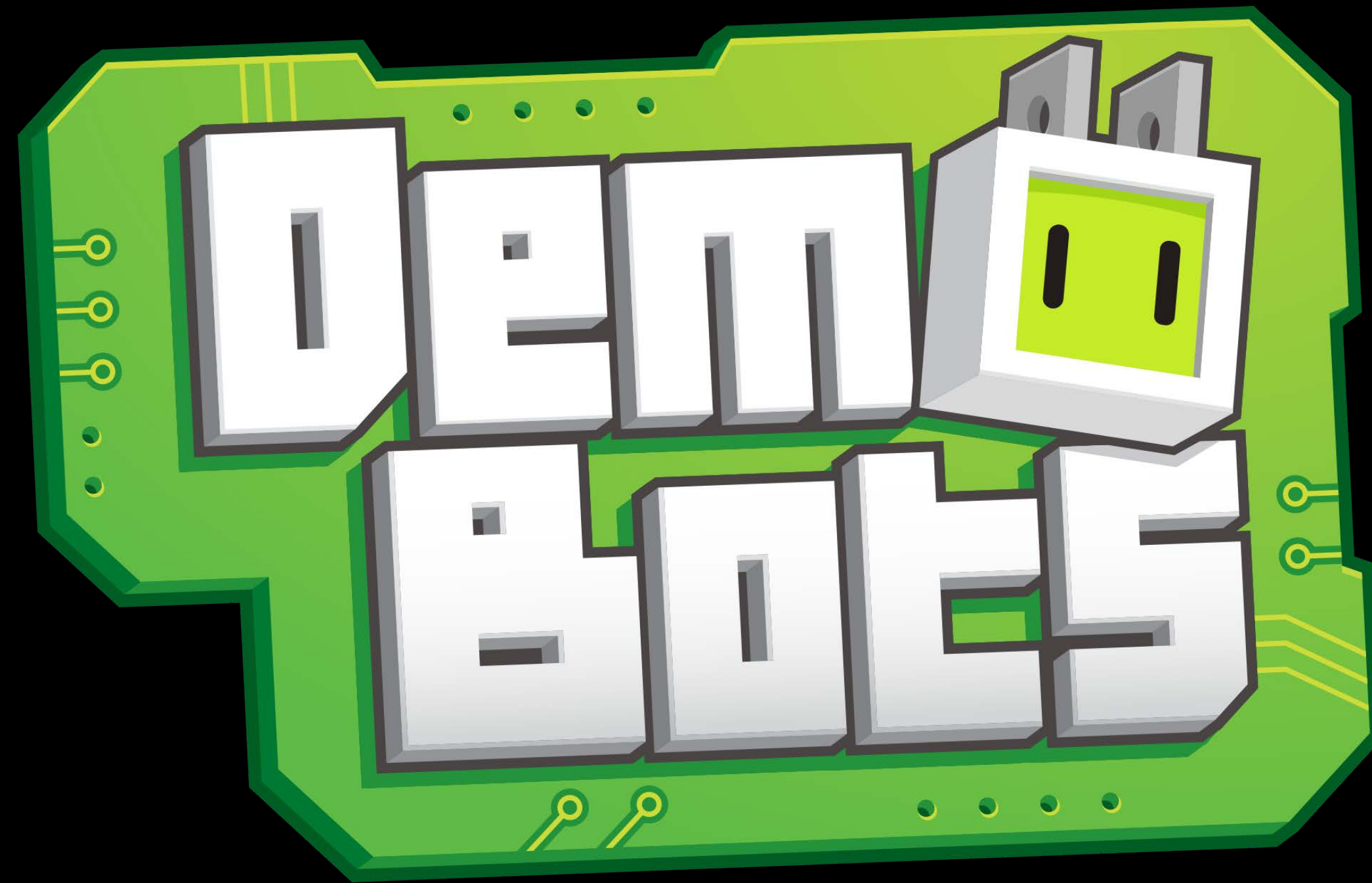
Michael DeWitt Sample Code Engineer





# Download Sample Files

<http://developer.apple.com/spritekit>



# Recommended Sessions

What's New in SpriteKit	Mission	Wednesday 10:00AM
Introducing GameplayKit	Mission	Thursday 11:00AM

*Demo*

# Tools and Technologies

DemoBots (OS X)My Mac

DemoBots | Build DemoBots (OS X): Succeeded | Today at 4:21 PM

DemoBots > DemoBots > Assets > ReferenceScene.sks > SKScene

Animate

Playback Speed - 1x +

- = +

All Nodes

0:00

00:01

GroundBotZapped

ZappedShake

GroundBotShadow

ZappedShadowShake

FlyingBotShadow

FlyingBotShadowScale

FlyingBotBadWalk

FlyingBotBob

Animate with Textures

FlyingBotZapped

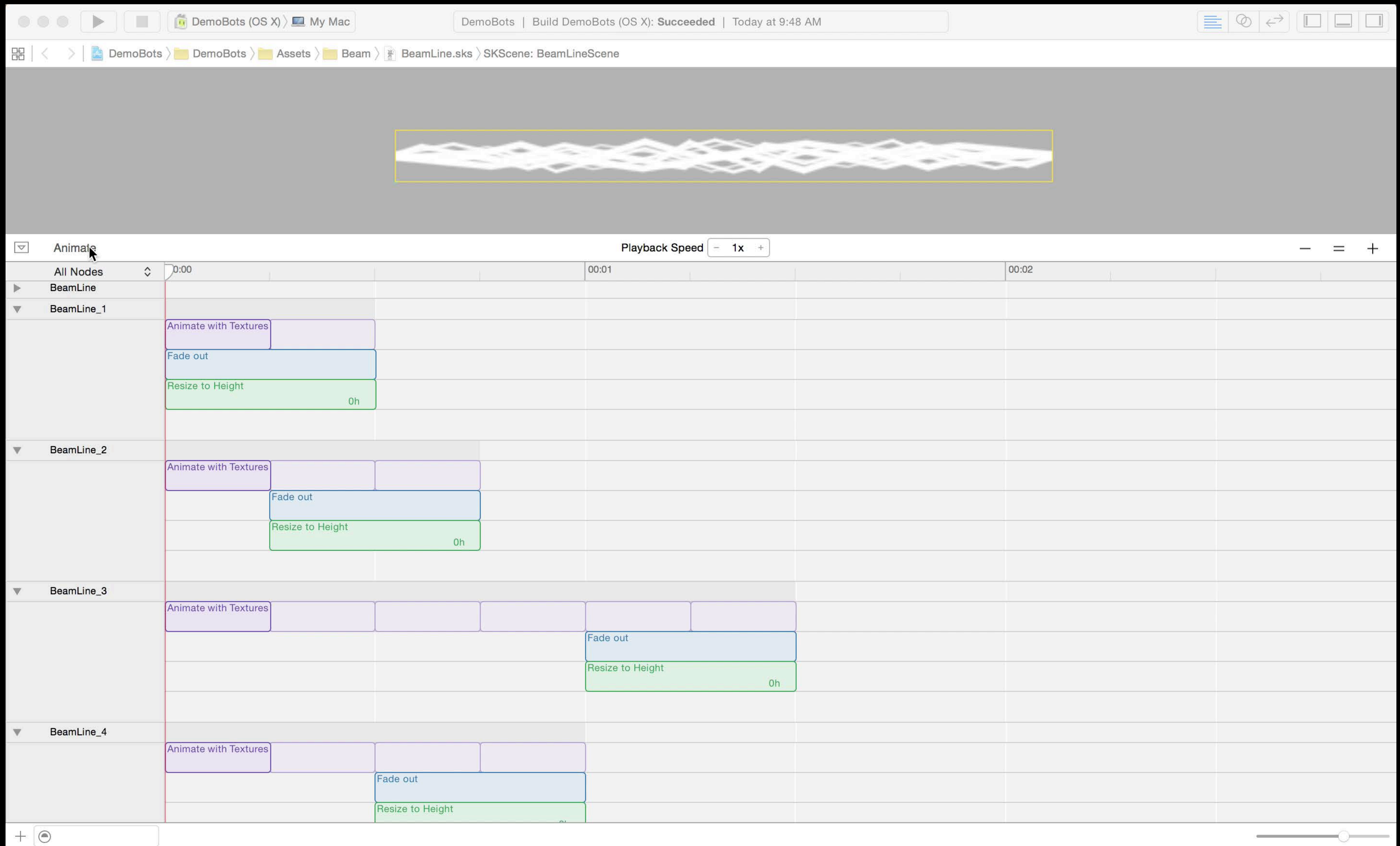
ZappedShake

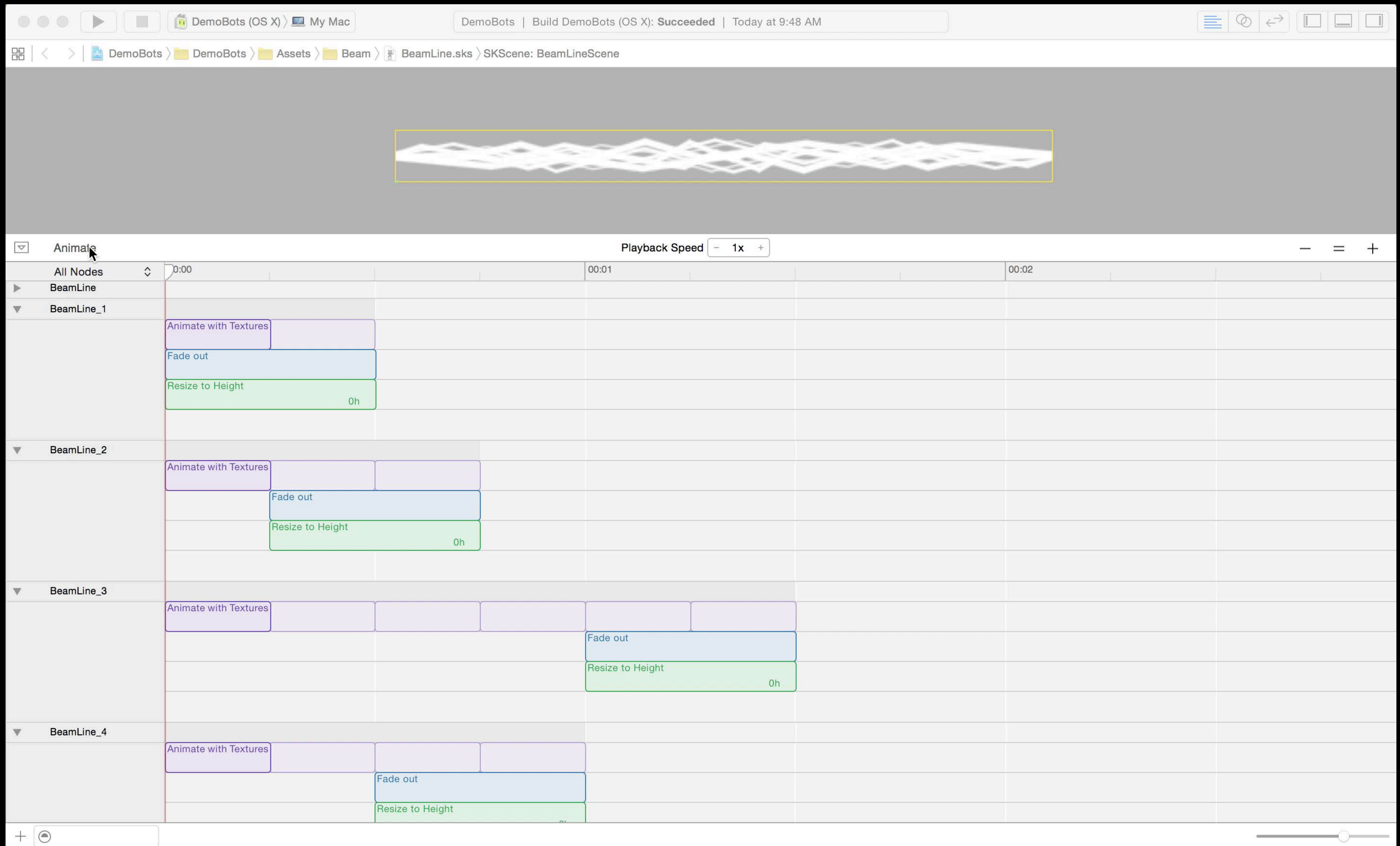
FlyingBotShadow

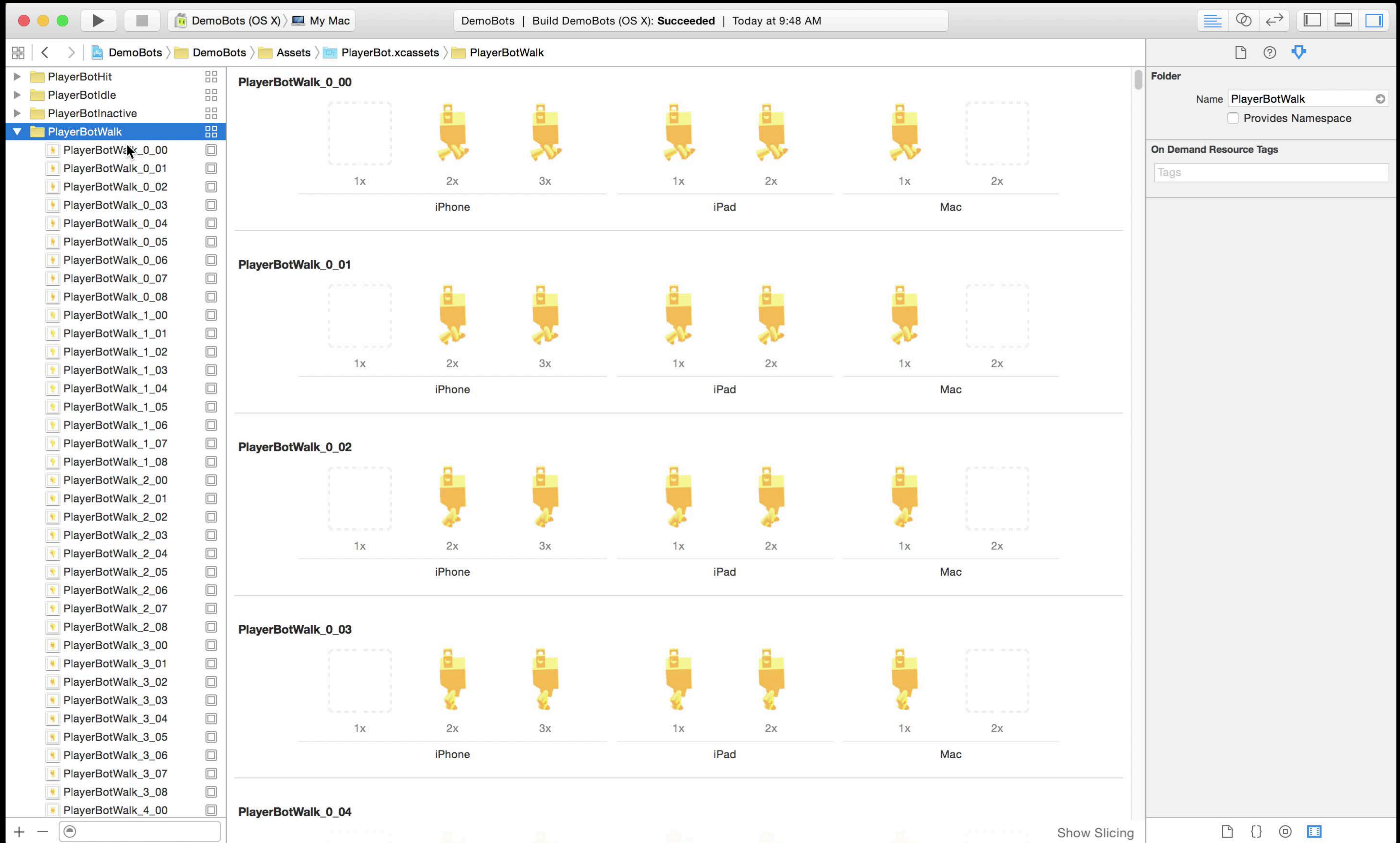
ZappedShadowShake

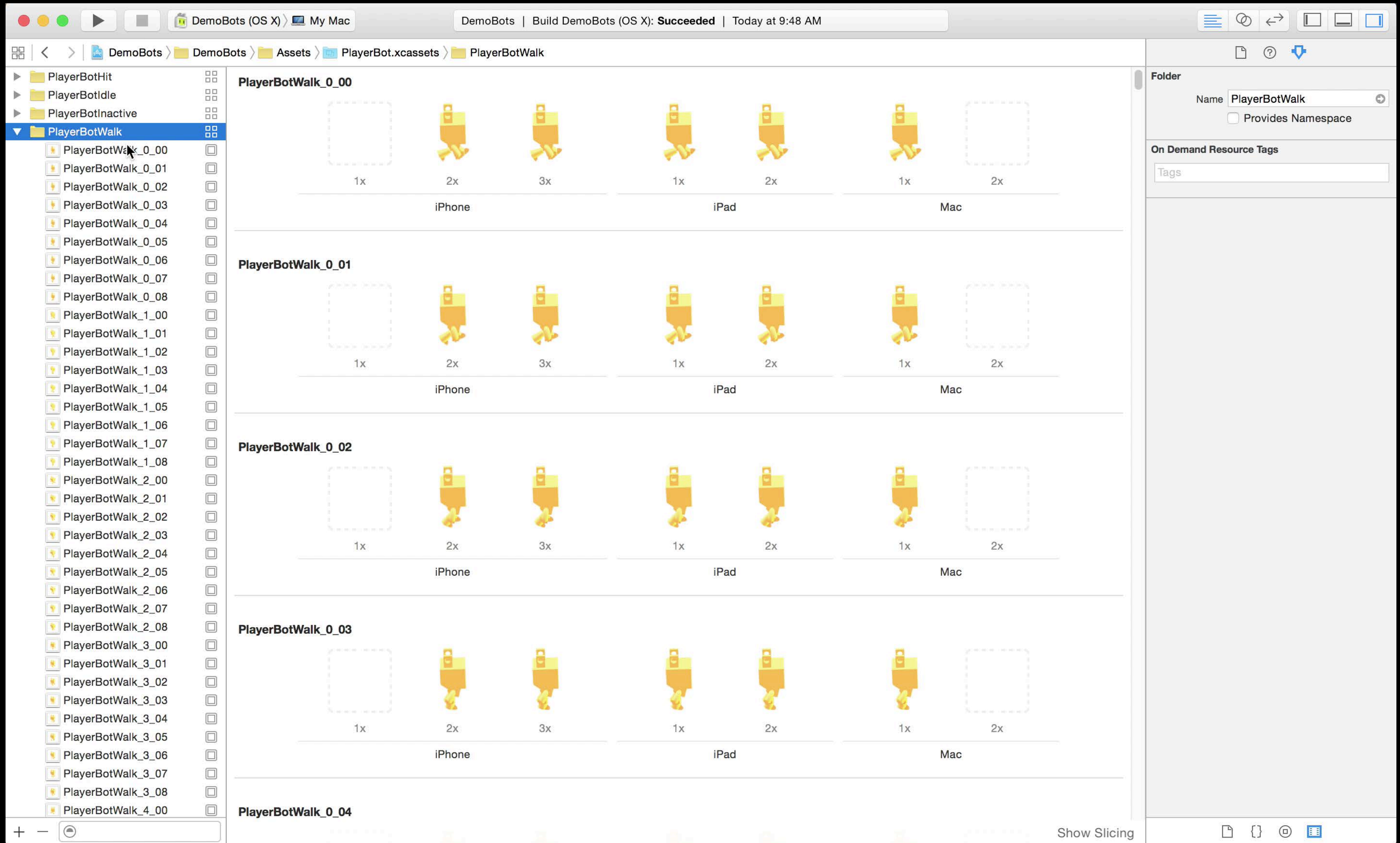
+ -





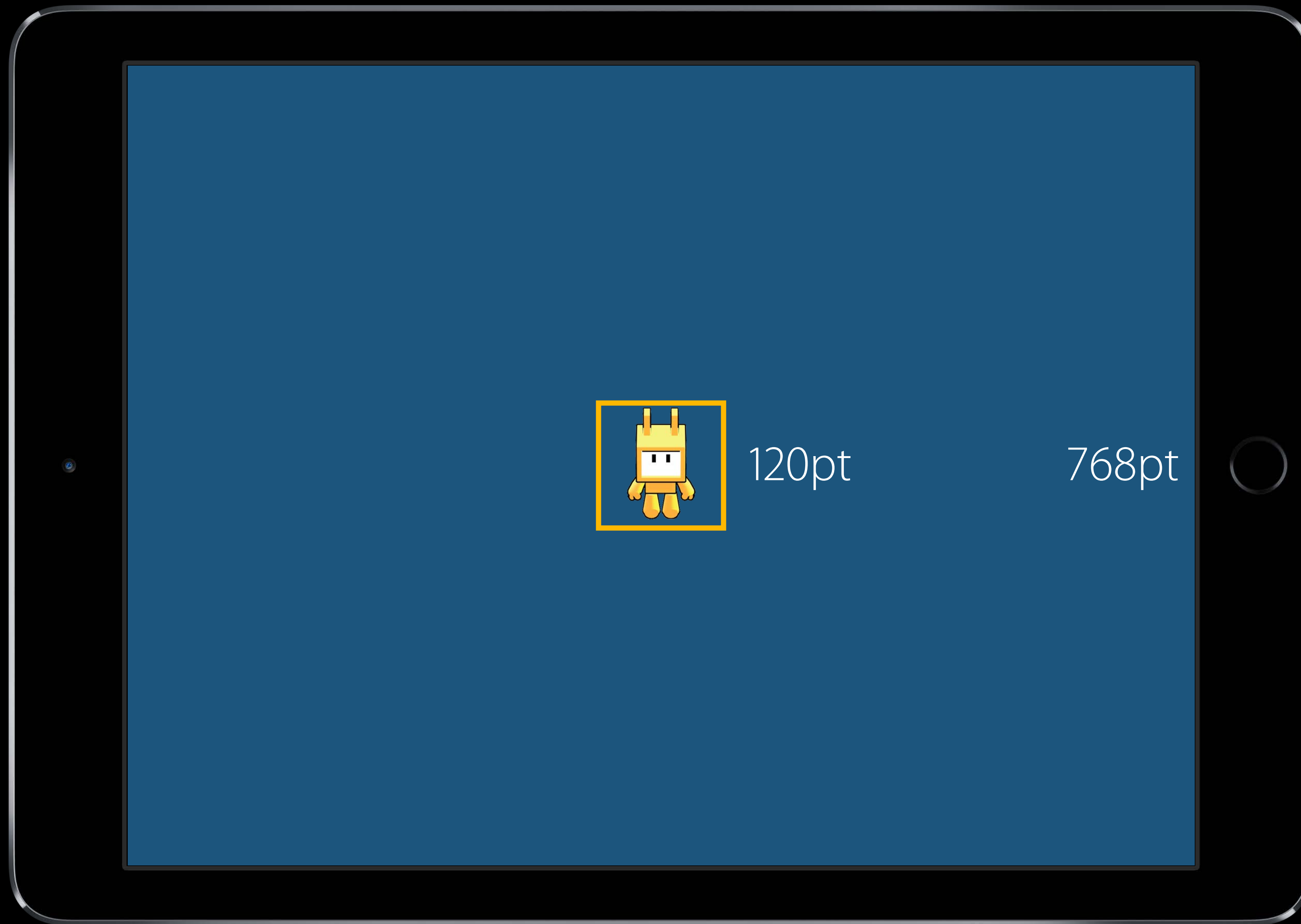


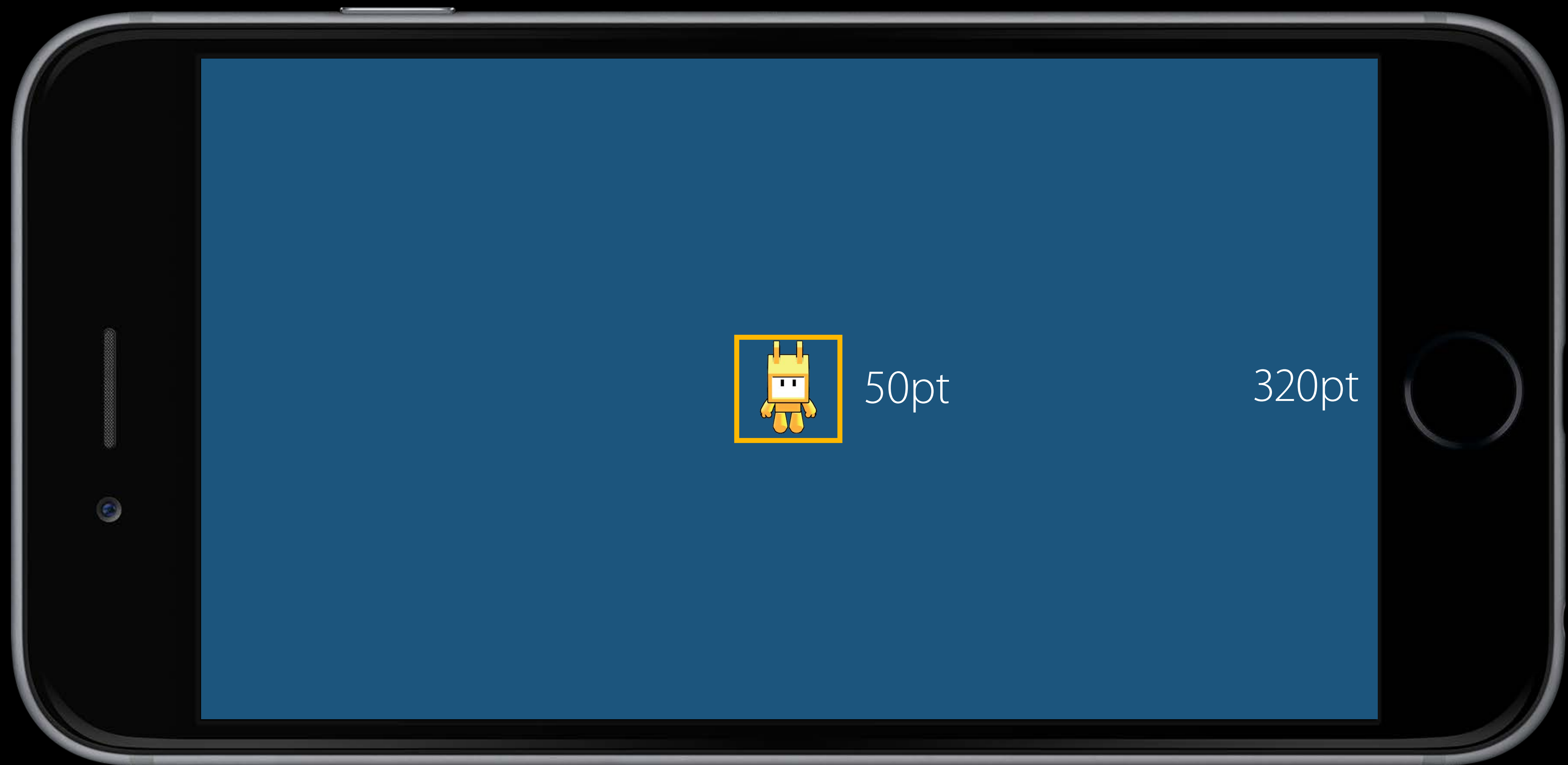












$$(320/768) \times 120 = 50\text{pt}$$

# Optimizing Assets

# Optimizing Assets

Device

---

iPad

---

iPhone 4s – 5s

---

iPhone 6

---

iPhone 6 Plus

---

Mac

---

# Optimizing Assets

Device	Scene Height
iPad	768pt
iPhone 4s – 5s	320pt
iPhone 6	326pt
iPhone 6 Plus	401pt
Mac	1440pt

# Optimizing Assets

Device	Scene Height	Player Height
iPad	768pt	120pt
iPhone 4s – 5s	320pt	50pt
iPhone 6	326pt	50pt
iPhone 6 Plus	401pt	62.65pt
Mac	1440pt	225pt

# Optimizing Assets

Device	Scene Height	Player Height	1x
iPad	768pt	120pt	120px
iPhone 4s – 5s	320pt	50pt	-
iPhone 6	326pt	50pt	-
iPhone 6 Plus	401pt	62.65pt	-
Mac	1440pt	225pt	225px

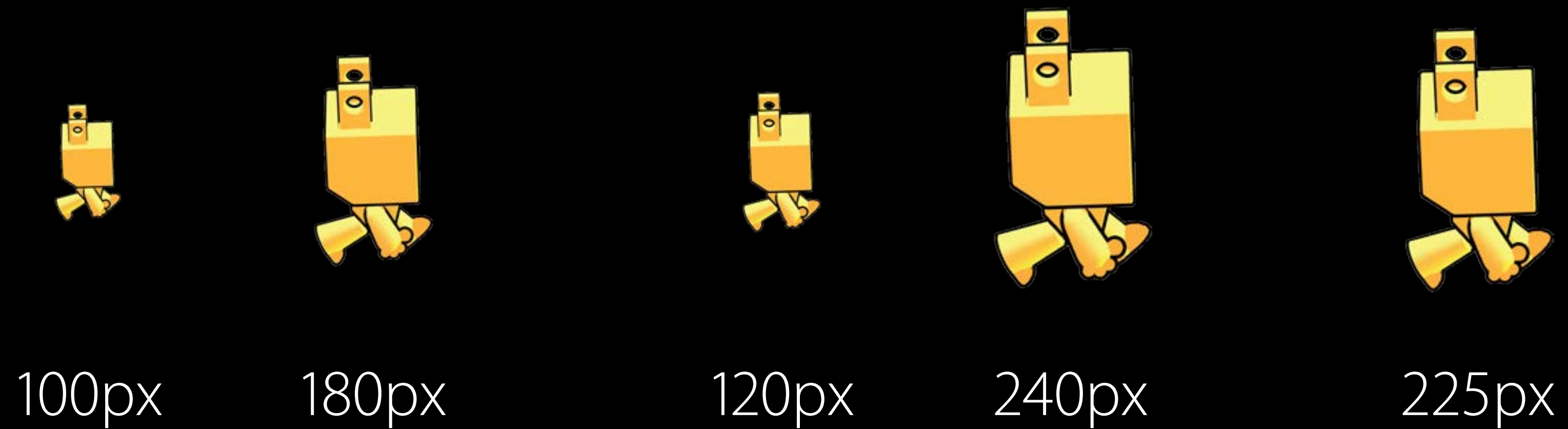
# Optimizing Assets

Device	Scene Height	Player Height	1x	2x
iPad	768pt	120pt	120px	240px
iPhone 4s – 5s	320pt	50pt	-	100px
iPhone 6	326pt	50pt	-	100px
iPhone 6 Plus	401pt	62.65pt	-	-
Mac	1440pt	225pt	225px	-

# Optimizing Assets

Device	Scene Height	Player Height	1x	2x	3x
iPad	768pt	120pt	120px	240px	-
iPhone 4s – 5s	320pt	50pt	-	100px	-
iPhone 6	326pt	50pt	-	100px	-
iPhone 6 Plus	401pt	62.65pt	-	-	180px
Mac	1440pt	225pt	225px	-	-

# Optimizing Assets



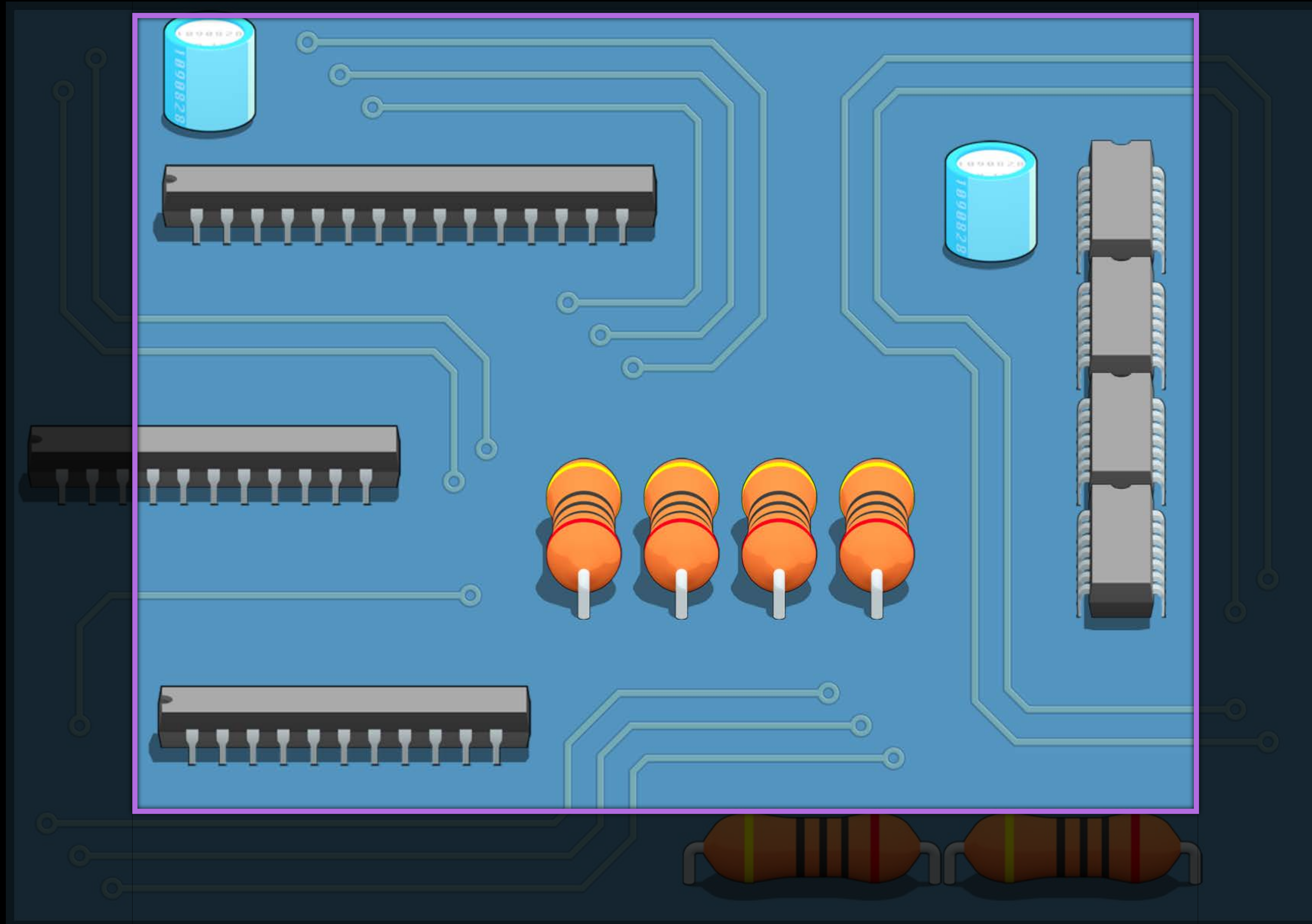
▶	PlayerBotHit	□□
▶	PlayerBotIdle	□□
▶	PlayerBotInactive	□□
▼	PlayerBotWalk	□□
	<b>PlayerBotWalk_0_00</b>	<b>□</b>
	PlayerBotWalk_0_01	□
	PlayerBotWalk_0_02	□
	PlayerBotWalk_0_03	□
	PlayerBotWalk_0_04	□
	PlayerBotWalk_0_05	□
	PlayerBotWalk_0_06	□
	PlayerBotWalk_0_07	□
	PlayerBotWalk_0_08	□
	PlayerBotWalk_1_00	□
	PlayerBotWalk_1_01	□
	PlayerBotWalk_1_02	□
	PlayerBotWalk_1_03	□
	PlayerBotWalk_1_04	□
	PlayerBotWalk_1_05	□
	PlayerBotWalk_1_06	□
	PlayerBotWalk_1_07	□
	PlayerBotWalk_1_08	□
	PlayerBotWalk_2_00	□
	PlayerBotWalk_2_01	□
	PlayerBotWalk_2_02	□
	PlayerBotWalk_2_03	□
	PlayerBotWalk_2_04	□

 PlayerBotWalk_13_00	<input type="checkbox"/>
 PlayerBotWalk_13_01	<input type="checkbox"/>
 PlayerBotWalk_13_02	<input type="checkbox"/>
 PlayerBotWalk_13_03	<input type="checkbox"/>
 PlayerBotWalk_13_04	<input type="checkbox"/>
 PlayerBotWalk_13_05	<input type="checkbox"/>
 PlayerBotWalk_13_06	<input type="checkbox"/>
 PlayerBotWalk_13_07	<input type="checkbox"/>
 PlayerBotWalk_13_08	<input type="checkbox"/>
 PlayerBotWalk_14_00	<input type="checkbox"/>
 PlayerBotWalk_14_01	<input type="checkbox"/>
 PlayerBotWalk_14_02	<input type="checkbox"/>
 PlayerBotWalk_14_03	<input type="checkbox"/>
 PlayerBotWalk_14_04	<input type="checkbox"/>
 PlayerBotWalk_14_05	<input type="checkbox"/>
 PlayerBotWalk_14_06	<input type="checkbox"/>
 PlayerBotWalk_14_07	<input type="checkbox"/>
 PlayerBotWalk_14_08	<input type="checkbox"/>
 PlayerBotWalk_15_00	<input type="checkbox"/>
 PlayerBotWalk_15_01	<input type="checkbox"/>
 PlayerBotWalk_15_02	<input type="checkbox"/>
 PlayerBotWalk_15_03	<input type="checkbox"/>
 PlayerBotWalk_15_04	<input type="checkbox"/>
 PlayerBotWalk_15_05	<input type="checkbox"/>
 PlayerBotWalk_15_06	<input type="checkbox"/>
 PlayerBotWalk_15_07	<input type="checkbox"/>
 PlayerBotWalk_15_08	<input type="checkbox"/>

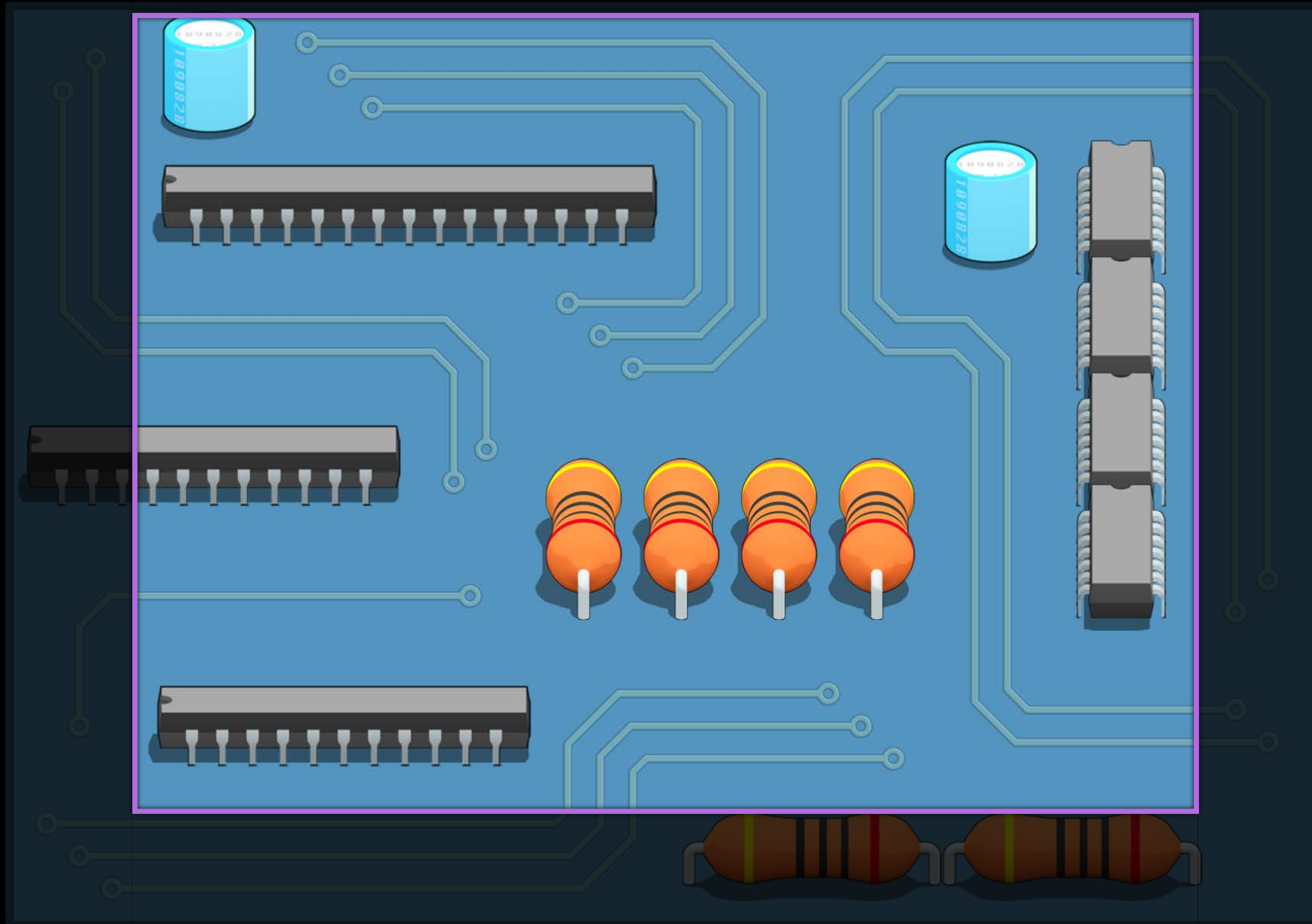
```
Contents.json
Contents.json > No Selection

1 {
2   "images" : [
3     {
4       "idiom" : "iphone",
5       "scale" : "1x"
6     },
7     {
8       "idiom" : "iphone",
9       "filename" : "PlayerBotWalk_0_00_100.png",
10      "scale" : "2x"
11    },
12    {
13      "idiom" : "iphone",
14      "filename" : "PlayerBotWalk_0_00_180.png",
15      "scale" : "3x"
16    },
17    {
18      "idiom" : "ipad",
19      "filename" : "PlayerBotWalk_0_00_120.png",
20      "scale" : "1x"
21    },
22    {
23      "idiom" : "ipad",
24      "filename" : "PlayerBotWalk_0_00_240.png",
25      "scale" : "2x"
26    },
27    {
28      "idiom" : "mac",
29      "filename" : "PlayerBotWalk_0_00_225.png",
30      "scale" : "1x"
31    },
32    {
33      "idiom" : "mac",
34      "scale" : "2x"
35    }
36  ],
37  "info" : {
38    "version" : 1,
39    "author" : "xcode"
40  }
41 }
```

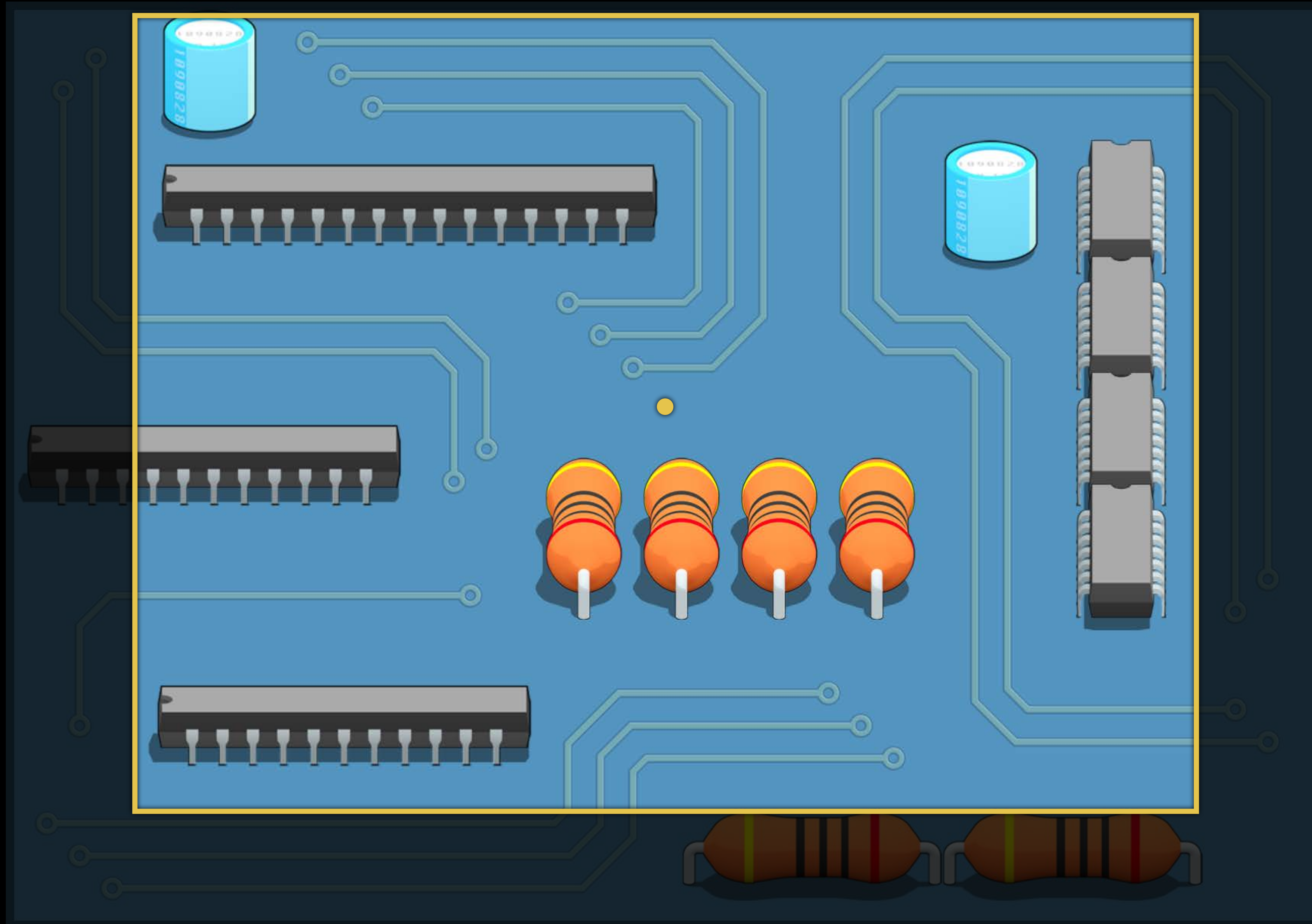
# Before SKCameraNode



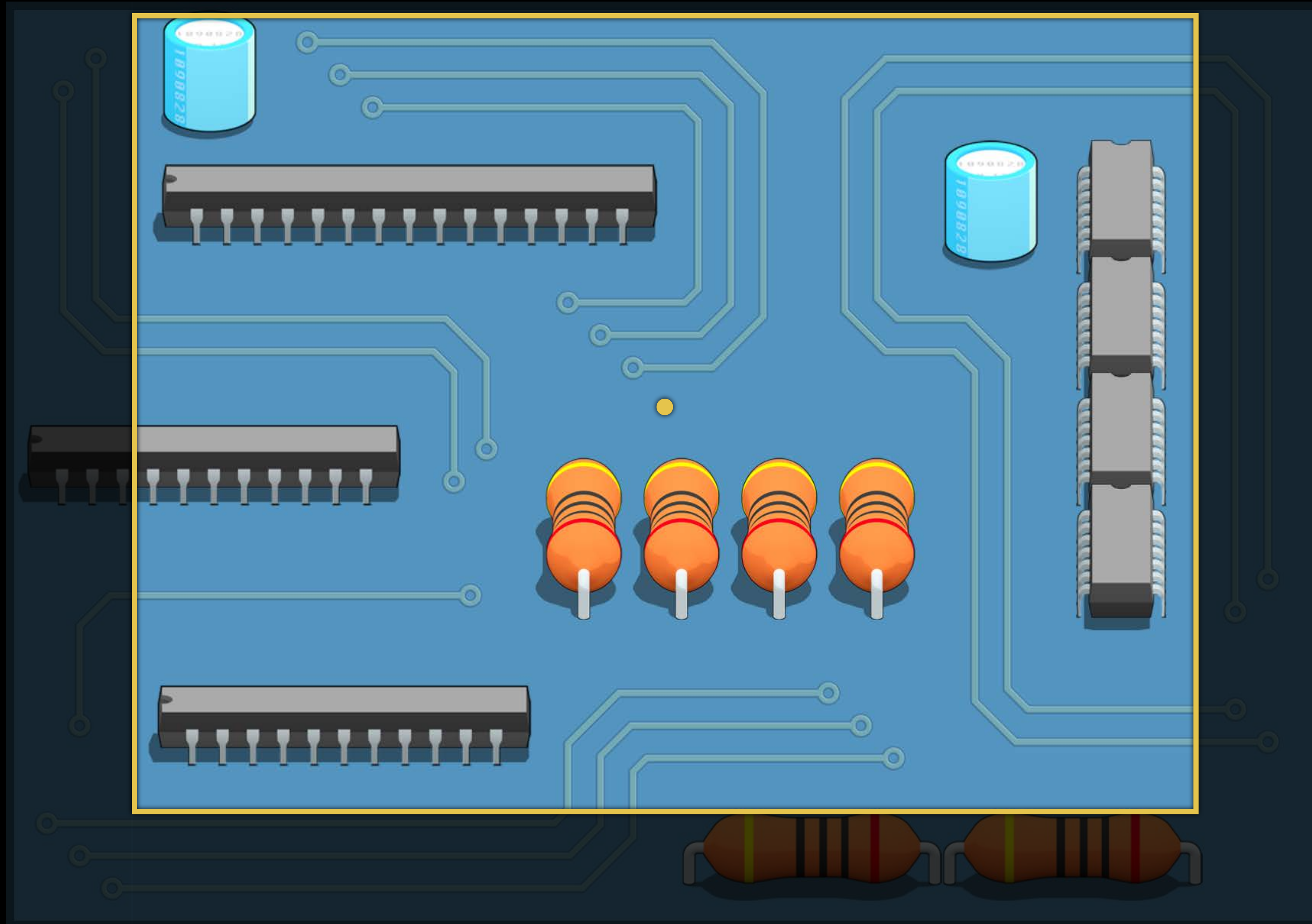
# Before SKCameraNode



# With SKCameraNode



# With SKCameraNode



3:59



3:59

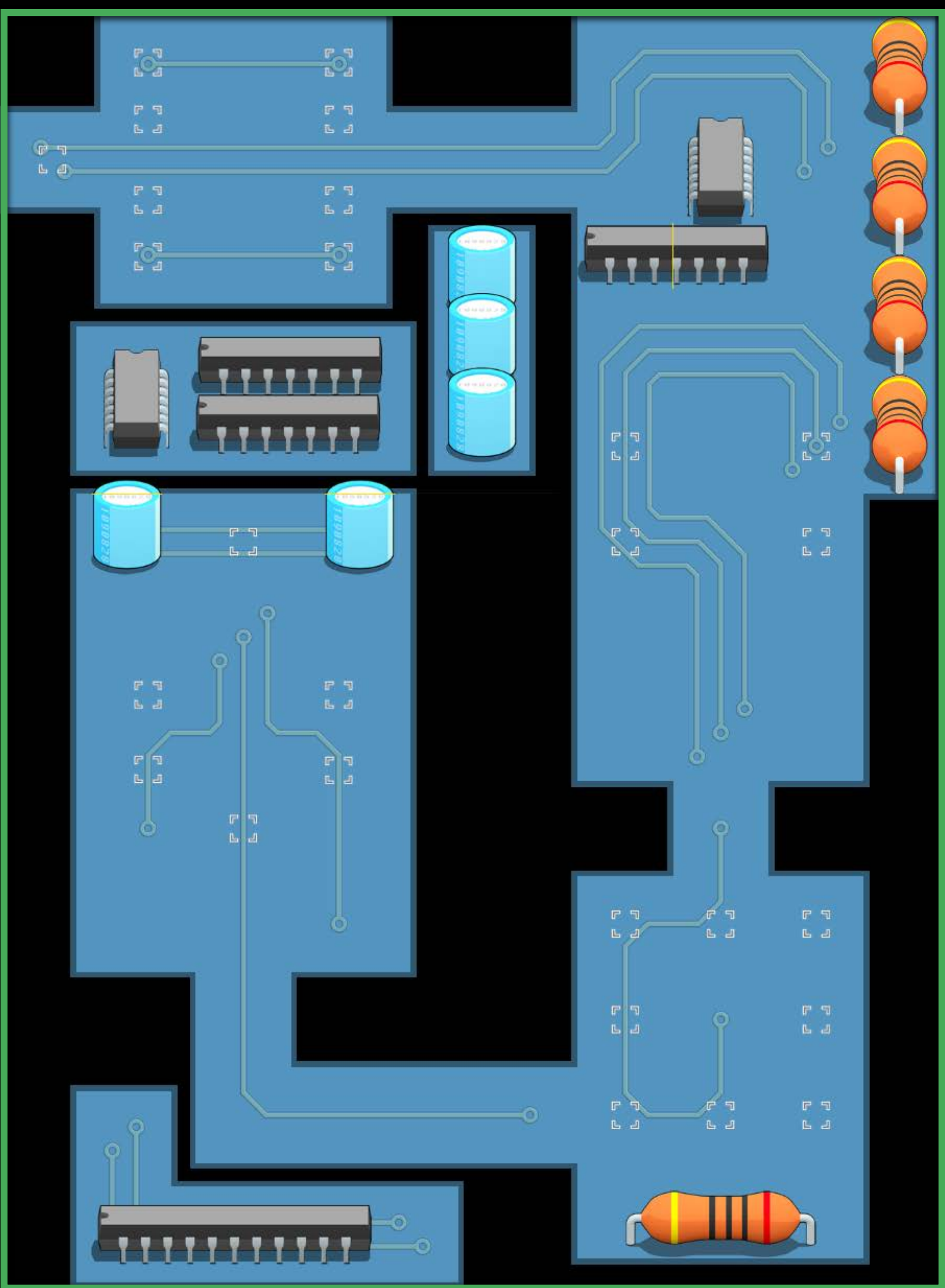


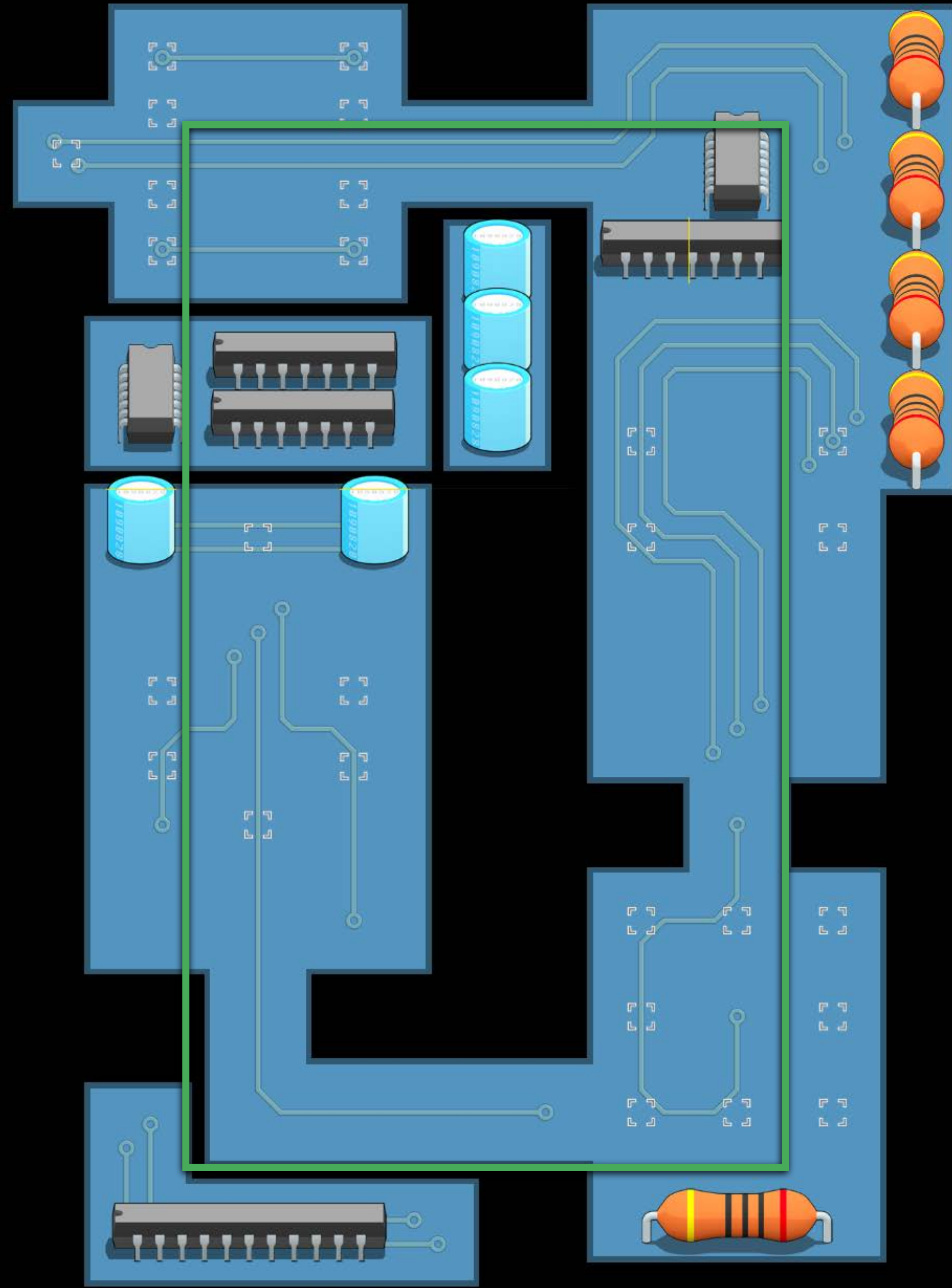
3:59

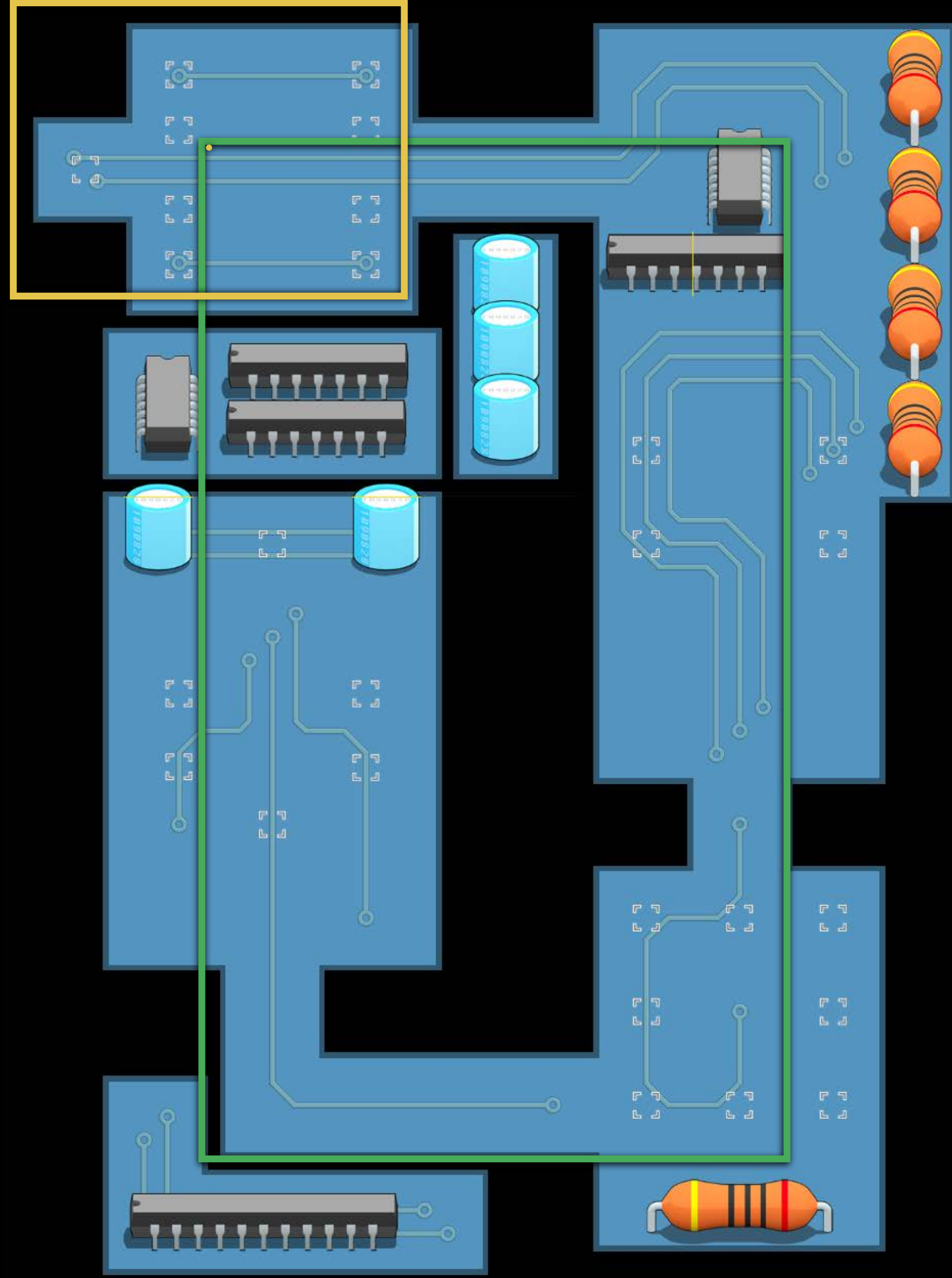


3:59

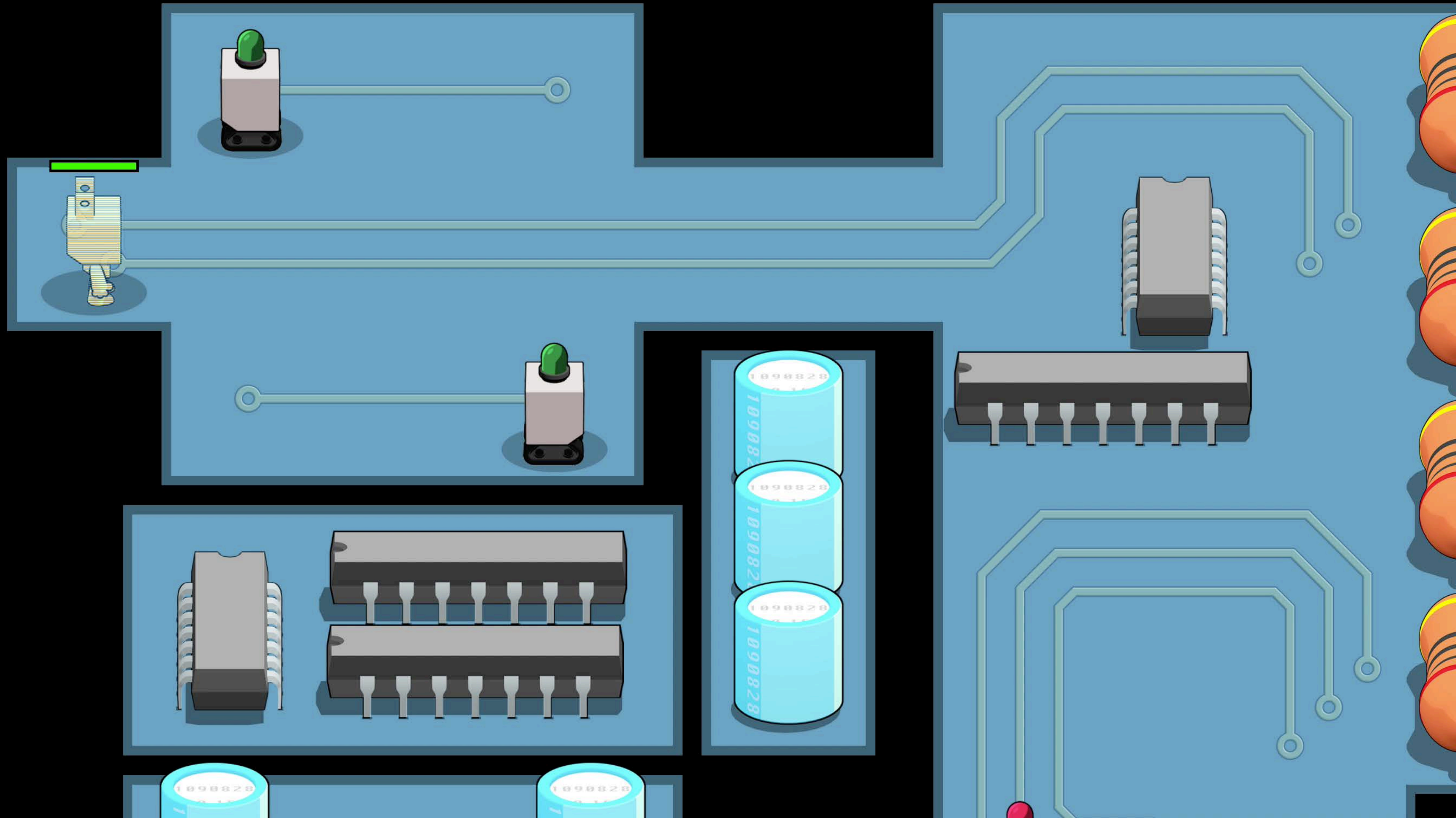




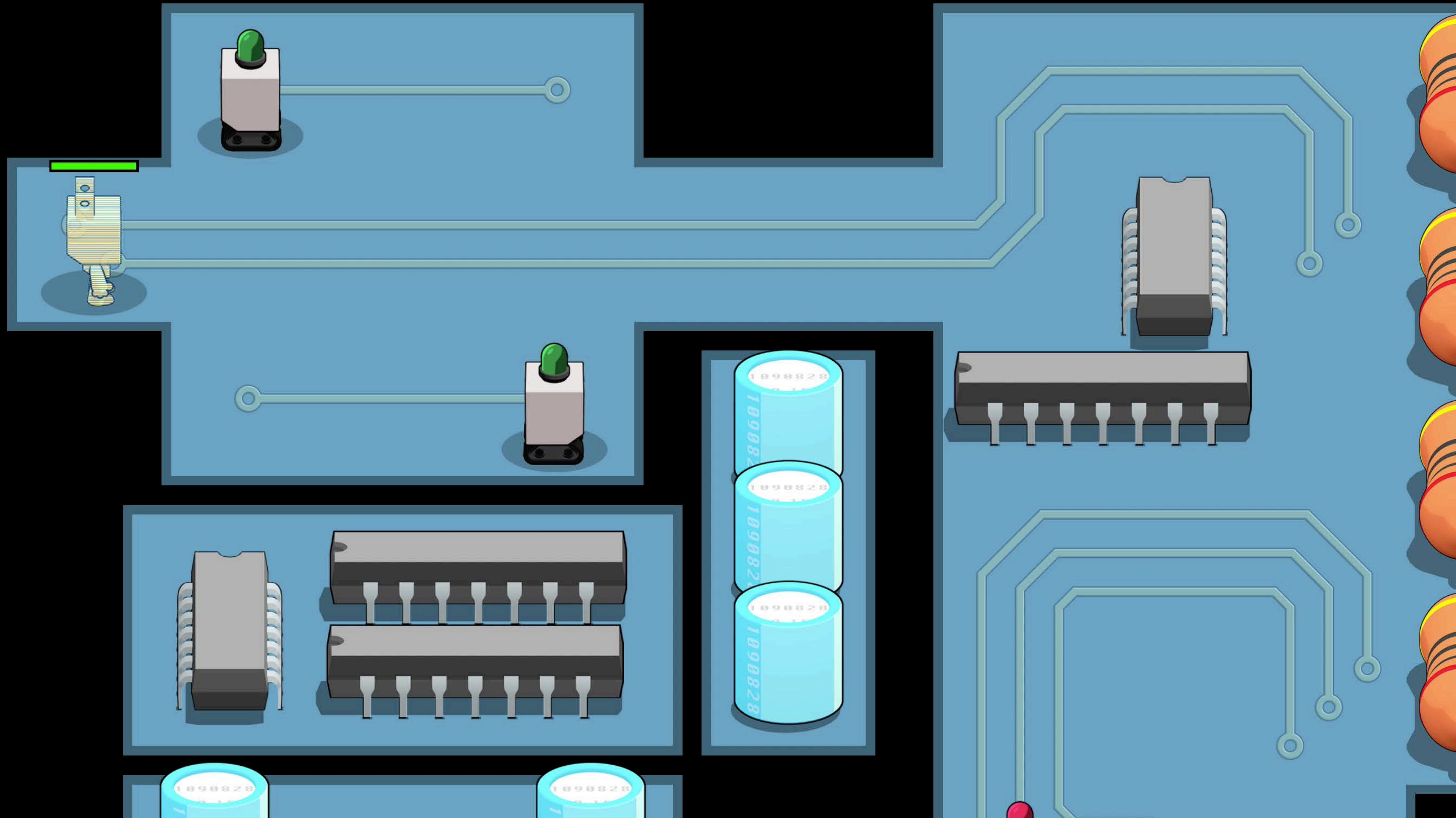




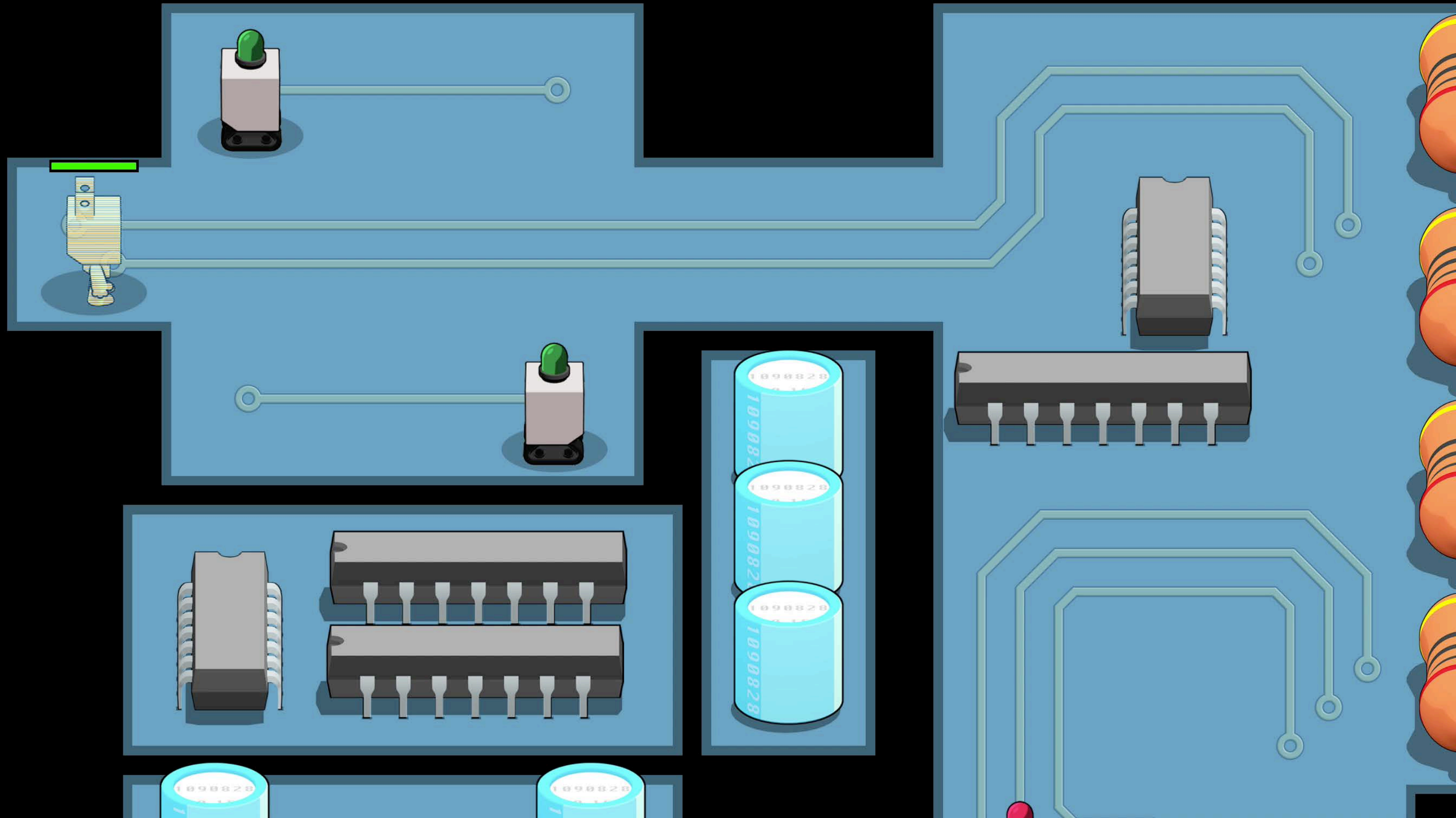
2:59



2:59



2:59



# GKStateMachine

PlayerBot state



# GKStateMachine

PlayerBot state

Appear

Player Controlled

Hit

Recharging

# GKStateMachine

PlayerBot state

Appear

Player Controlled

Hit

Recharging

# GKStateMachine

PlayerBot state

Appear

Player Controlled

Hit

Recharging



# GKStateMachine

PlayerBot state

Appear

Player Controlled

Hit

Recharging



# GKStateMachine

PlayerBot state

Appear

Player Controlled

Hit

Recharging



# GKStateMachine

PlayerBot state

Appear

Player Controlled

Hit

Recharging



# GKStateMachine

PlayerBot state

Appear

Player Controlled

Hit

Recharging



# GKStateMachine

PlayerBot state

Appear

Player Controlled

Hit

Recharging



# GKStateMachine

PlayerBot state

Appear

Player Controlled

Hit

Recharging



# GKStateMachine

PlayerBot state

Appear

Player Controlled

Hit

Recharging



# GKStateMachine

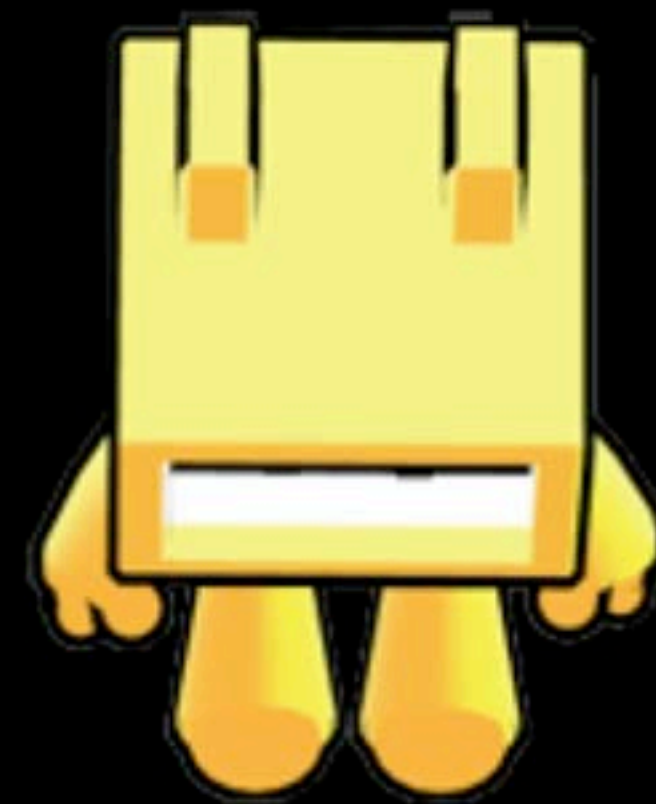
PlayerBot state

Appear

Player Controlled

Hit

Recharging



# GKStateMachine

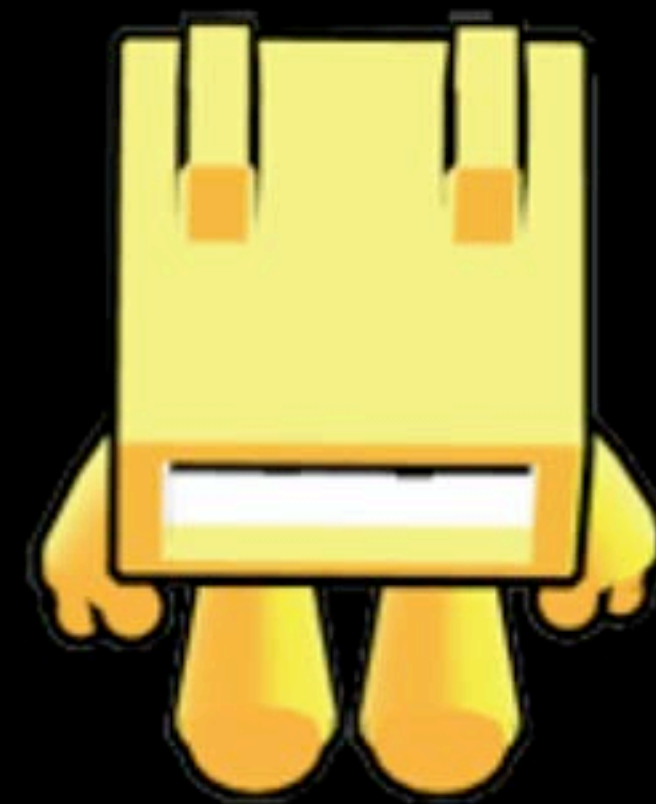
PlayerBot state

Appear

Player Controlled

Hit

Recharging



# GKStateMachine

PlayerBot state

Appear

Player Controlled

Hit

Recharging



# GKStateMachine

PlayerBot state

Appear

Player Controlled

Hit

Recharging



# GKStateMachine

PlayerBot state

Appear

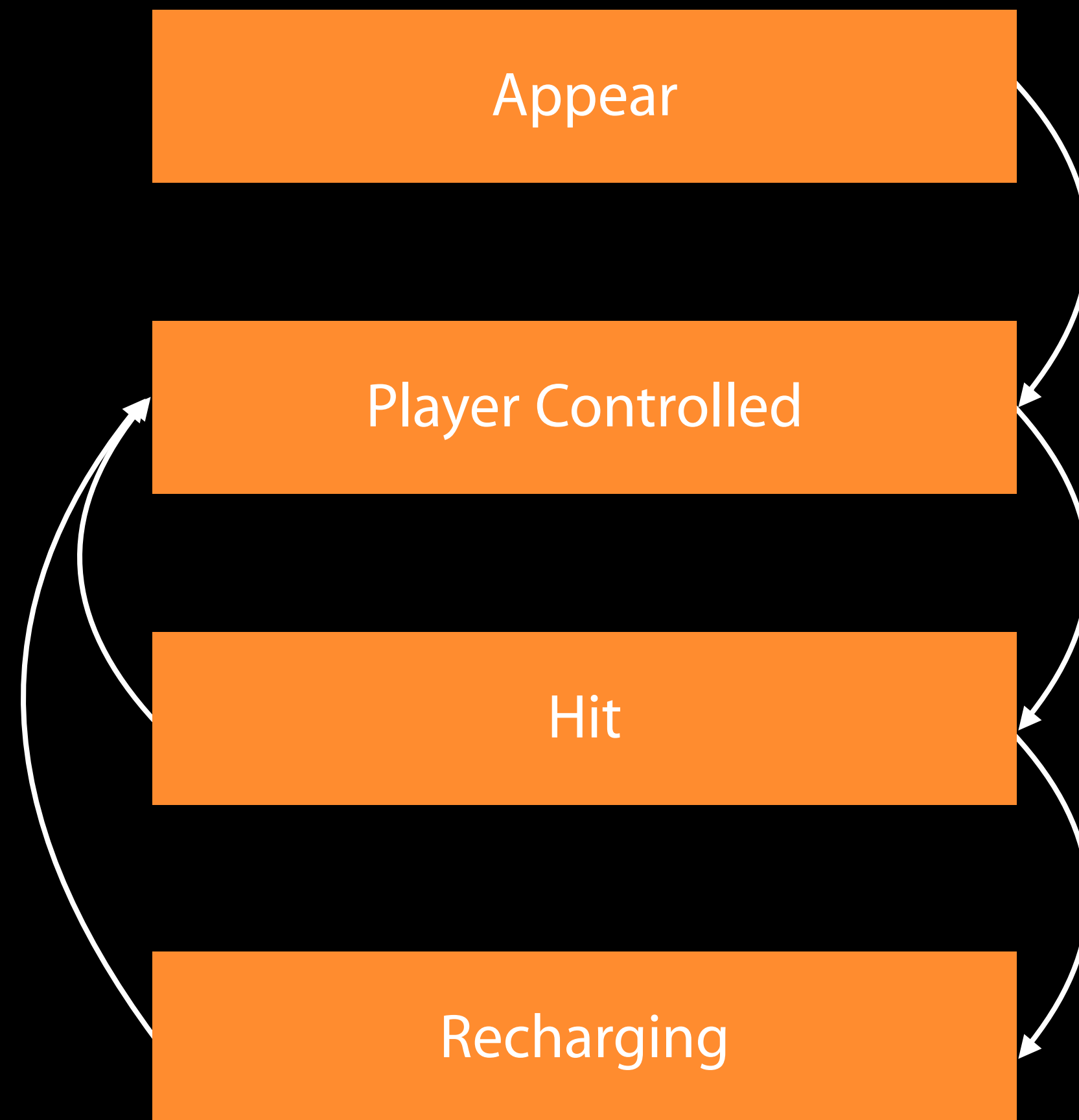
Player Controlled

Hit

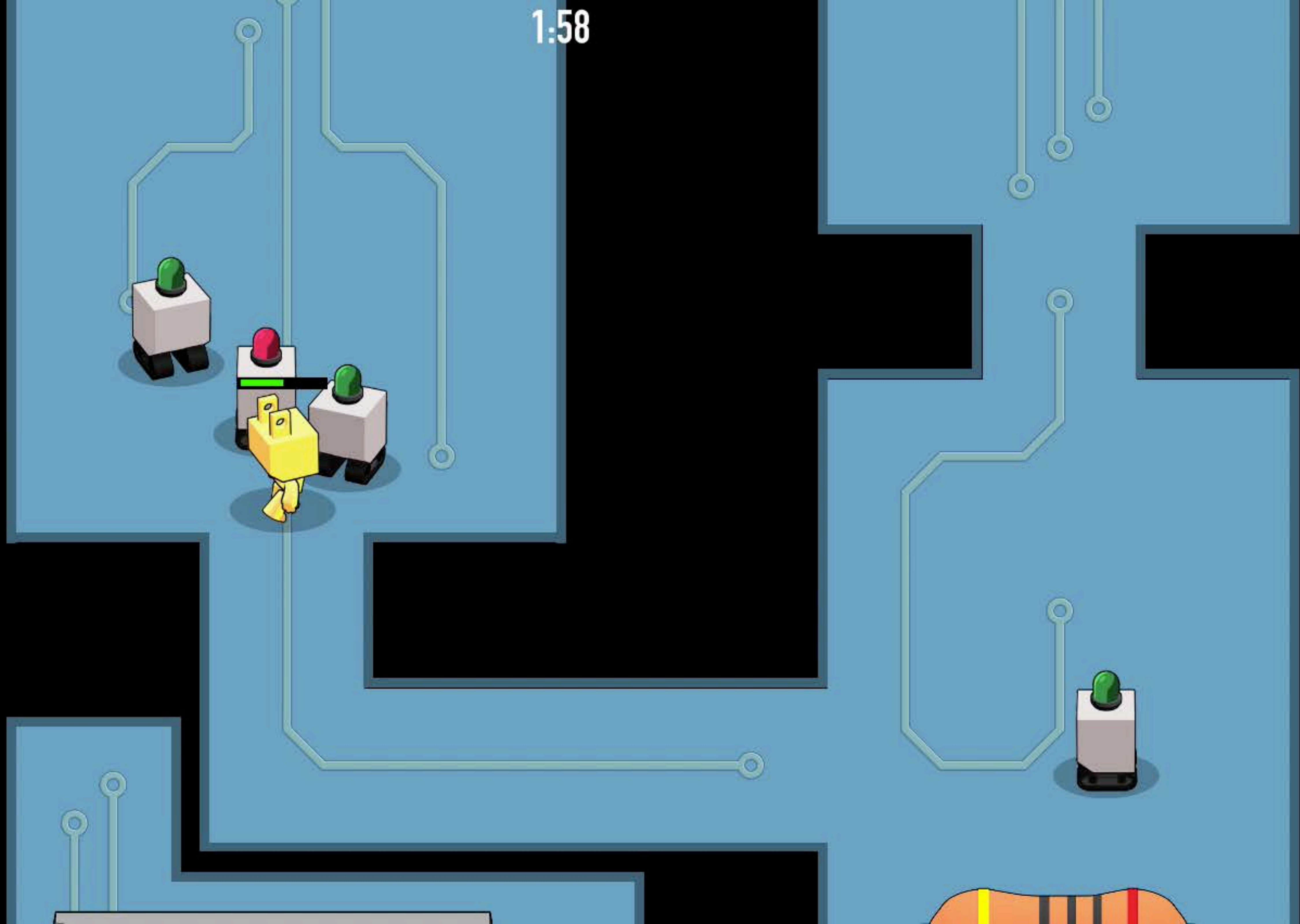
Recharging

# GKStateMachine

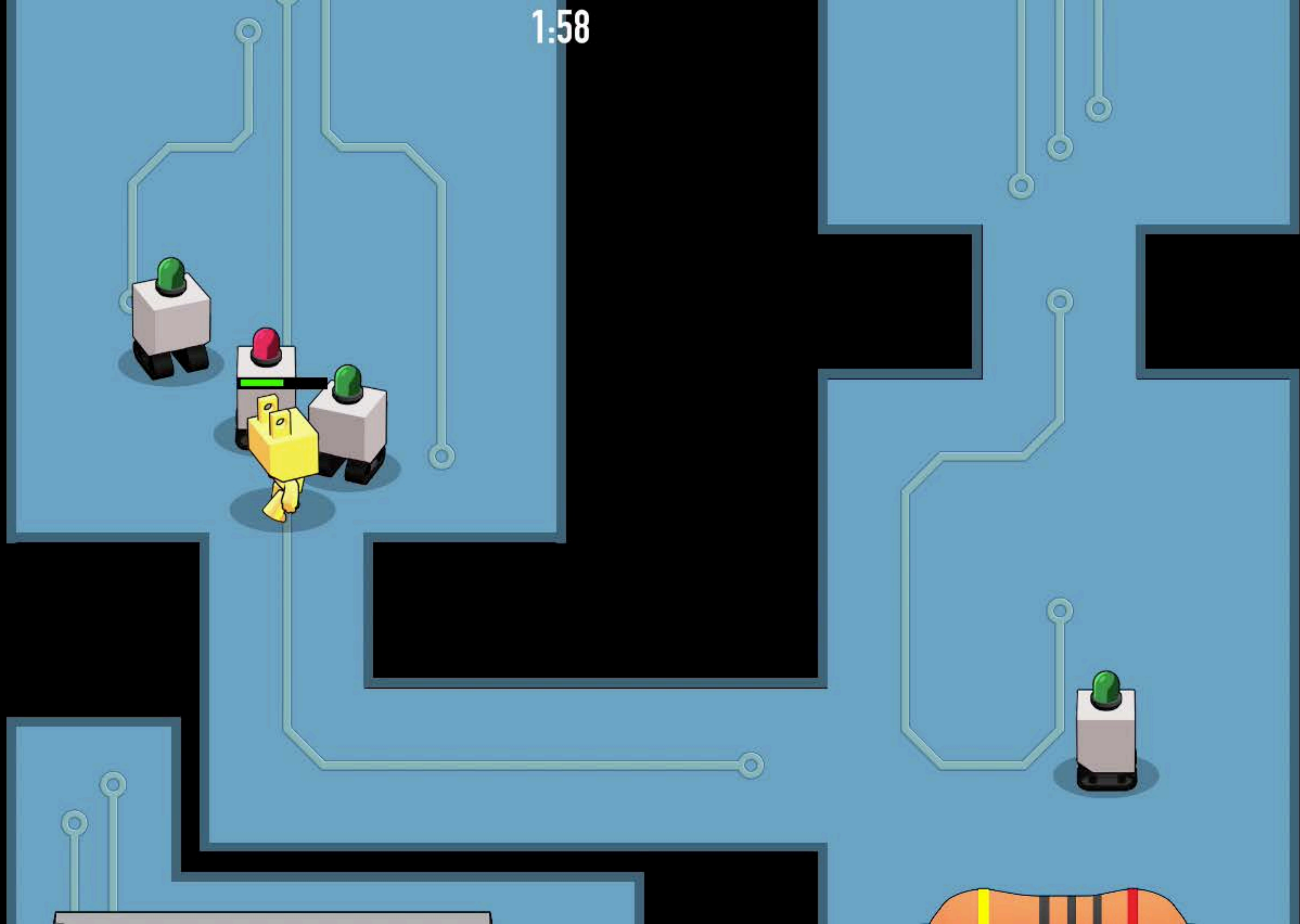
PlayerBot state



1:58



1:58



# GKEntity and GKComponent

# GKEntity and GKComponent

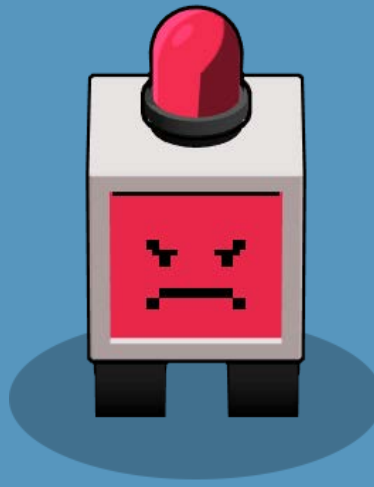


PlayerBot

# GKEntity and GKComponent

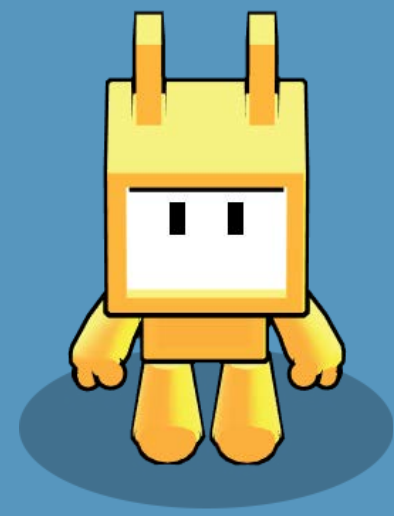


PlayerBot

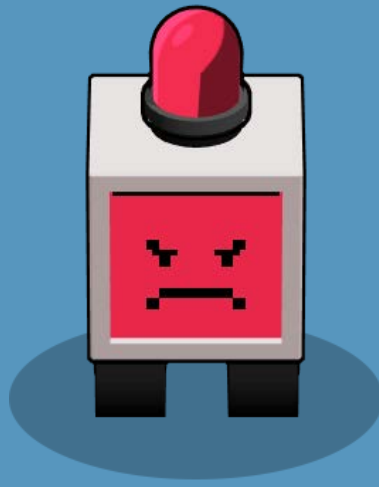


GroundBot

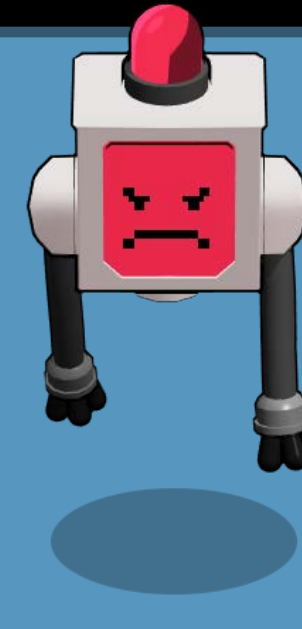
# GKEntity and GKComponent



PlayerBot



GroundBot



FlyingBot

# GKEntity and GKComponent



PlayerBot

Render

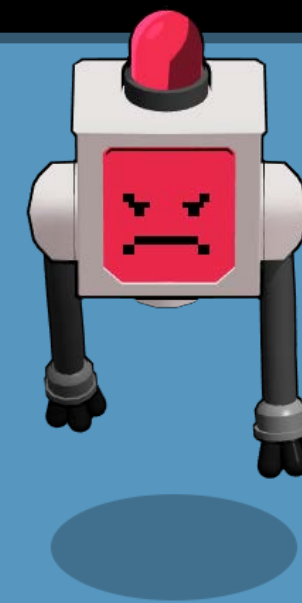
Shadow



GroundBot

Render

Shadow



FlyingBot

Render

Shadow

# GKEntity and GKComponent



PlayerBot

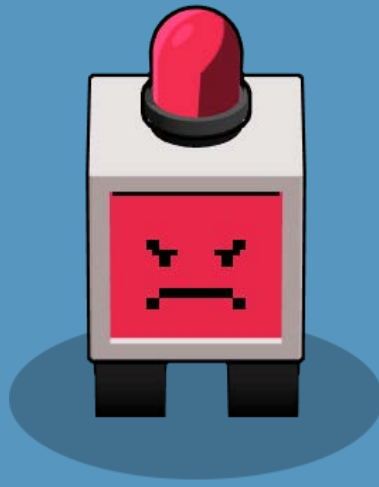
Render

Shadow

Animation

Physics

Intelligence



GroundBot

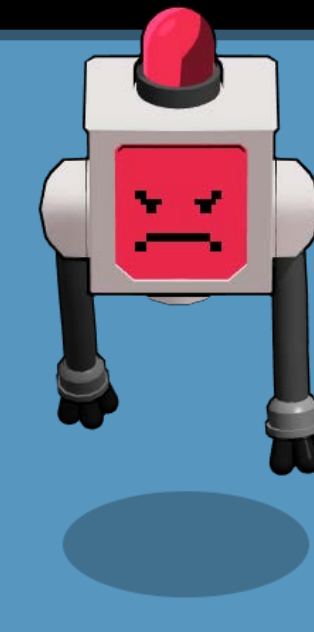
Render

Shadow

Animation

Physics

Intelligence



FlyingBot

Render

Shadow

Animation

Physics

Intelligence

# GKEntity and GKComponent



PlayerBot

Render

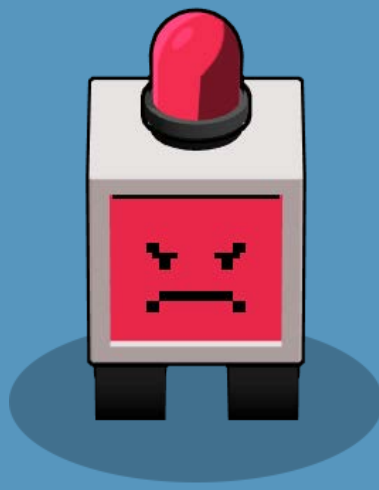
Shadow

Animation

Physics

Intelligence

Input



GroundBot

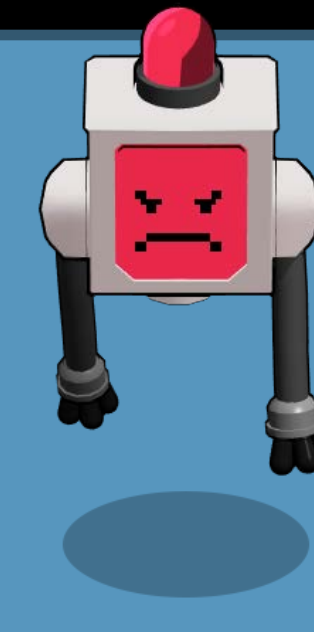
Render

Shadow

Animation

Physics

Intelligence



FlyingBot

Render

Shadow

Animation

Physics

Intelligence

# GKEntity and GKComponent



PlayerBot

Render

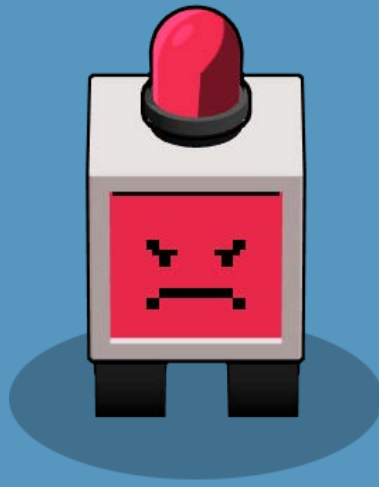
Shadow

Animation

Physics

Intelligence

Input



GroundBot

Render

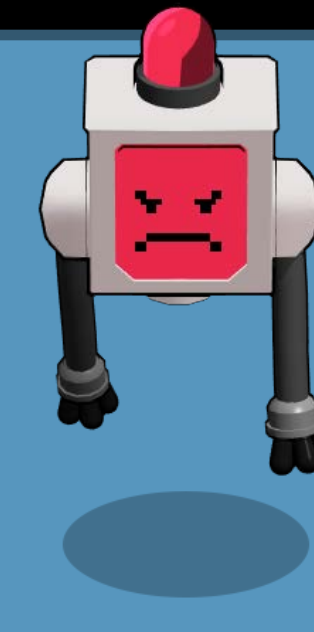
Shadow

Animation

Physics

Intelligence

Input



FlyingBot

Render

Shadow

Animation

Physics

Intelligence

Input

# GKEntity and GKComponent



PlayerBot

Render

Shadow

Animation

Physics

Intelligence

Input



GroundBot

Render

Shadow

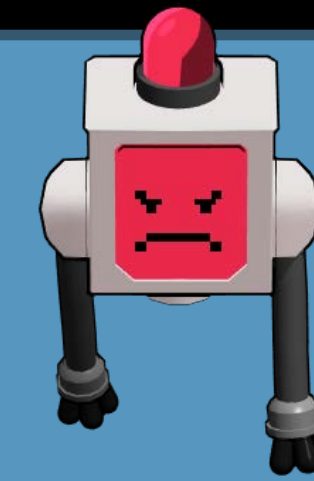
Animation

Physics

Intelligence

Input

Agent



FlyingBot

Render

Shadow

Animation

Physics

Intelligence

Input

Agent

# GKEntity and GKComponent



PlayerBot

Render

Shadow

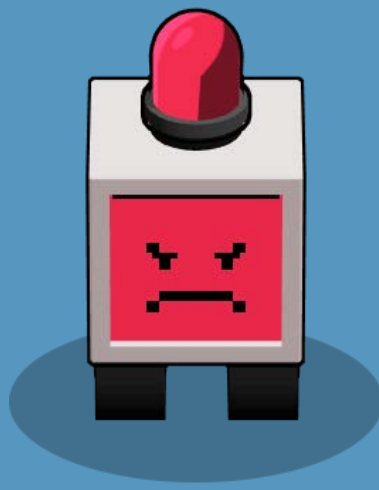
Animation

Physics

Intelligence

Input

Agent



GroundBot

Render

Shadow

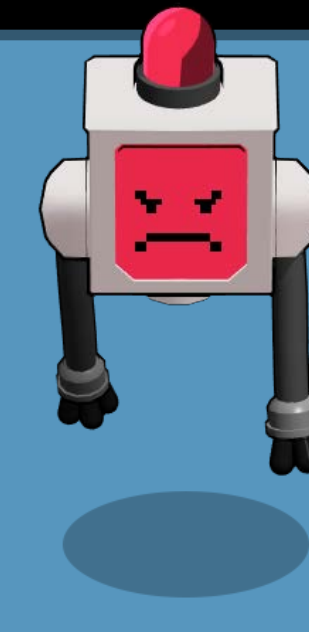
Animation

Physics

Intelligence

Input

Agent



FlyingBot

Render

Shadow

Animation

Physics

Intelligence

Input

Agent

# GKEntity and GKComponent



PlayerBot

Render

Shadow

Animation

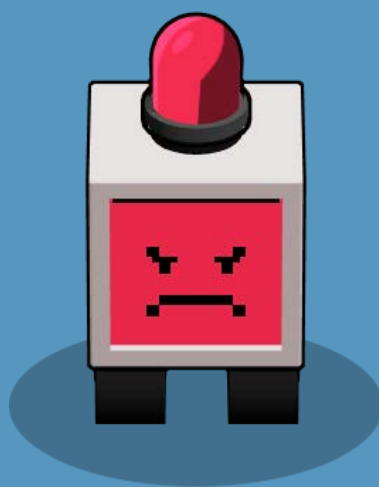
Physics

Intelligence

Input

Agent

Rules



GroundBot

Render

Shadow

Animation

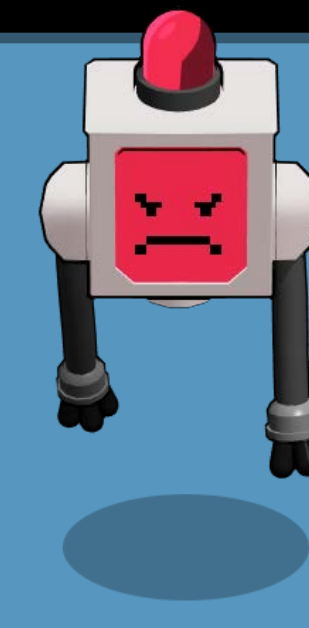
Physics

Intelligence

Input

Agent

Rules



FlyingBot

Render

Shadow

Animation

Physics

Intelligence

Input

Agent

Rules

# GKEntity and GKComponent



PlayerBot

Render

Shadow

Animation

Physics

Intelligence

Input

Agent

Rules

Movement



GroundBot

Render

Shadow

Animation

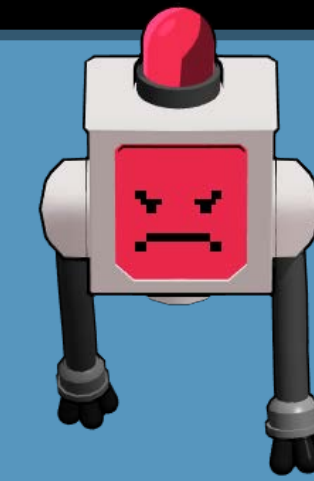
Physics

Intelligence

Input

Agent

Rules



FlyingBot

Render

Shadow

Animation

Physics

Intelligence

Input

Agent

Rules

# GKEntity and GKComponent



PlayerBot

Render

Shadow

Animation

Physics

Intelligence

Input

Agent

Rules

Movement



GroundBot

Render

Shadow

Animation

Physics

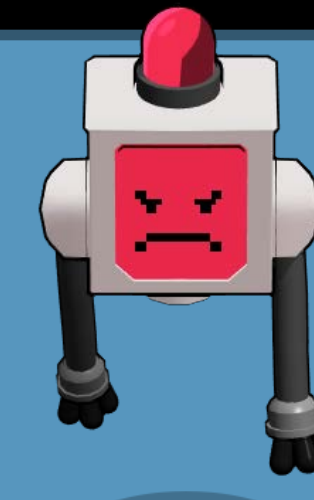
Intelligence

Input

Agent

Rules

Movement



FlyingBot

Render

Shadow

Animation

Physics

Intelligence

Input

Agent

Rules

# GKEntity and GKComponent



PlayerBot

Render

Shadow

Animation

Physics

Intelligence

Input

Agent

Rules

Movement



GroundBot

Render

Shadow

Animation

Physics

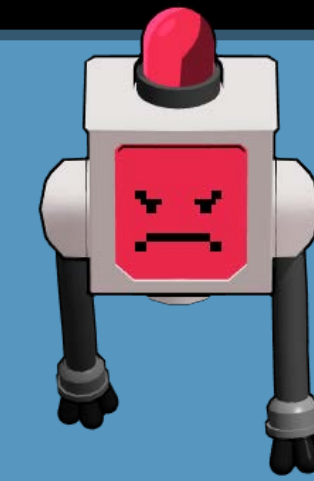
Intelligence

Input

Agent

Rules

Movement



FlyingBot

Render

Shadow

Animation

Physics

Intelligence

Input

Agent

Rules

Movement

# Logic and Gameplay

Dave Schaefgen Sample Code Engineer

# TaskBot Intelligence

What's my motivation?

# TaskBot Intelligence

What's my motivation?

Good

- Keep things working



# TaskBot Intelligence

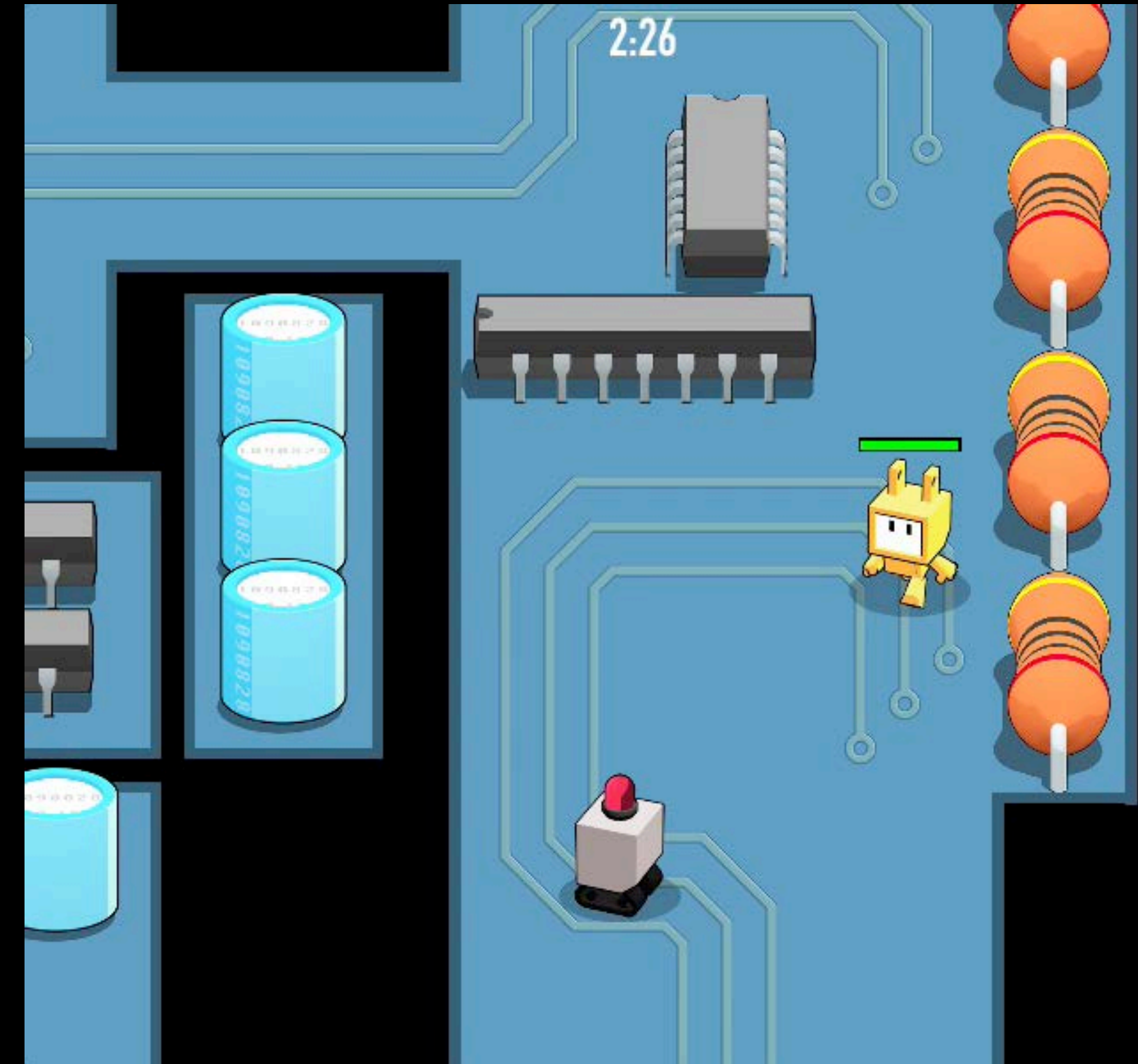
What's my motivation?

Good

- Keep things working

Bad

- Attack the PlayerBot



# TaskBot Intelligence

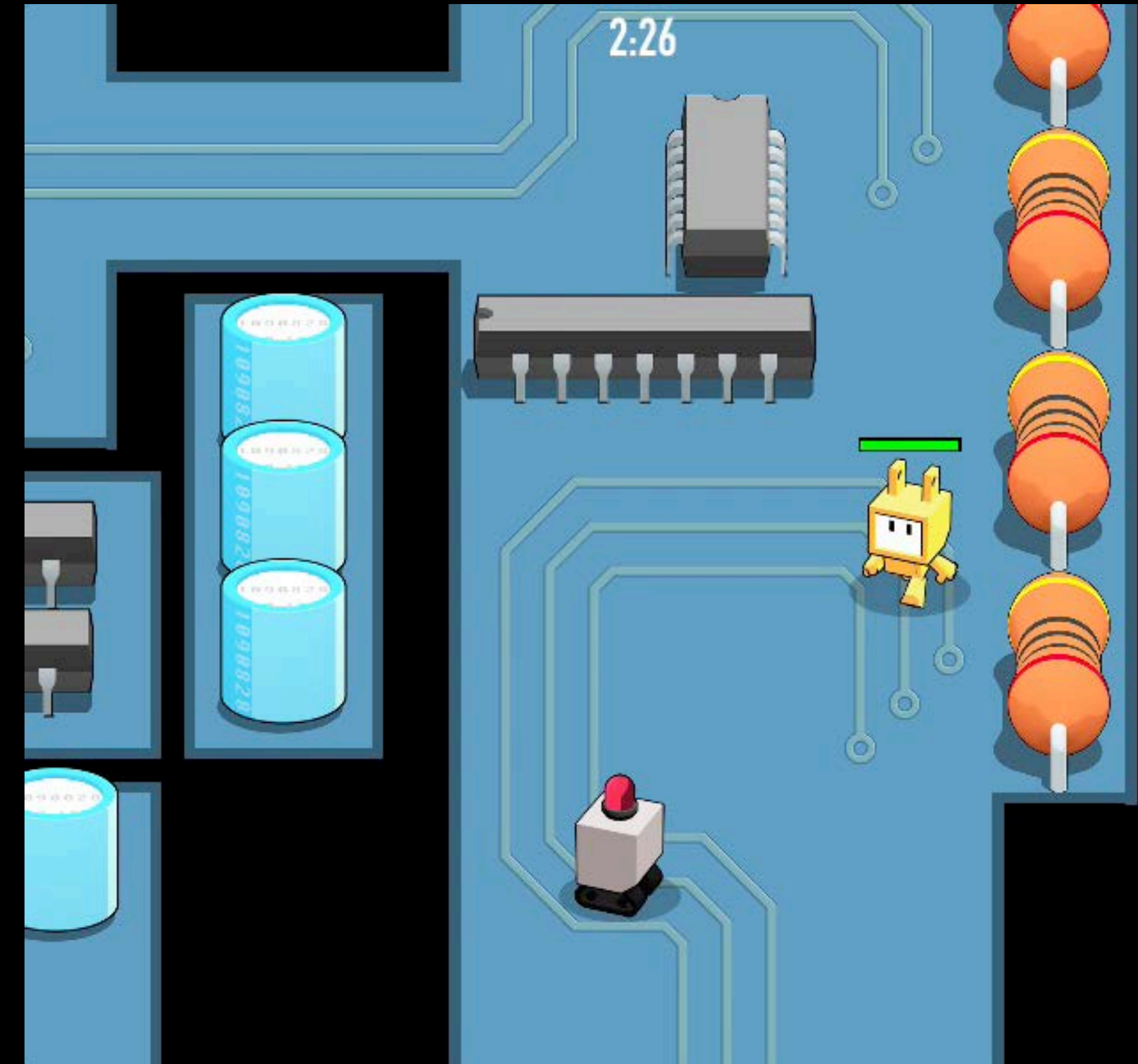
What's my motivation?

Good

- Keep things working

Bad

- Attack the PlayerBot



# TaskBot Intelligence

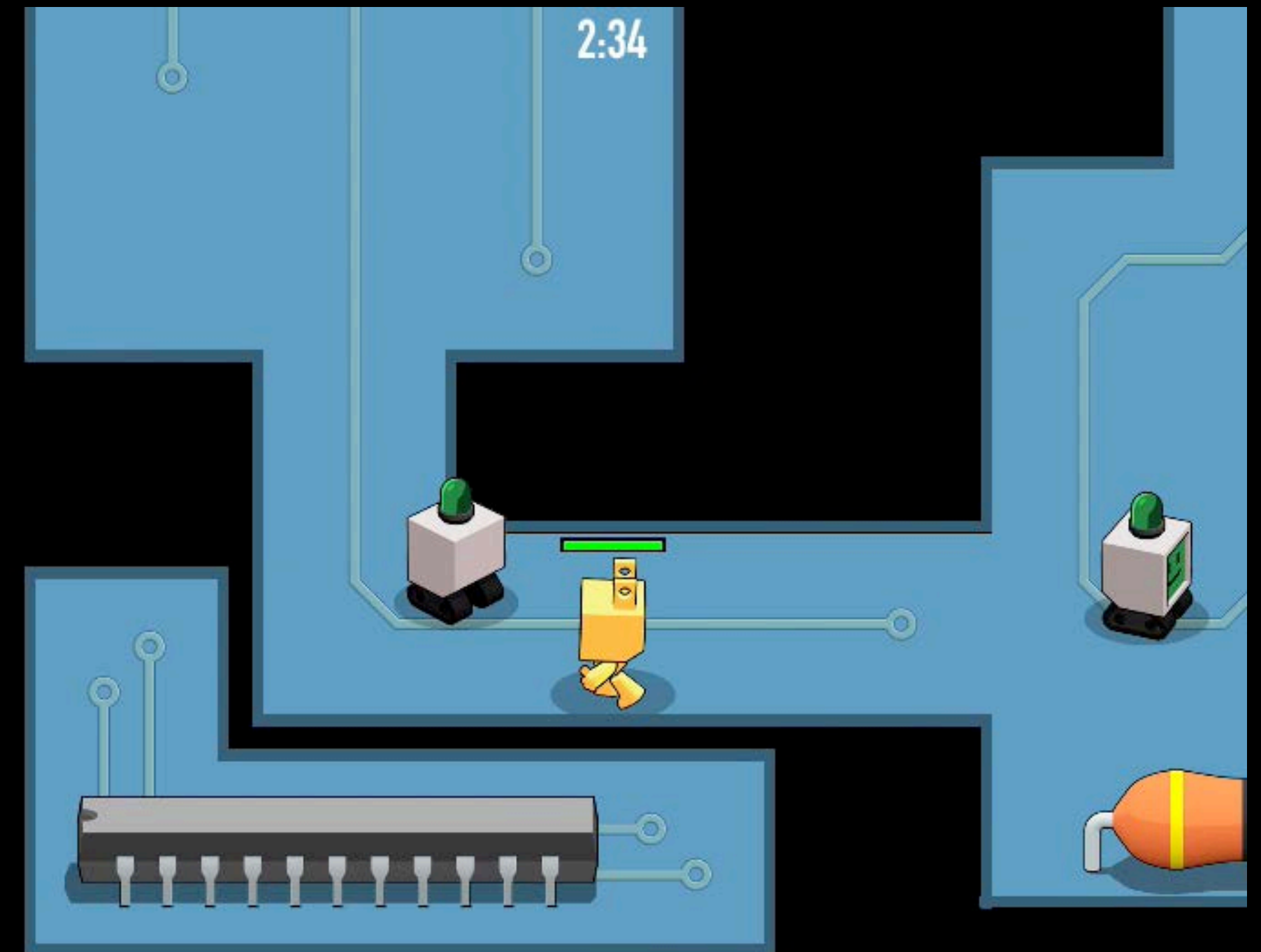
What's my motivation?

Good

- Keep things working

Bad

- Attack the PlayerBot
- Turn other TaskBots



# TaskBot Intelligence

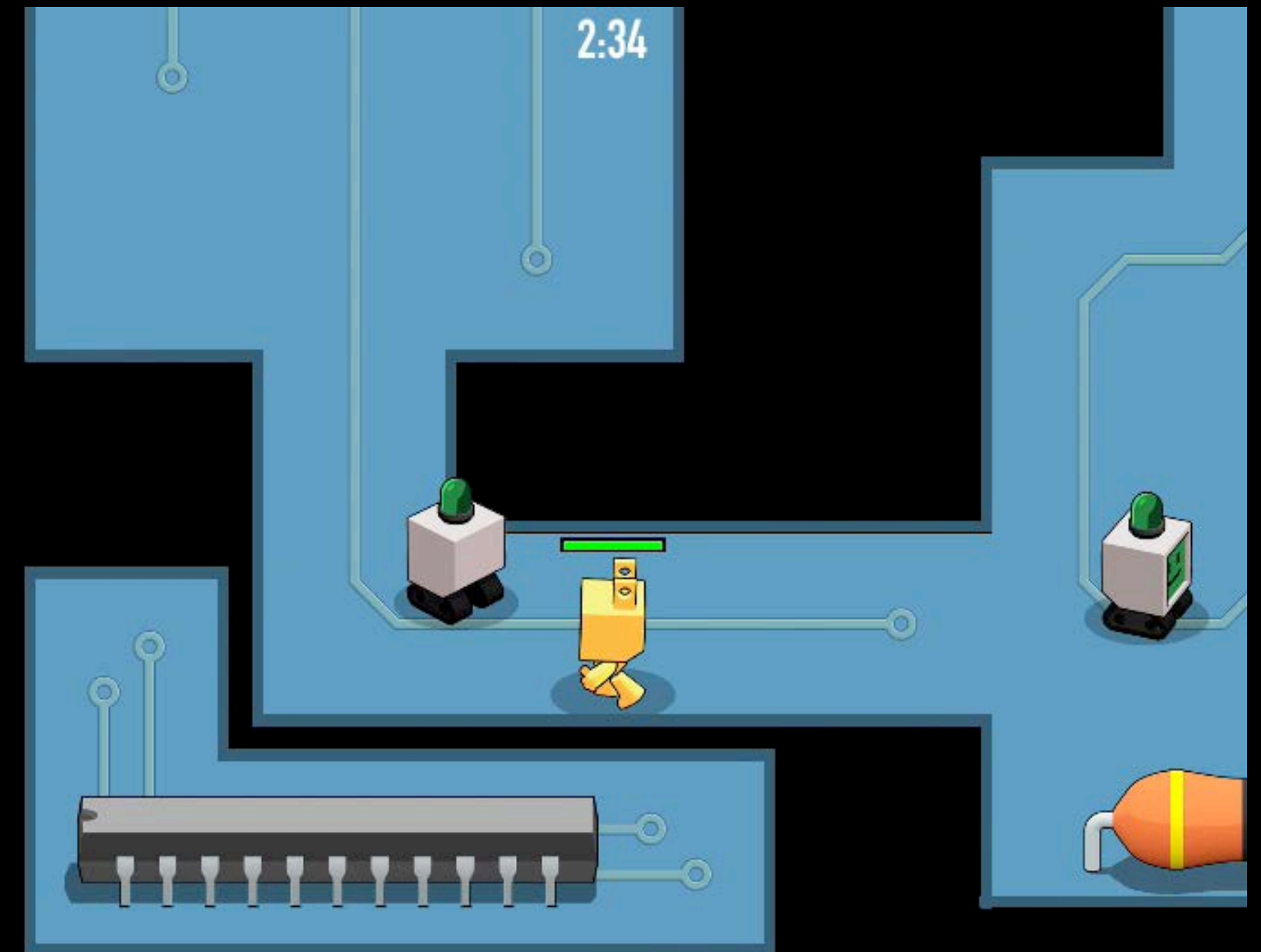
What's my motivation?

Good

- Keep things working

Bad

- Attack the PlayerBot
- Turn other TaskBots



# TaskBot Intelligence

What's my motivation?

## Good

- Keep things working

## Bad

- Attack the PlayerBot
- Turn other TaskBots
- Interrupt normal work



# TaskBot Intelligence

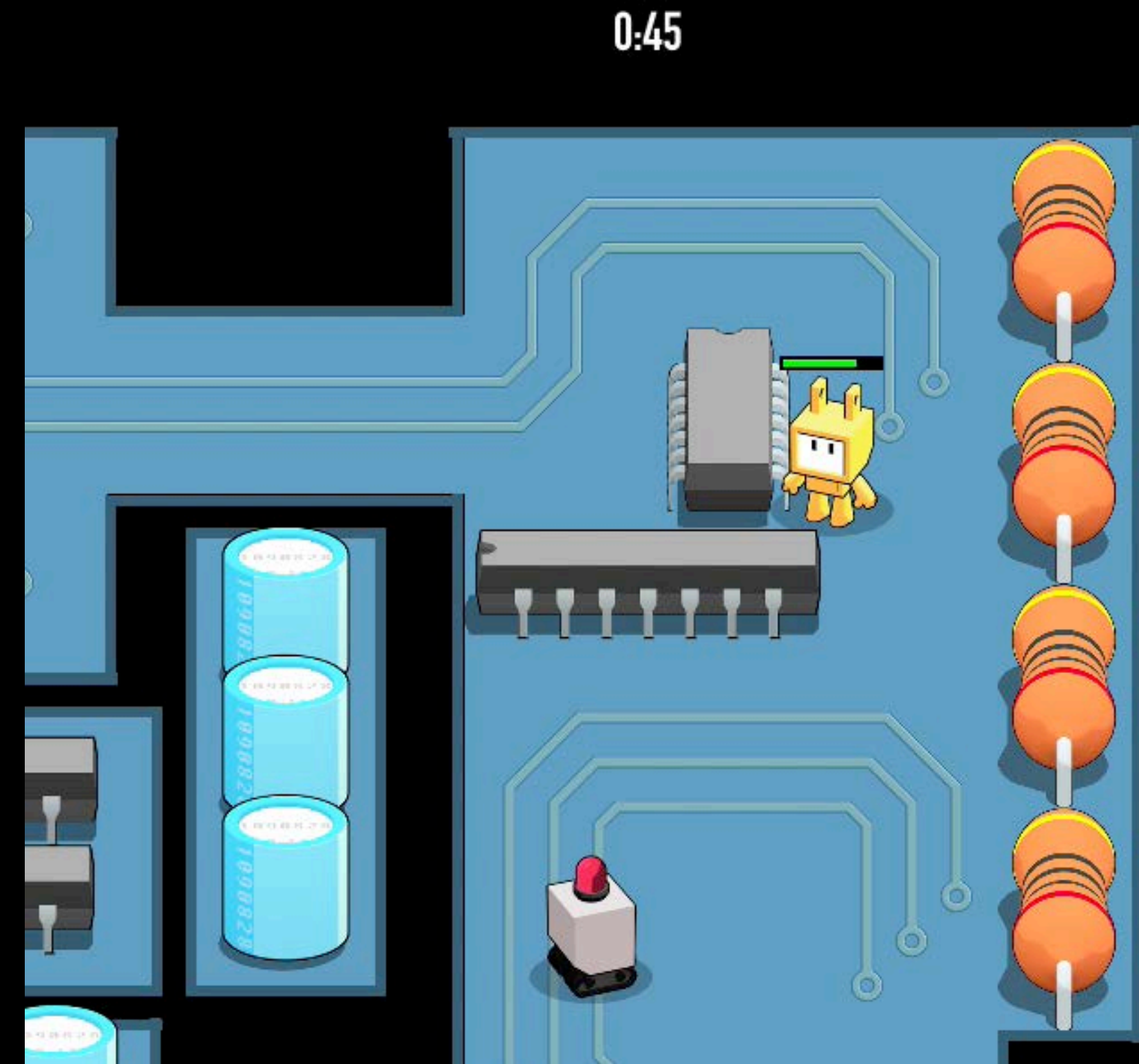
What's my motivation?

## Good

- Keep things working

## Bad

- Attack the PlayerBot
- Turn other TaskBots
- Interrupt normal work



# TaskBot Intelligence

Determining a mandate

# TaskBot Intelligence

## Determining a mandate

Fuzzy Logic via **GKRuleSystem**

- Characters are engaged
- Simpler to maintain
- Emergent behavior

# Fuzzy Rules

I'm a little fuzzy

# Fuzzy Rules

I'm a little fuzzy

Model natural concepts

- Player is near
- Percentage of bad TaskBots is high

# Fuzzy Rules

I'm a little fuzzy

Model natural concepts

- Player is near
- Percentage of bad TaskBots is high

Implemented via **FuzzyTaskBotRule**

- Subclass of **GKRule**
- **fact** is asserted if **grade**  $> 0$
- **grade** is a function of input

# Fuzzy Rules

Functions for proximity rules

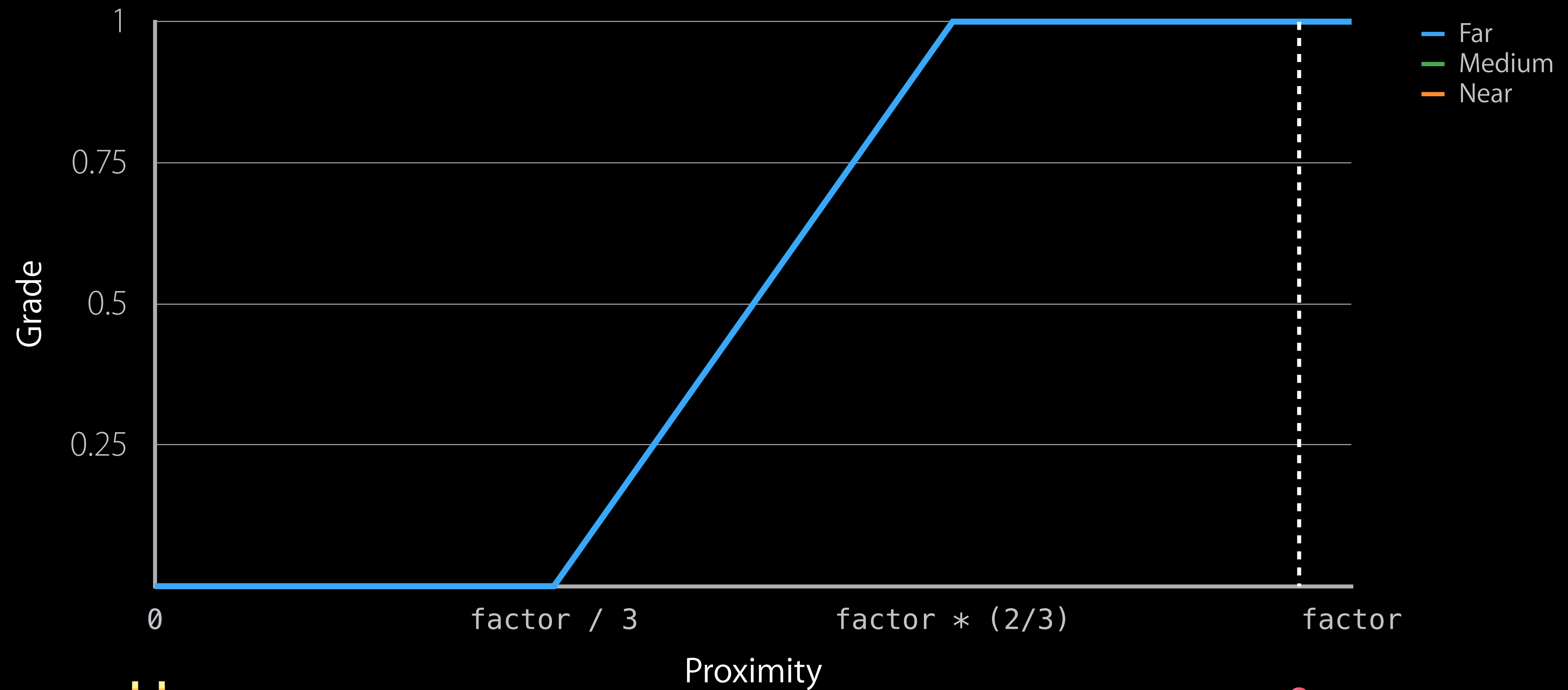
# Fuzzy Rules

Functions for proximity rules



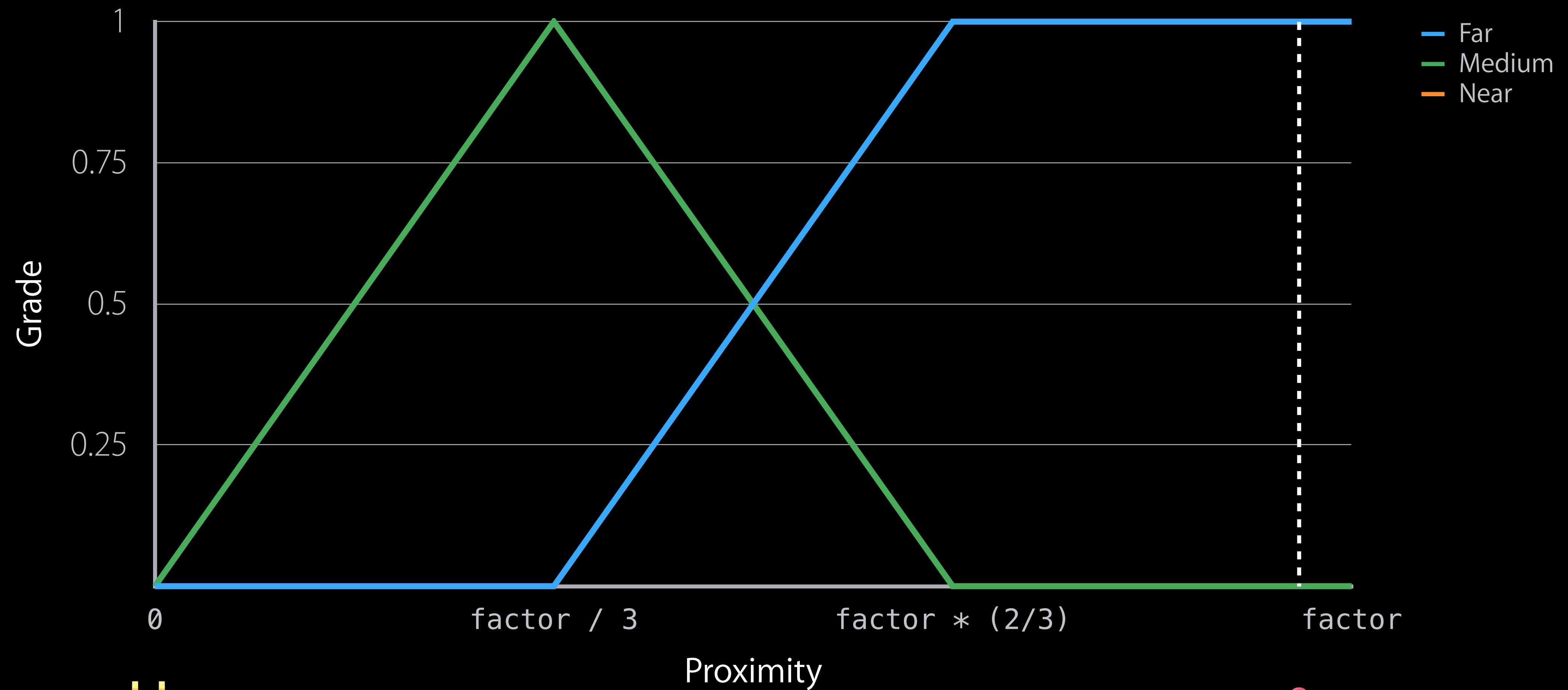
# Fuzzy Rules

Functions for proximity rules



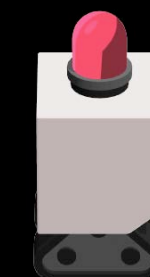
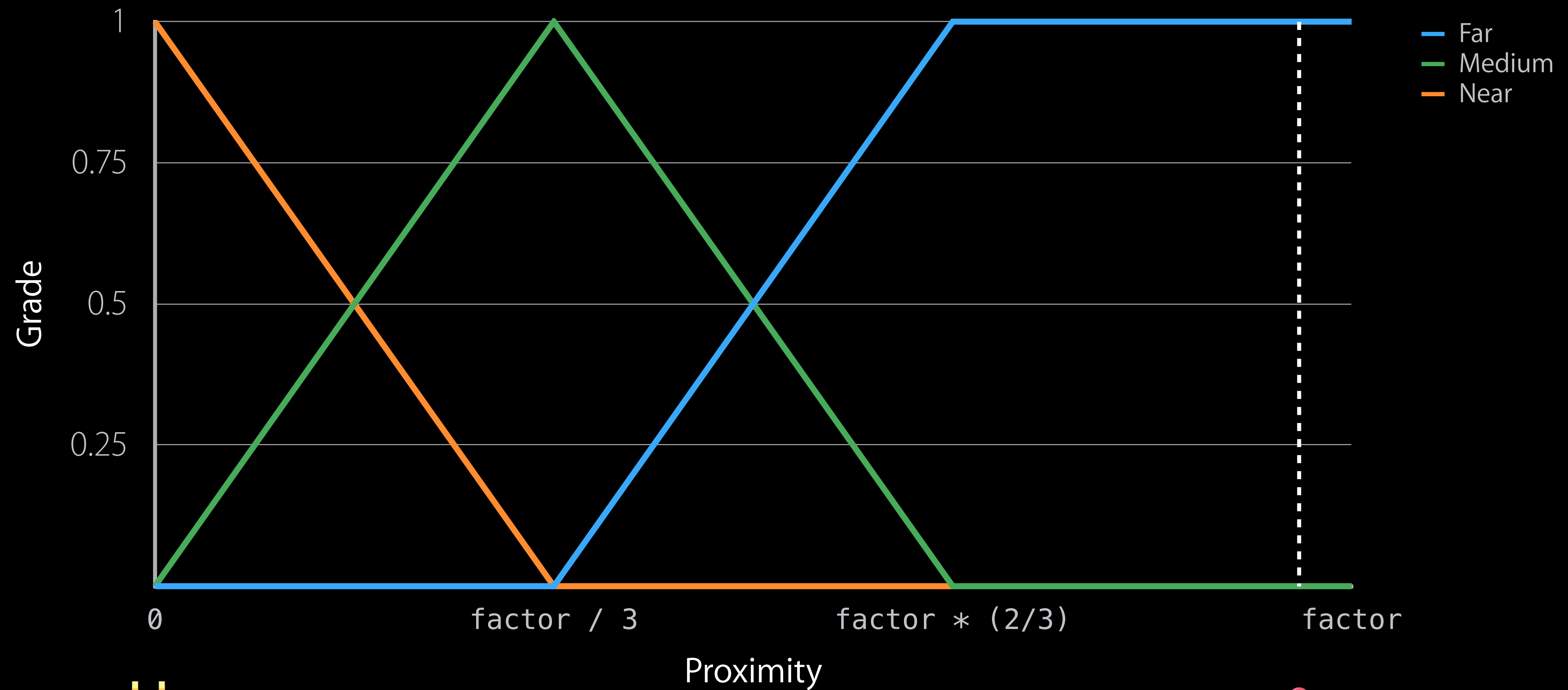
# Fuzzy Rules

Functions for proximity rules



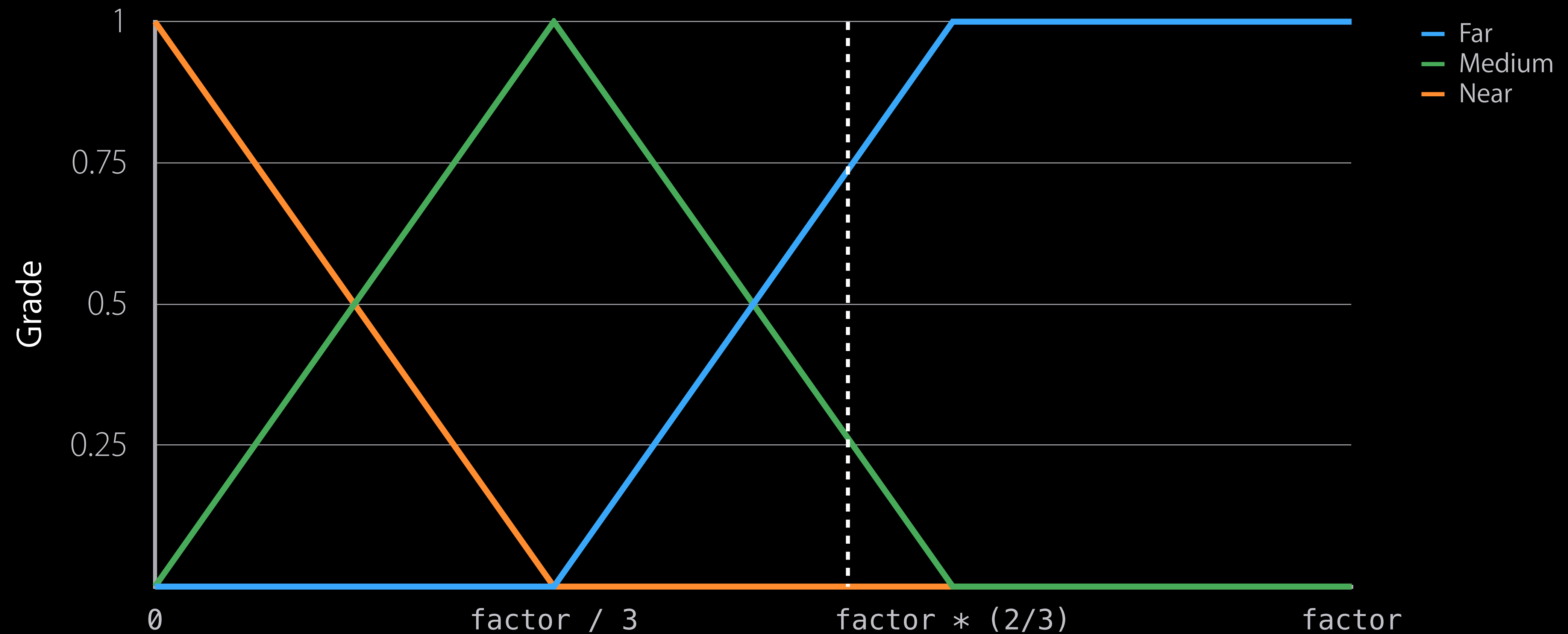
# Fuzzy Rules

Functions for proximity rules



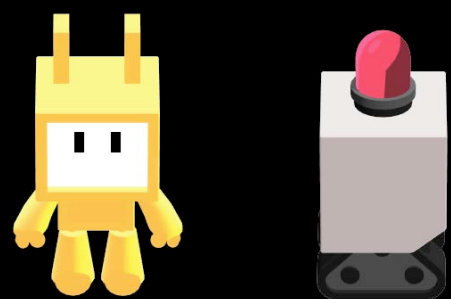
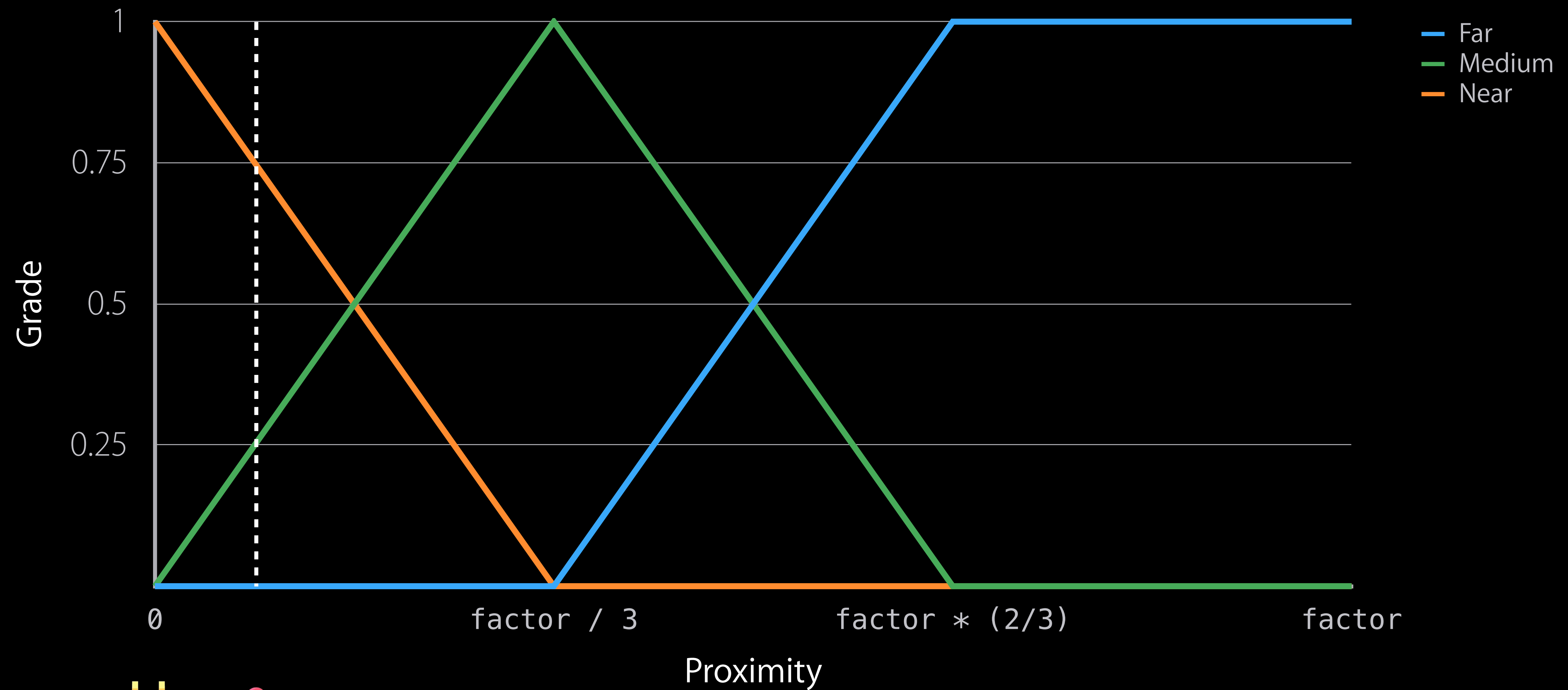
# Fuzzy Rules

Functions for proximity rules



# Fuzzy Rules

Functions for proximity rules



# Fuzzy Rules

Making decisions

% Bad TaskBots High

% Bad TaskBots Medium

% Bad TaskBots Low

PlayerBot Near

PlayerBot Medium

PlayerBot Far

Good TaskBot Near

Good TaskBot Medium

Good TaskBot Far

# Fuzzy Rules

## Making decisions

Evaluate the rules

% Bad TaskBots High	.60
% Bad TaskBots Medium	.40
% Bad TaskBots Low	.00
PlayerBot Near	.30
PlayerBot Medium	.70
PlayerBot Far	.00
Good TaskBot Near	.70
Good TaskBot Medium	.30
Good TaskBot Far	.00

# Fuzzy Rules

## Making decisions

Evaluate the rules

Combine facts

% Bad TaskBots High	.60
PlayerBot Medium	.70
Good TaskBot Medium	.30

# Fuzzy Rules

## Making decisions

Evaluate the rules

Combine facts

- `ruleSystem.minimumGradeForFacts(_:)`

Hunt PlayerBot

.30

# Fuzzy Rules

## Making decisions

Evaluate the rules

Combine facts

- `ruleSystem.minimumGradeForFacts(_:)`

Hunt PlayerBot

.30

# Fuzzy Rules

## Making decisions

Evaluate the rules

Combine facts

- `ruleSystem.minimumGradeForFacts(_:)`

Hunt PlayerBot	.30
----------------	-----

Hunt PlayerBot	.45
----------------	-----

Hunt TaskBot	.00
--------------	-----

Hunt TaskBot	.20
--------------	-----

# Fuzzy Rules

## Making decisions

Evaluate the rules

Combine facts

- `ruleSystem.minimumGradeForFacts(_:)`

Defuzzify rules

Hunt PlayerBot	.30
----------------	-----

Hunt PlayerBot	.45
----------------	-----

Hunt TaskBot	.00
--------------	-----

Hunt TaskBot	.20
--------------	-----

# Fuzzy Rules

## Making decisions

Evaluate the rules

Combine facts

- `ruleSystem.minimumGradeForFacts(_:)`

Defuzzify rules

- `facts.reduce(0.0, combine: max)`

Hunt PlayerBot	.45
Hunt TaskBot	.20

# Fuzzy Rules

## Making decisions

Evaluate the rules

Combine facts

- `ruleSystem.minimumGradeForFacts(_:)`

Defuzzify rules

- `facts.reduce(0.0, combine: max)`

Hunt the PlayerBot

Hunt PlayerBot	.45
Hunt TaskBot	.20

# TaskBot Intelligence

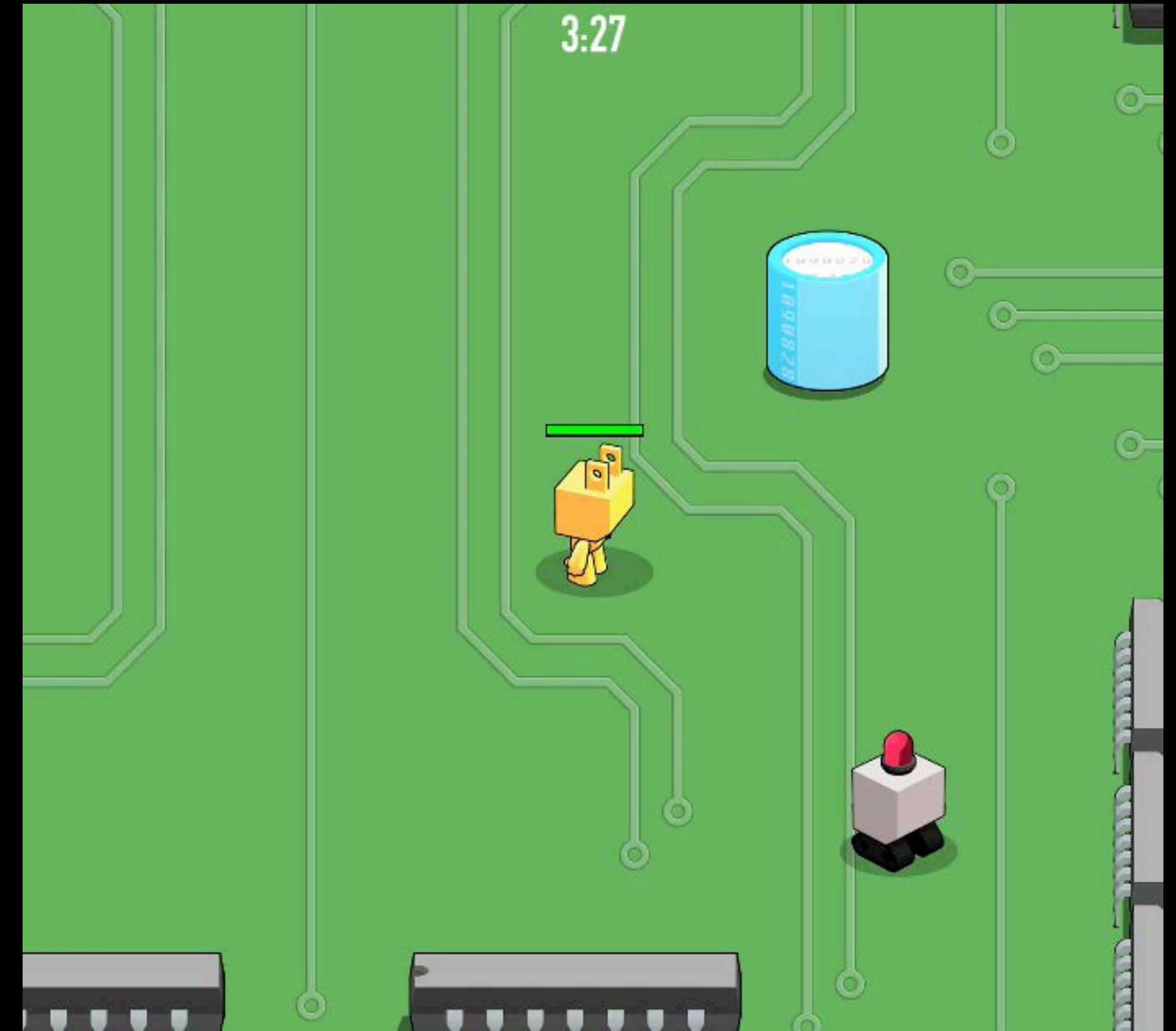
OK, hunt the PlayerBot

# TaskBot Intelligence

OK, hunt the PlayerBot

Get to the **PlayerBot**

- Often straightforward

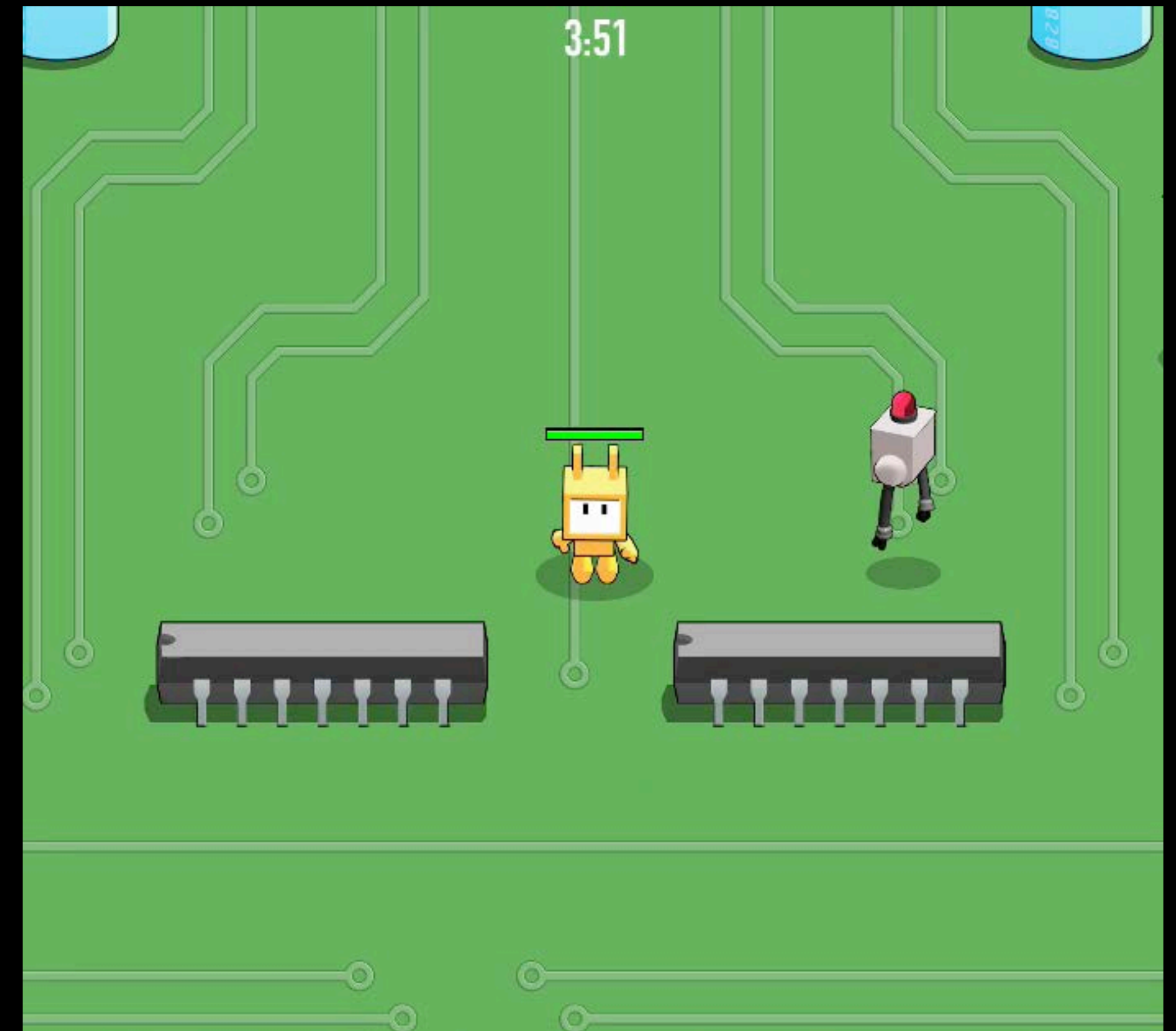


# TaskBot Intelligence

OK, hunt the PlayerBot

Get to the **PlayerBot**

- Often straightforward
- Obstacles present a challenge

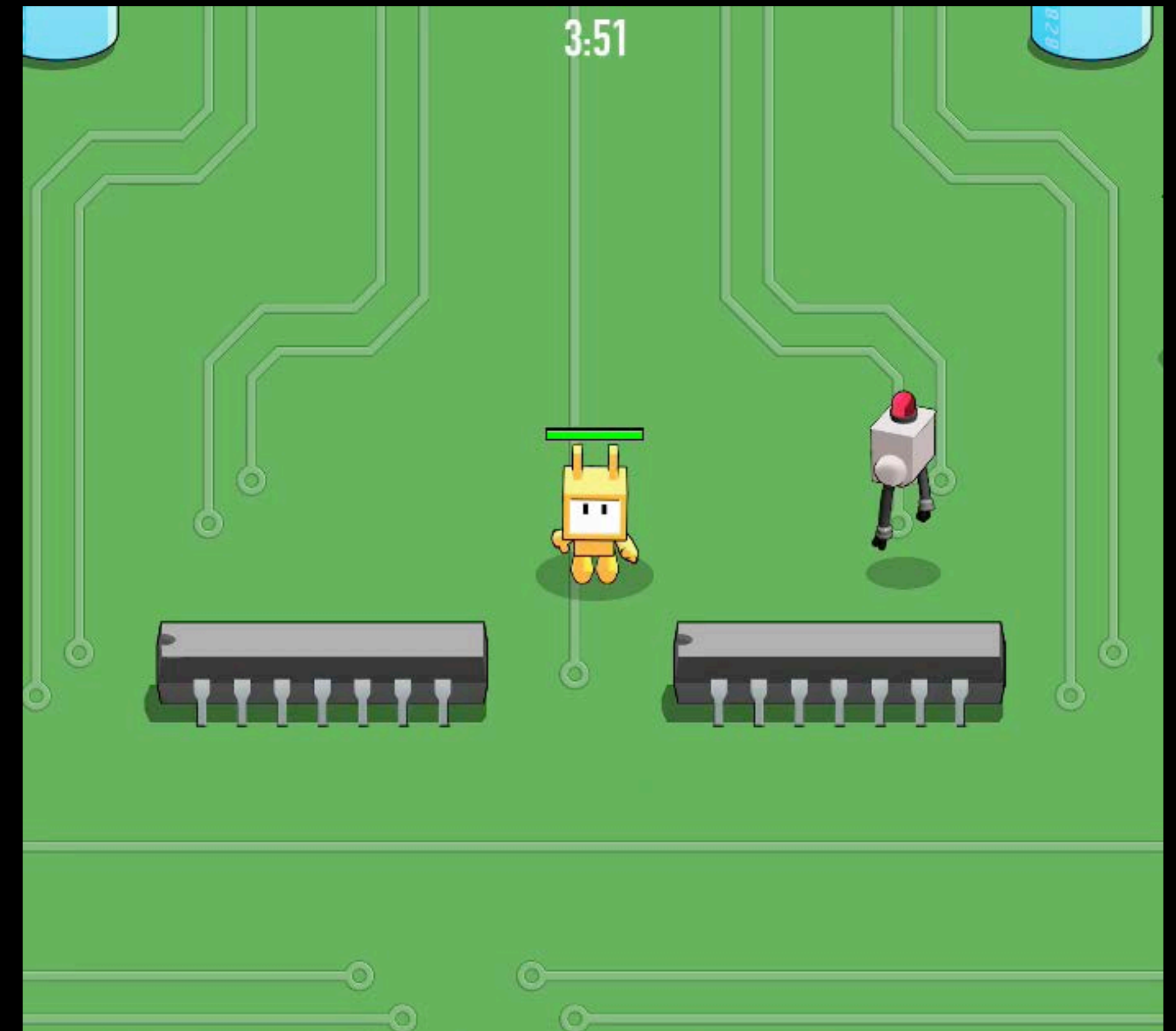


# TaskBot Intelligence

OK, hunt the PlayerBot

Get to the **PlayerBot**

- Often straightforward
- Obstacles present a challenge



# TaskBot Intelligence

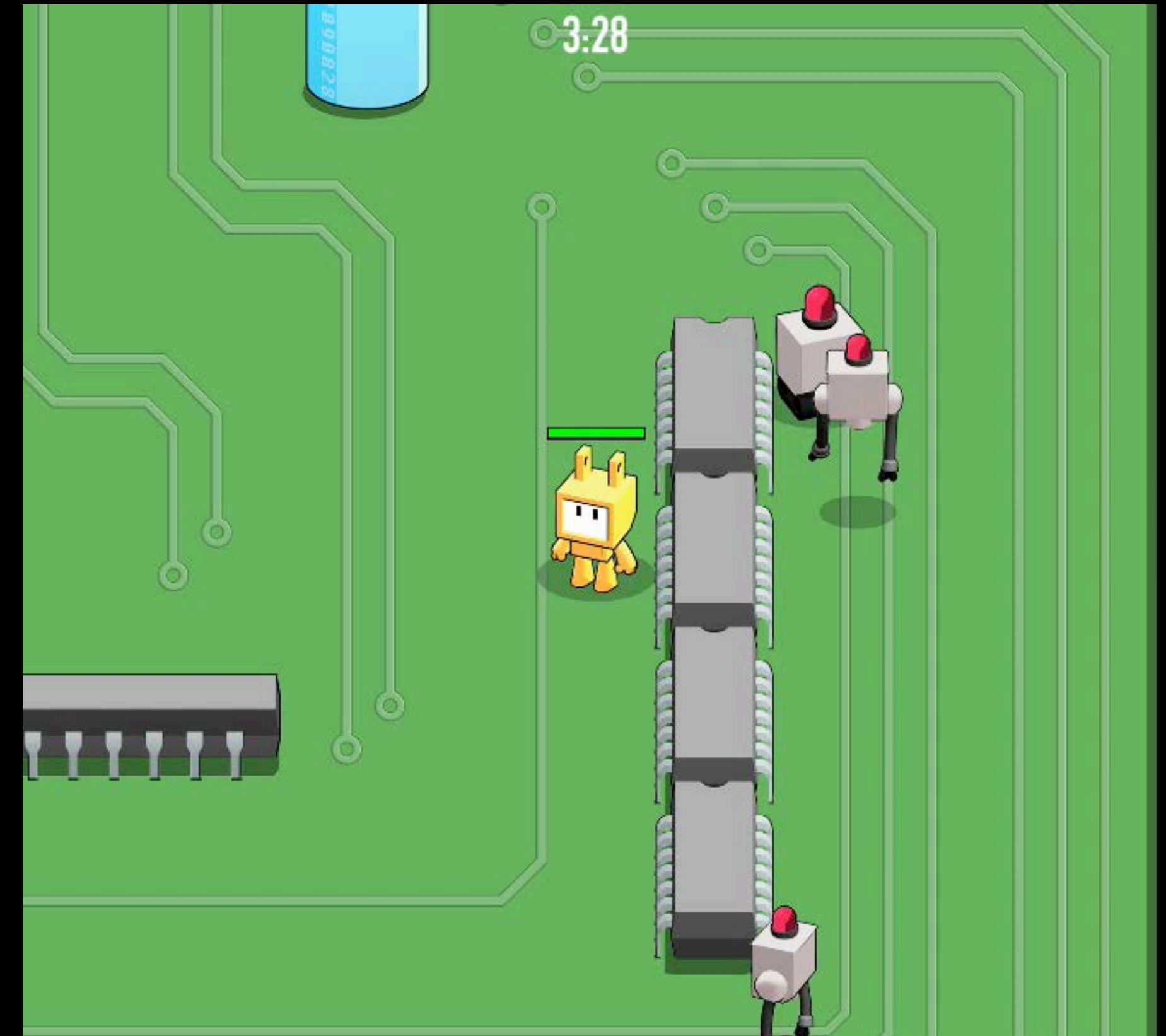
OK, hunt the PlayerBot

Get to the **PlayerBot**

- Often straightforward
- Obstacles present a challenge

Pathfinding via **GameplayKit**

- Conveniences for **SpriteKit**
- Up and running quickly



# TaskBot Intelligence

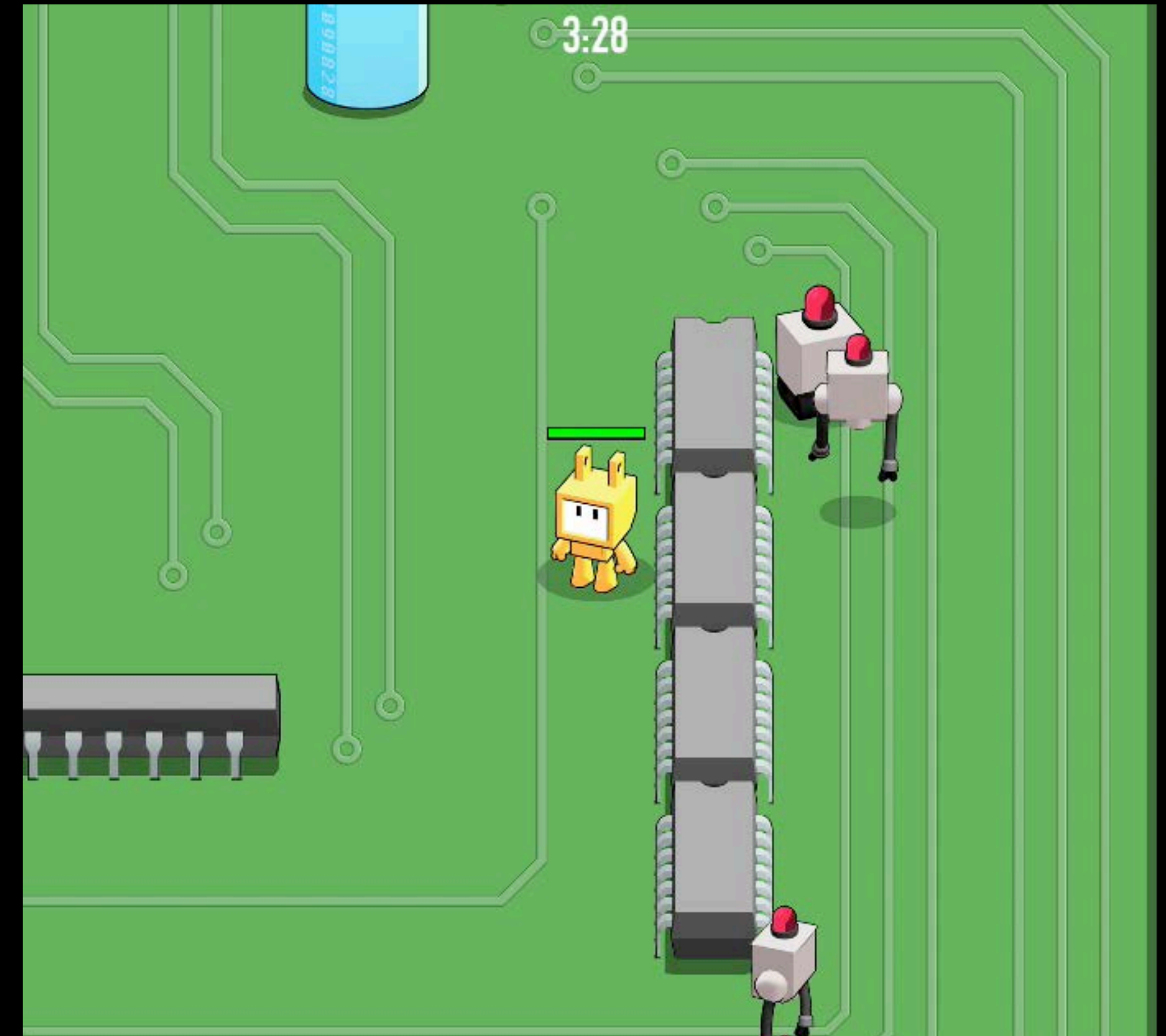
OK, hunt the PlayerBot

Get to the **PlayerBot**

- Often straightforward
- Obstacles present a challenge

Pathfinding via **GameplayKit**

- Conveniences for **SpriteKit**
- Up and running quickly



# Pathfinding

A way around obstacles

# Pathfinding

A way around obstacles

```
// Convert node physics bodies into GKPolygonObstacles.  
let obstacles = SKNode.obstaclesFromNodePhysicsBodies(self["//obstacles"])
```

# Pathfinding

A way around obstacles

```
// Convert node physics bodies into GKPolygonObstacles.  
let obstacles = SKNode.obstaclesFromNodePhysicsBodies(self["//obstacles"])  
  
// Construct a GKObstacleGraph.  
let graph = GKObstacleGraph(obstacles: obstacles, bufferRadius: 30.0)
```

# Pathfinding

A way around obstacles

```
// Convert node physics bodies into GKPolygonObstacles.  
let obstacles = SKNode.obstaclesFromNodePhysicsBodies(self["//obstacles"])  
  
// Construct a GKObstacleGraph.  
let graph = GKObstacleGraph(obstacles: obstacles, bufferRadius: 30.0)  
  
// Connect the TaskBot and PlayerBot via their positions.  
let startNode = graph.connectNodeUsingObstacles(taskBot.position)  
let endNode = graph.connectNodeUsingObstacles(playerBot.position)
```

[illegible]

# TaskBot Intelligence

All mapped out with no way to go

# TaskBot Intelligence

All mapped out with no way to go

**GKAgent2D** to the rescue

- Configure a **GKBehavior**
- **GKGoal** provides path goals
- SpriteKit updates via delegate

# Agent Behavior

A smooth motivator

# Agent Behavior

A smooth motivator

```
// Construct a path from the pathNodes.  
let path = GKPath(graphNodes: pathNodes, radius: 20.0)
```

# Agent Behavior

A smooth motivator

```
// Construct a path from the pathNodes.  
let path = GKPath(graphNodes: pathNodes, radius: 20.0)  
  
// Create a new behavior.  
let behavior = GKBehavior()
```

# Agent Behavior

A smooth motivator

```
// Construct a path from the pathNodes.  
let path = GKPath(graphNodes: pathNodes, radius: 20.0)  
  
// Create a new behavior.  
let behavior = GKBehavior()  
  
// Add goals to follow and stay on the path.  
let followPathGoal = GKGoal(toFollowPath: path, maxPredictionTime: 1.0,  
    forward: true)  
behavior.setWeight(1.0, forGoal: followPathGoal)  
  
let stayOnPathGoal = GKGoal(toStayOnPath: path, maxPredictionTime: 1.0)  
behavior.setWeight(1.0, forGoal: stayOnPathGoal)
```

# Agent Behavior

Move along, please

# Agent Behavior

Move along, please

```
// Assign the behavior to the agent.  
agent.behavior = behavior
```

# Agent Behavior

Move along, please

```
// Assign the behavior to the agent.
```

```
agent.behavior = behavior
```

```
// Agent will update based on the behavior.
```

```
// Its delegate is notified before and after changes.
```

# Agent Behavior

Move along, please

```
// Assign the behavior to the agent.  
agent.behavior = behavior  
  
// Agent will update based on the behavior.  
// Its delegate is notified before and after changes.  
  
func agentWillUpdate(agent: GKAgent) {  
    // TIP: Update agent position to match node position in SpriteKit.  
}  

```

# Agent Behavior

Move along, please

```
// Assign the behavior to the agent.  
agent.behavior = behavior  
  
// Agent will update based on the behavior.  
// Its delegate is notified before and after changes.  
  
func agentWillUpdate(agent: GKAgent) {  
    // TIP: Update agent position to match node position in SpriteKit.  
}  
  
func agentDidUpdate(agent: GKAgent) {  
    // TIP: Update node position in SpriteKit to match agent position.  
}
```

# TaskBot Intelligence

Just the beginning

2:20



# TaskBot Intelligence

Just the beginning

2:20



# Deployment and Delivery

Michael DeWitt Sample Code Engineer



Time to Fun

# Initial Download

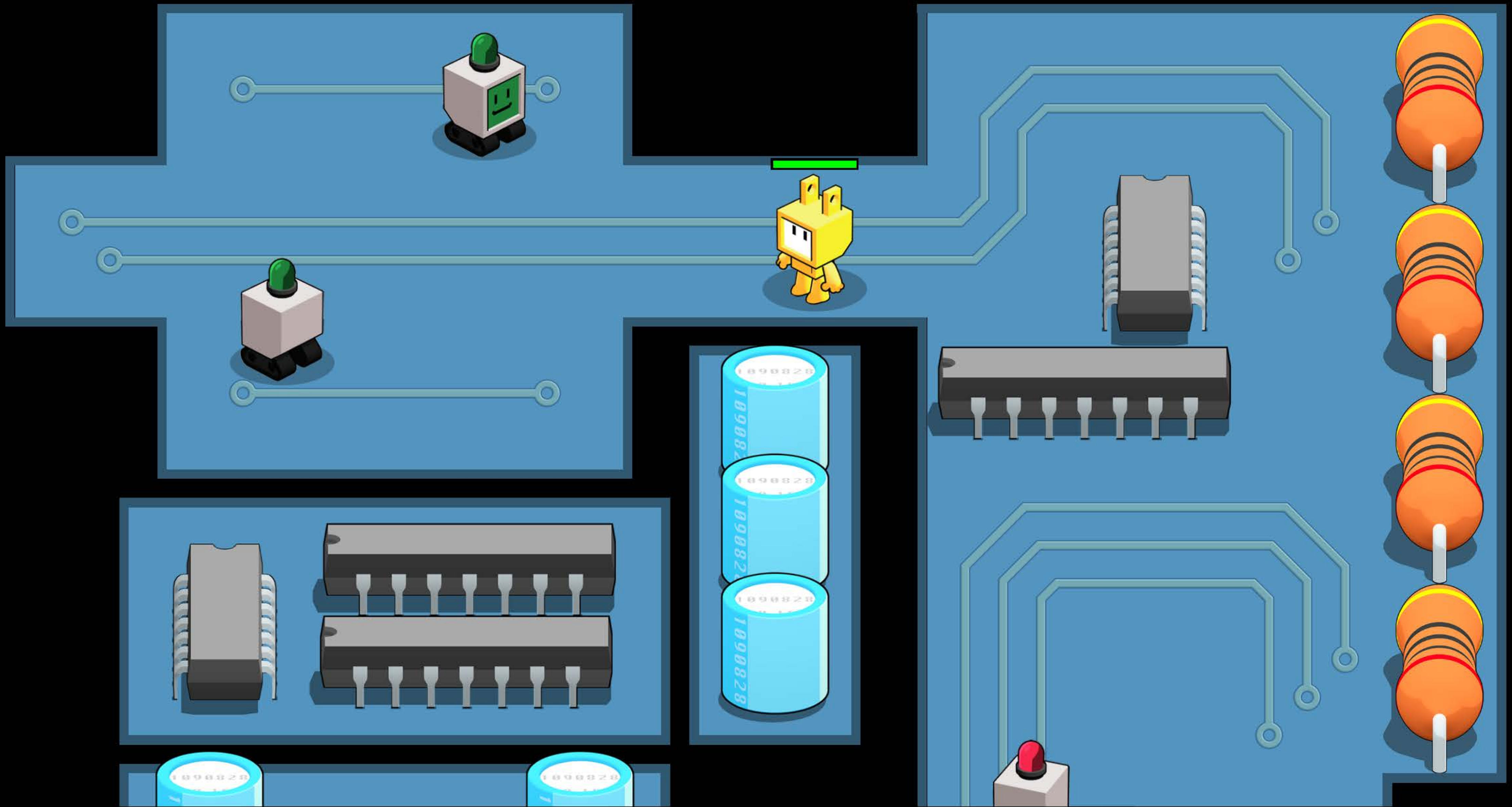
# Initial Download

**This item is over 100MB.**  
DemoBots will not download  
until you connect to Wi-Fi.

Cancel

OK

2:43



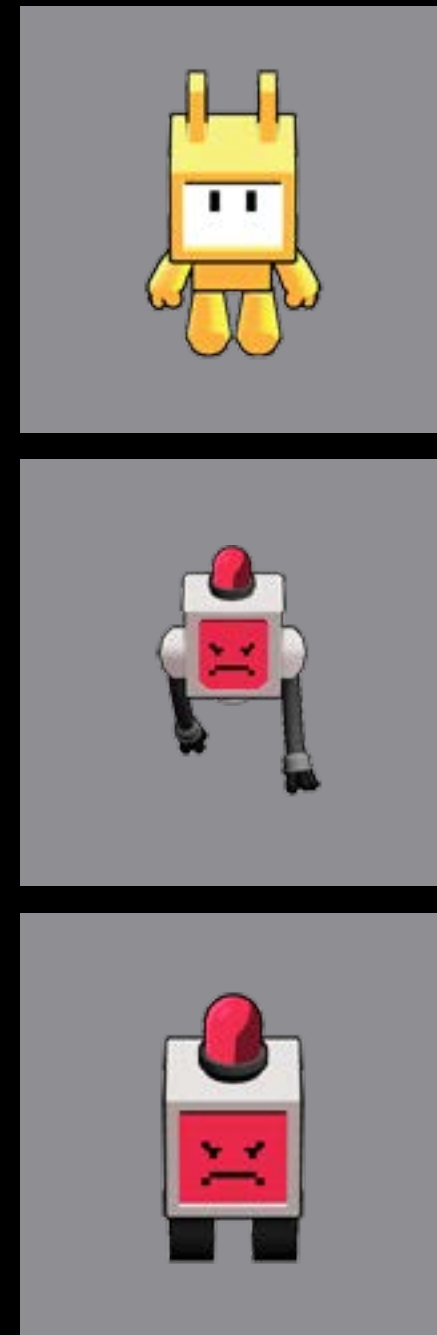




6 MB

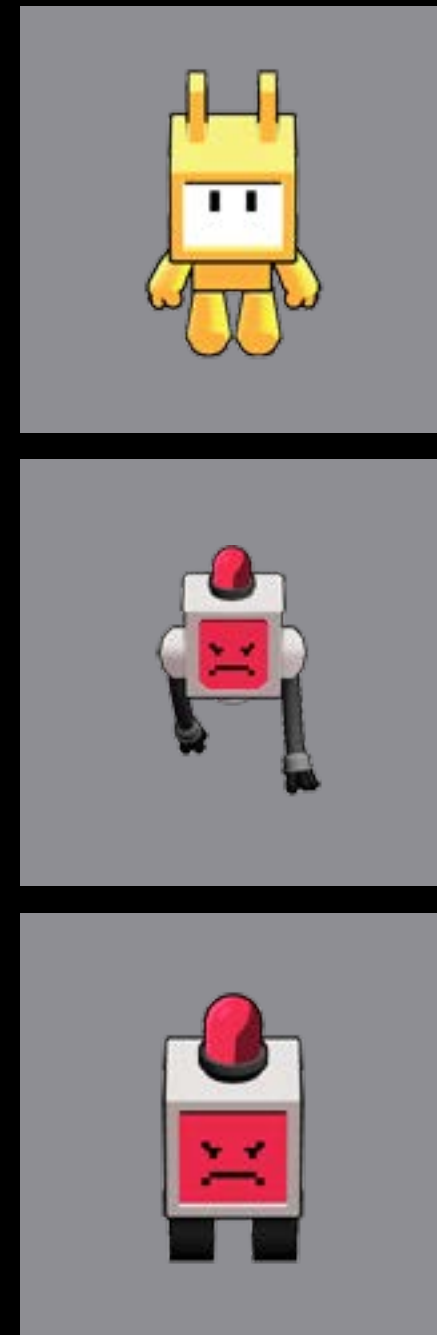
6 MB x

3 Bots



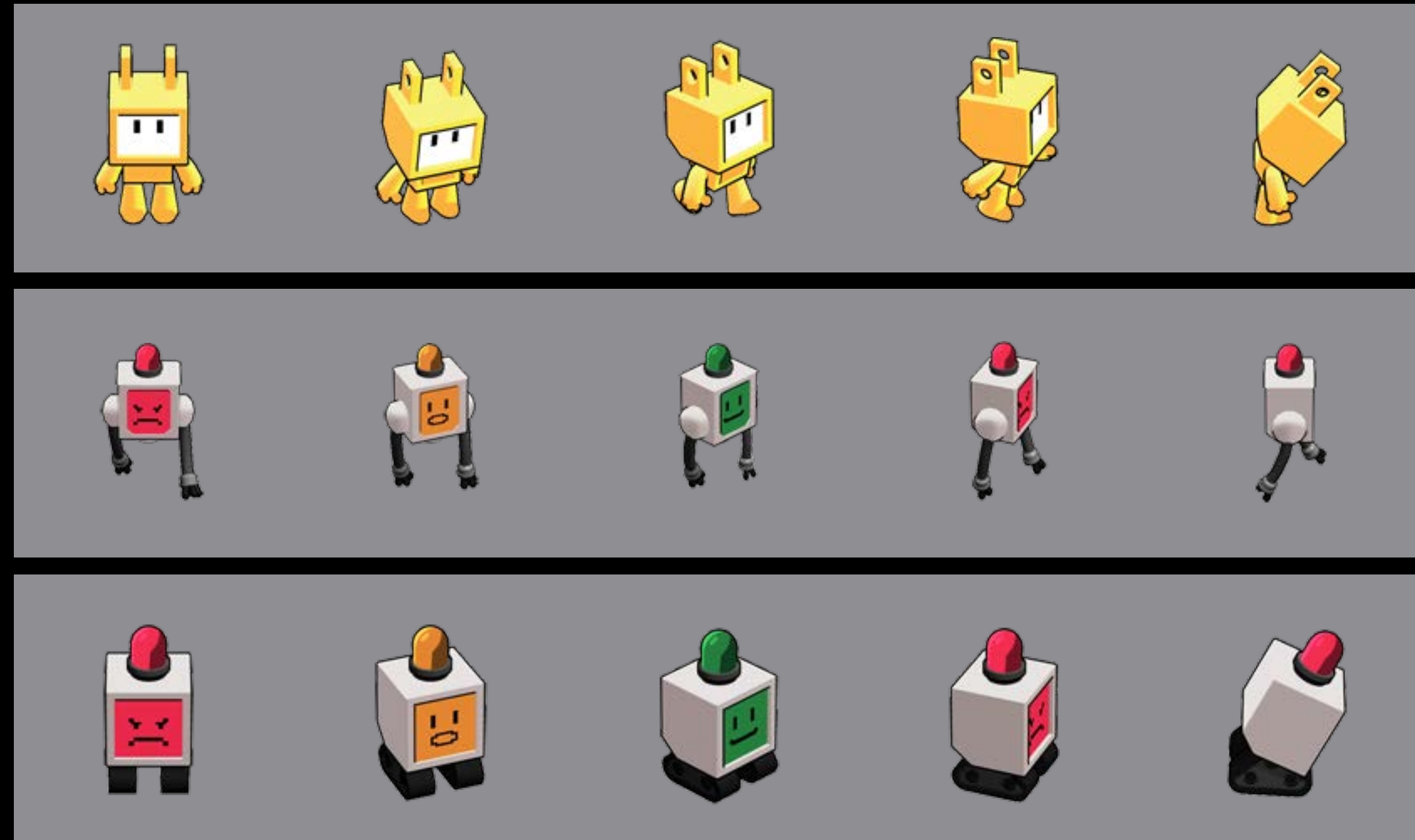
6 MB ×

3 Bots

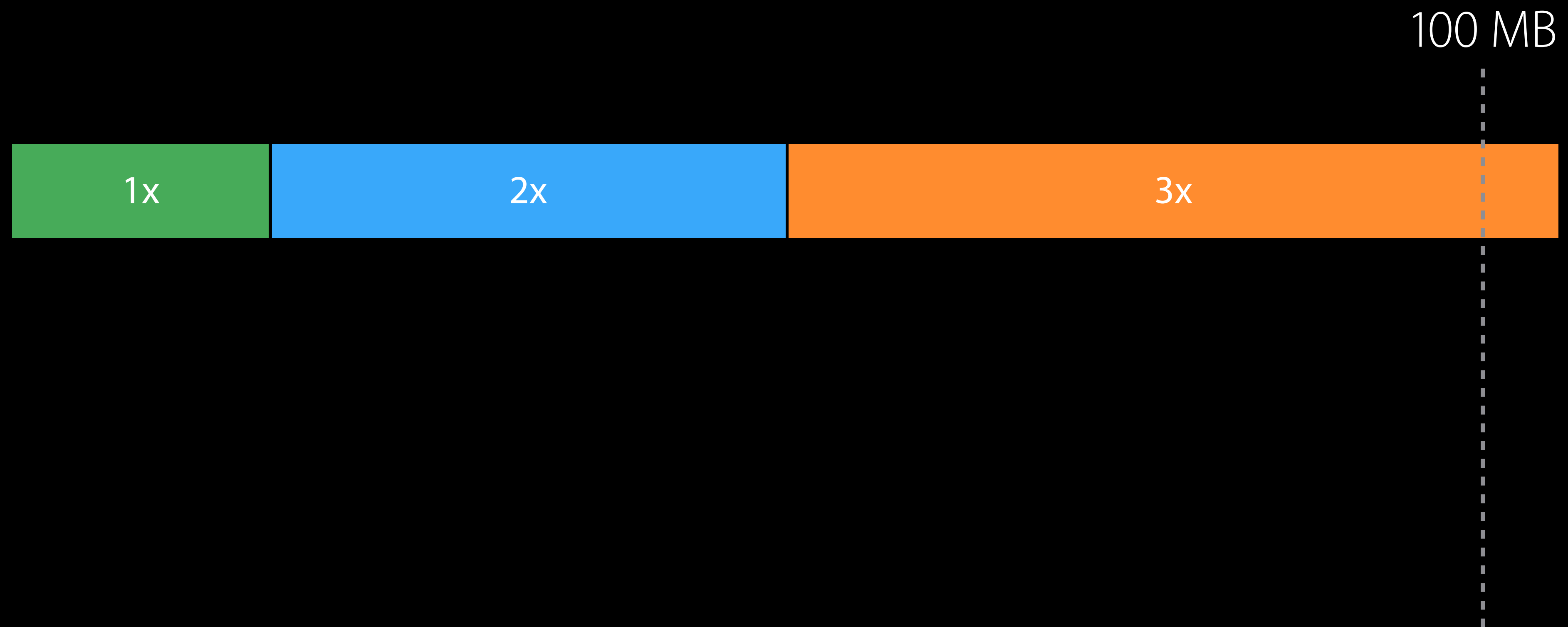


×

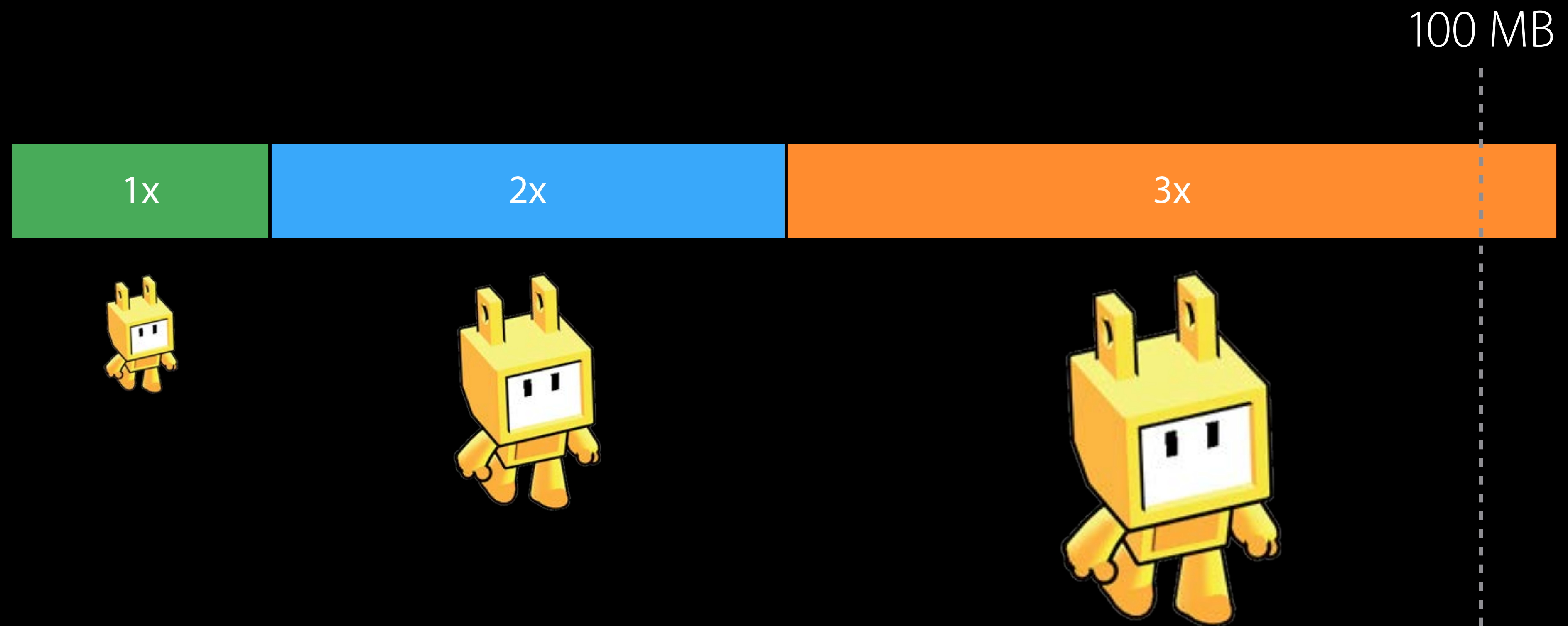
5 Actions



# In Your App

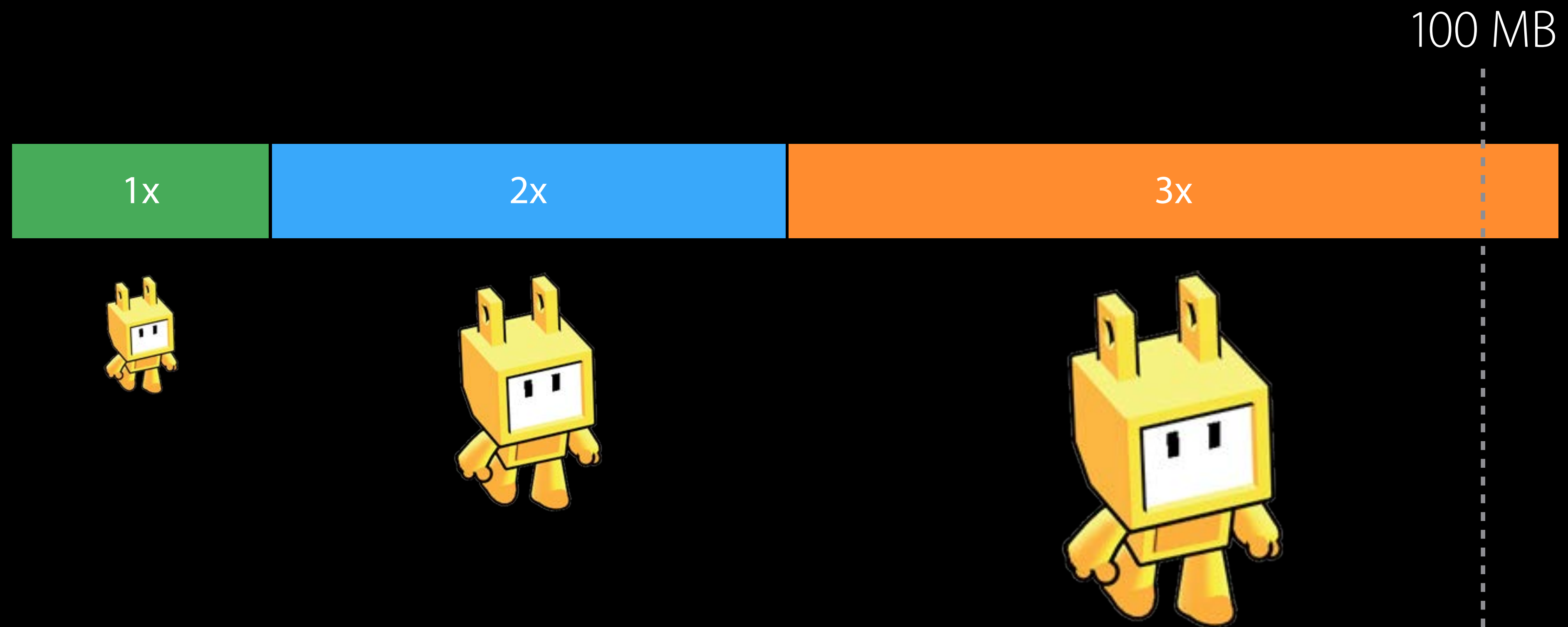


# In Your App



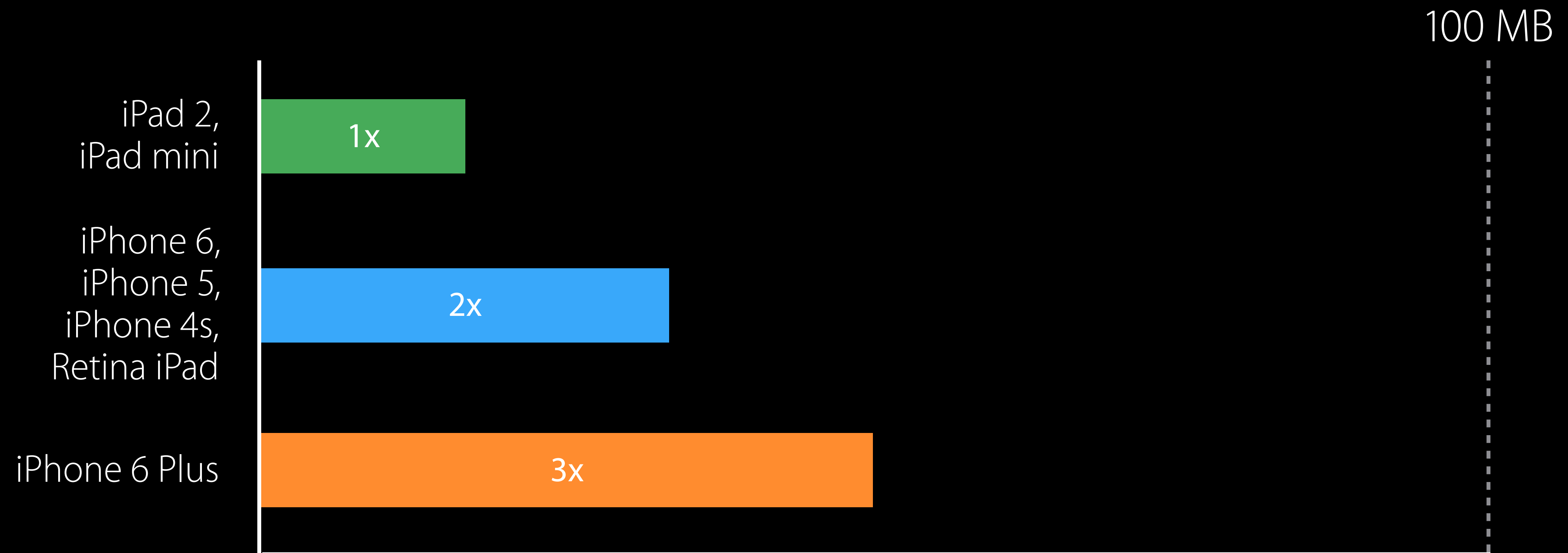
# App Slicing

NEW

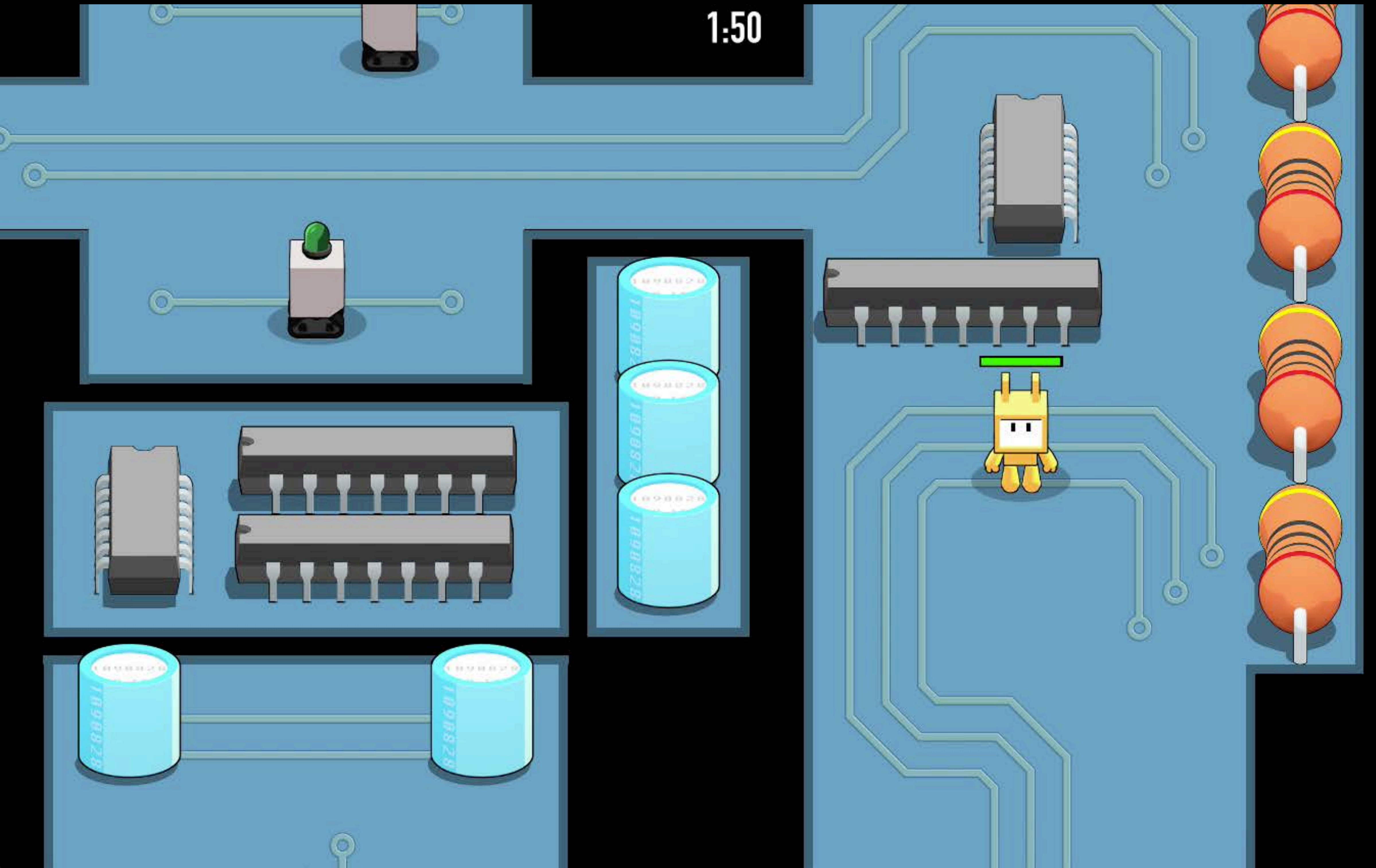


# App Slicing

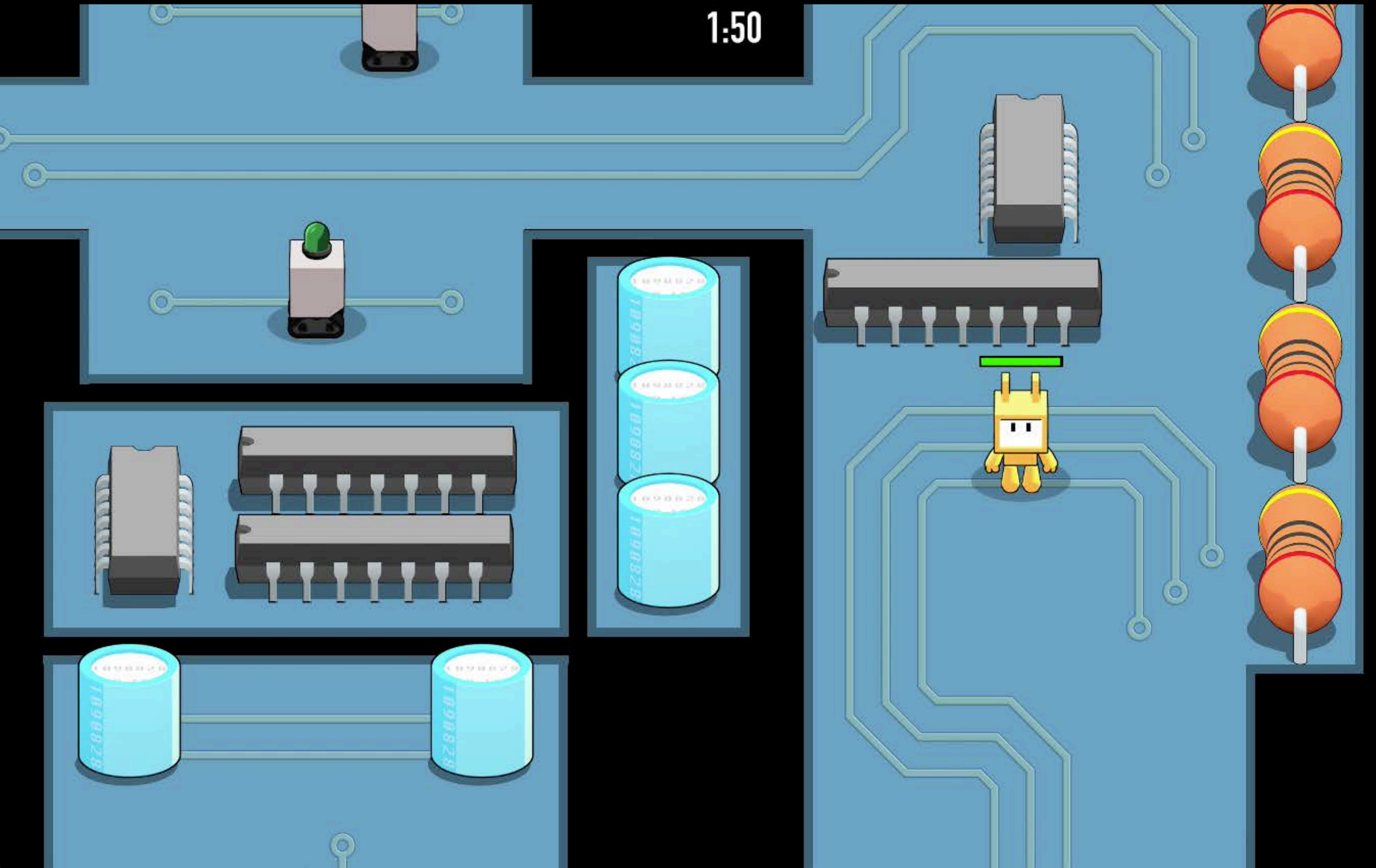
NEW

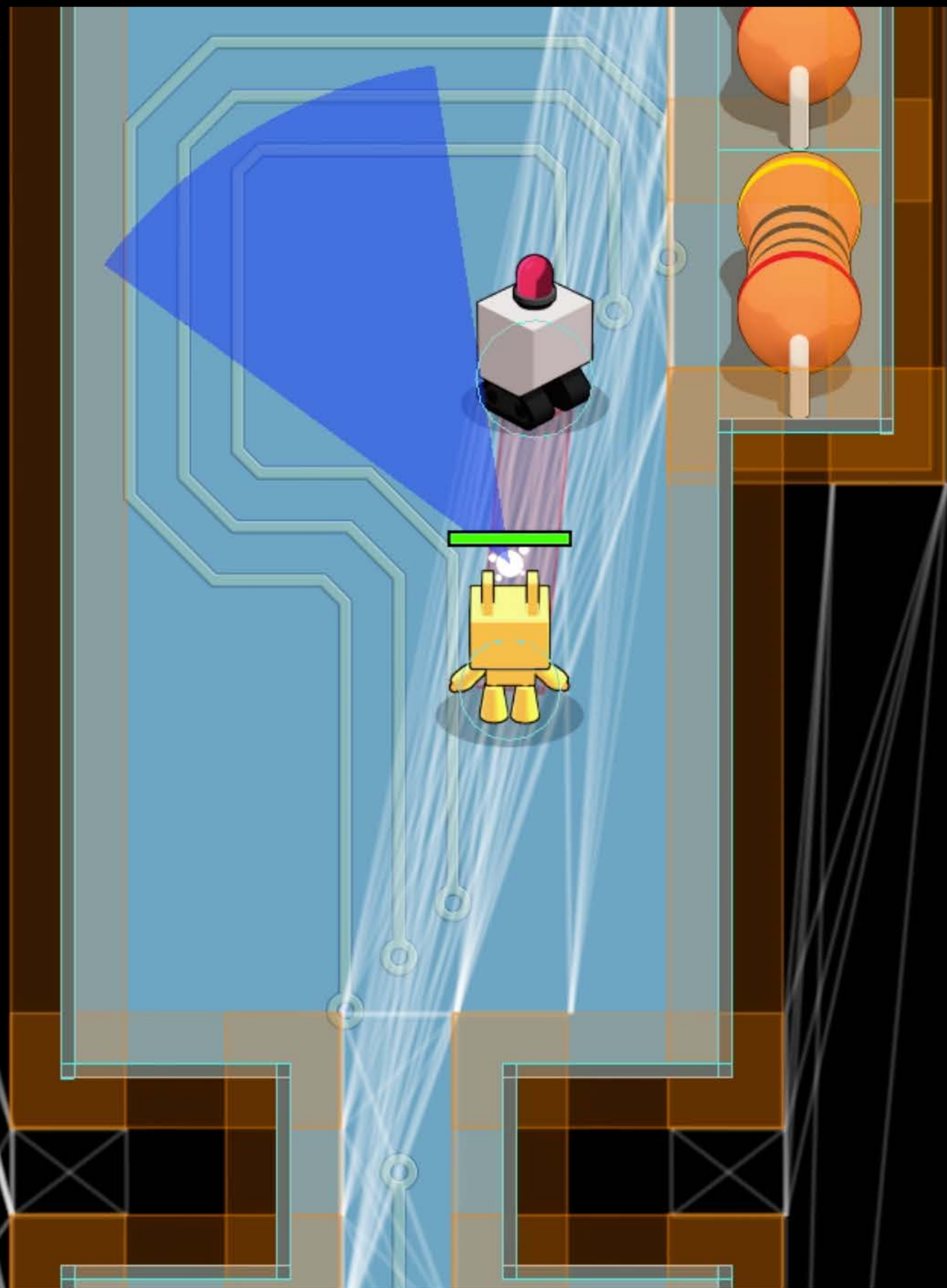
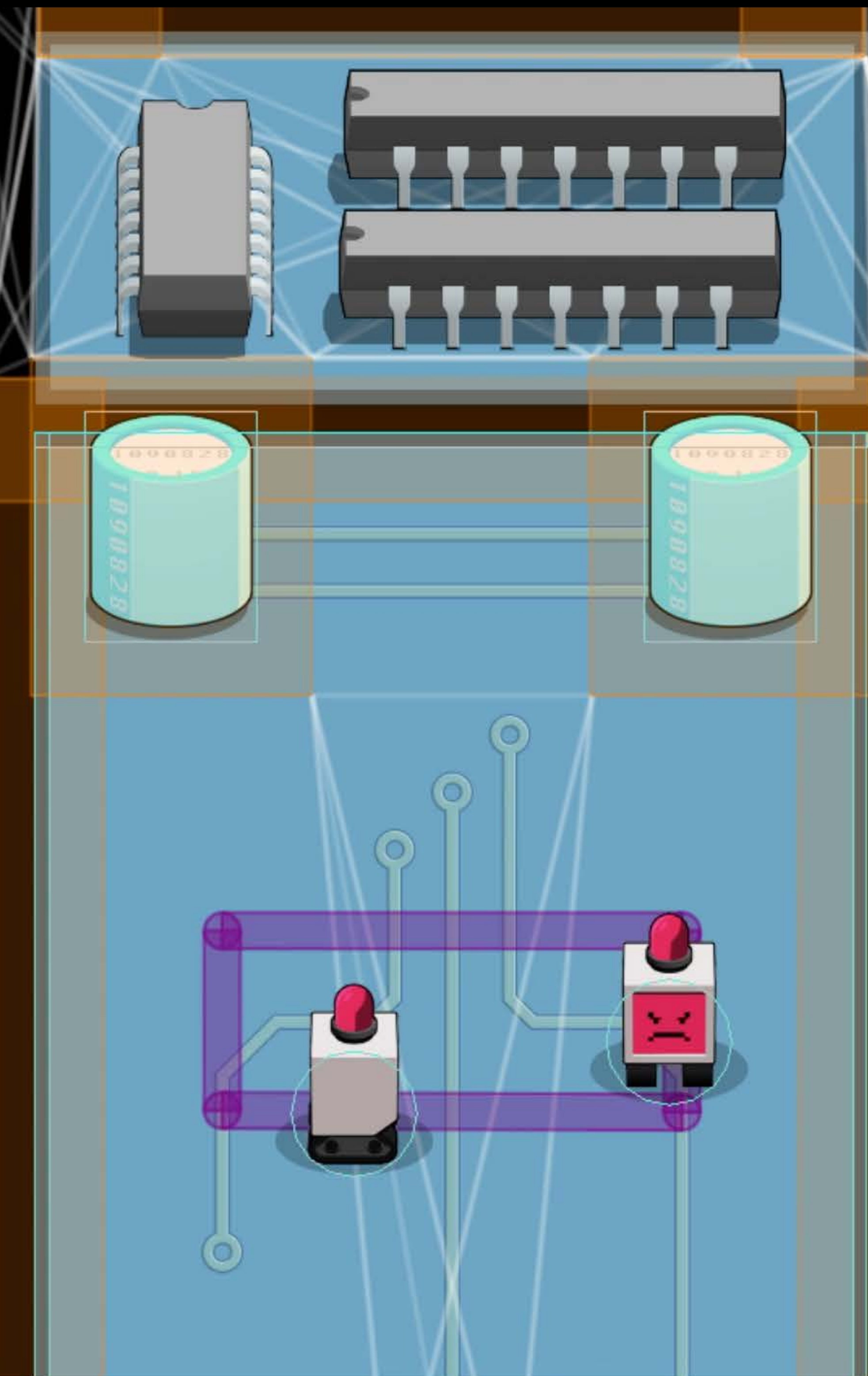


1:50



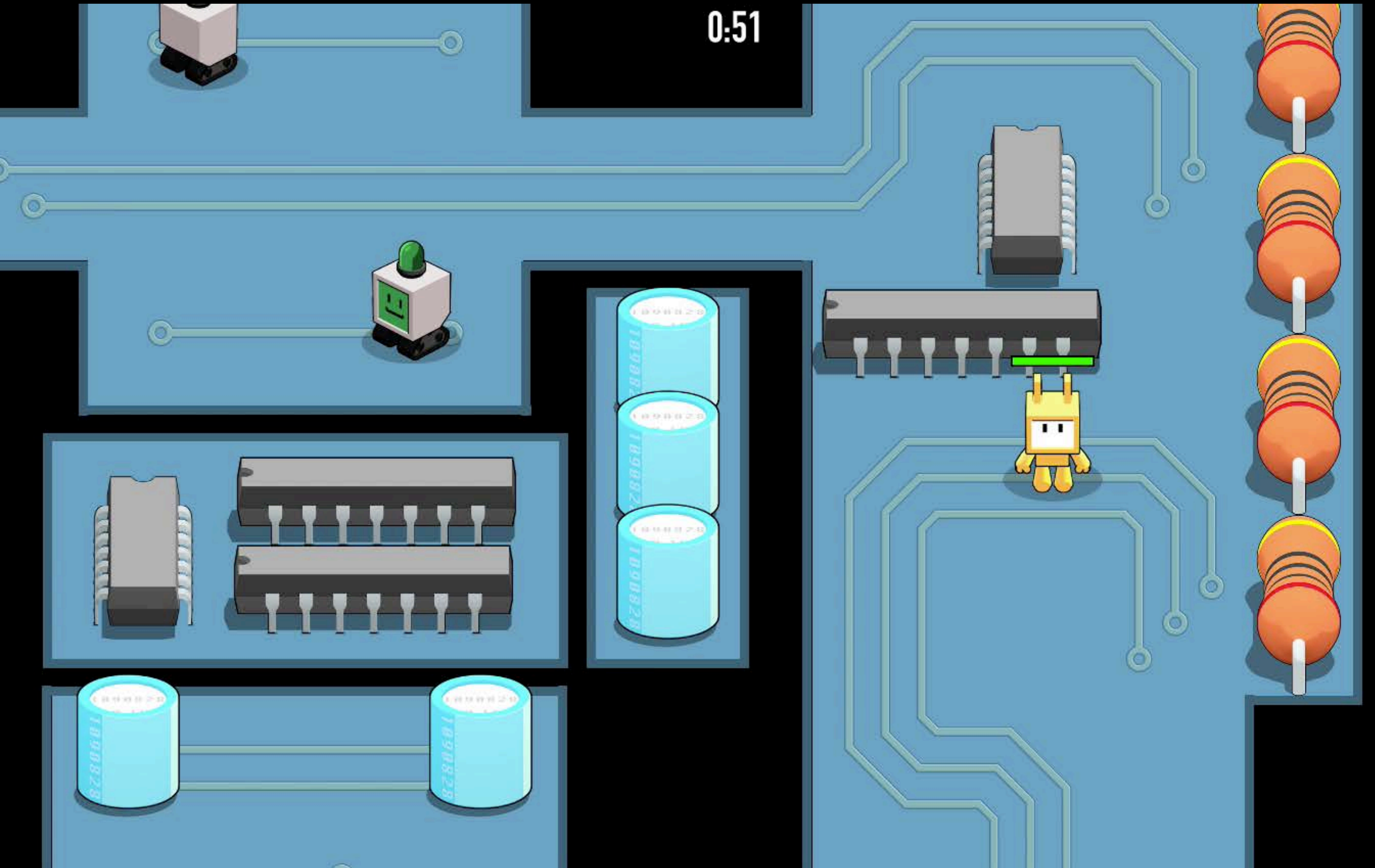
1:50



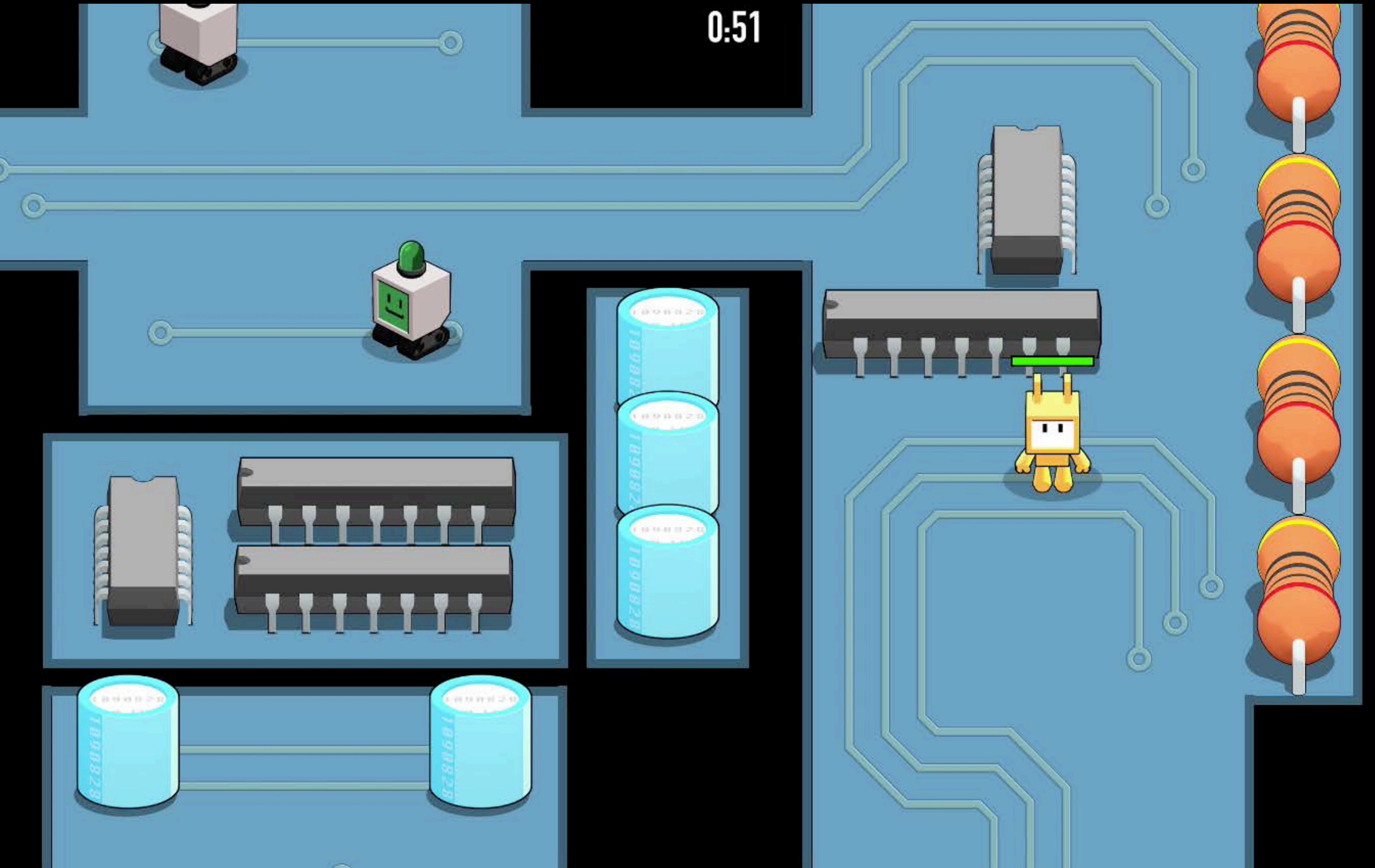


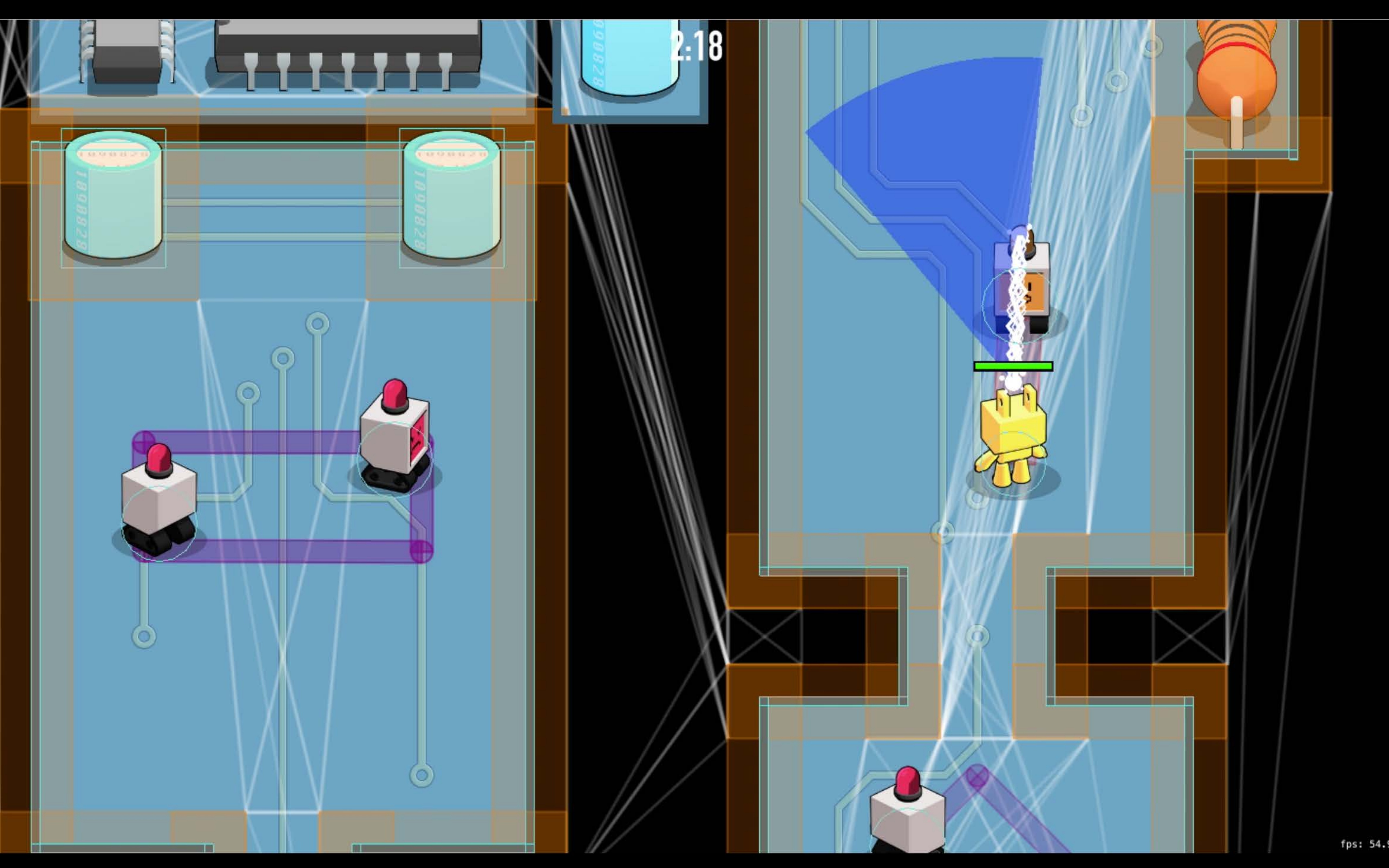
16 Orientations

0:51



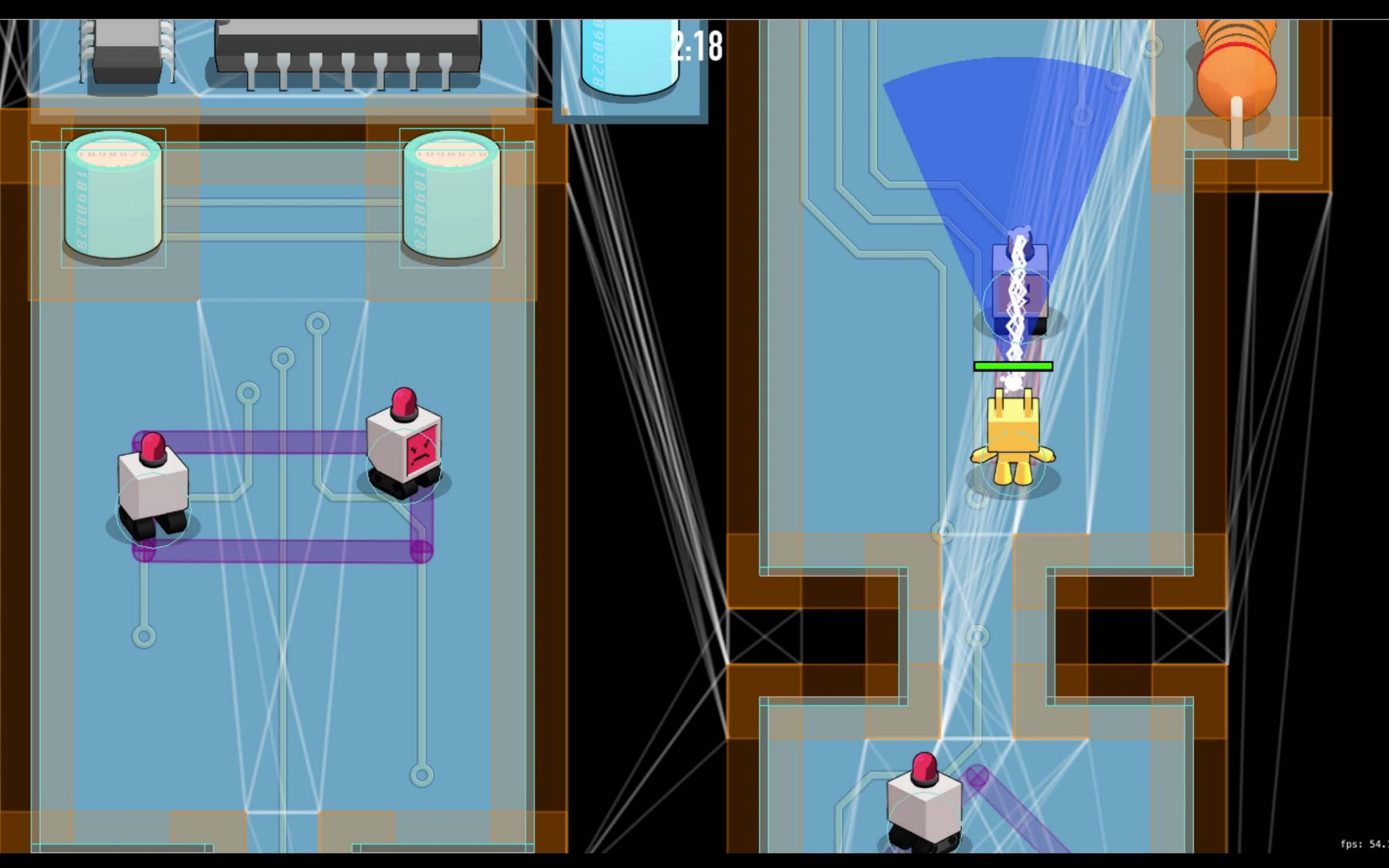
0:51





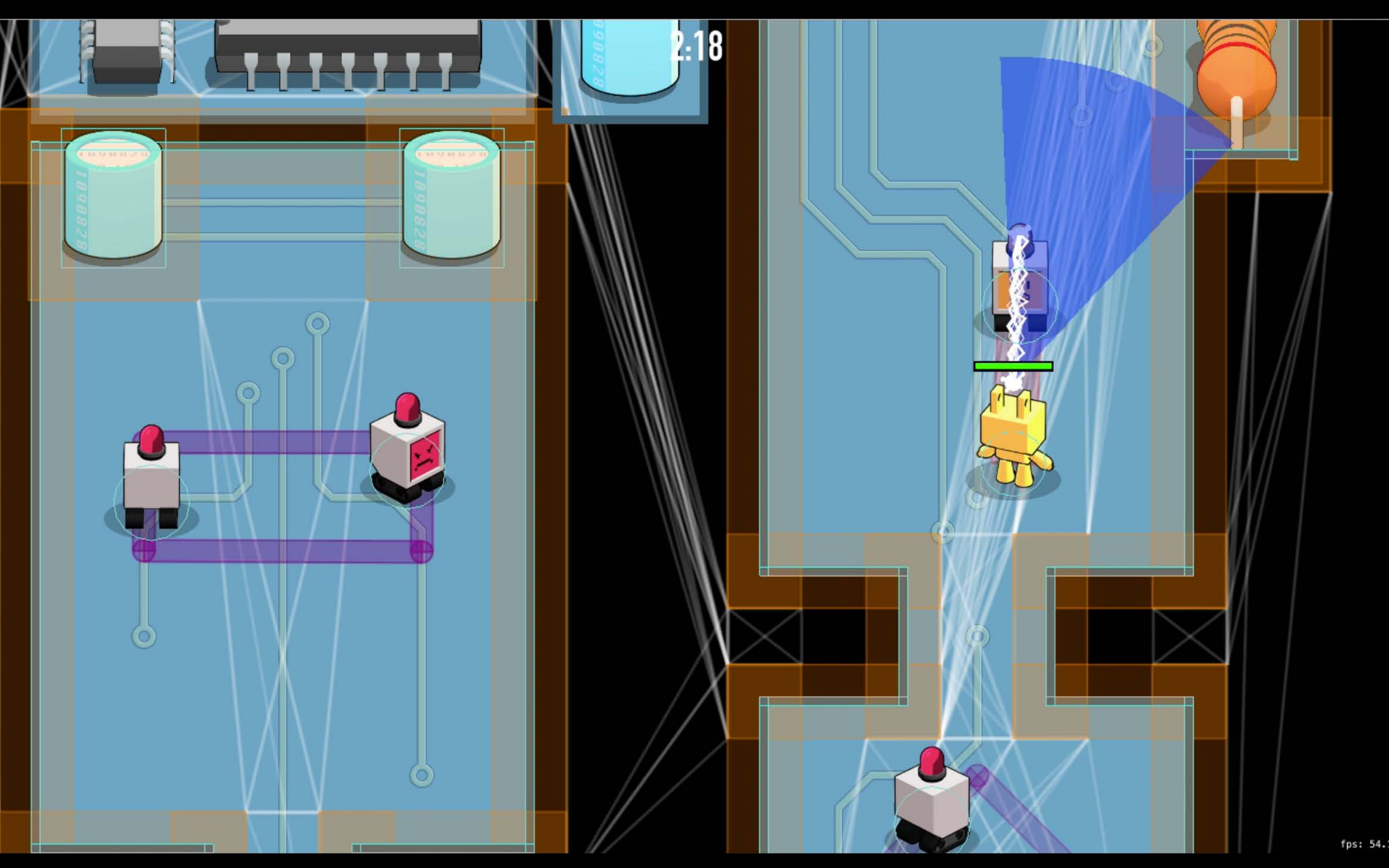
2:18

fps: 54.9



2:18

fps: 54.



# App Slicing

In DemoBots

# App Slicing

## In DemoBots

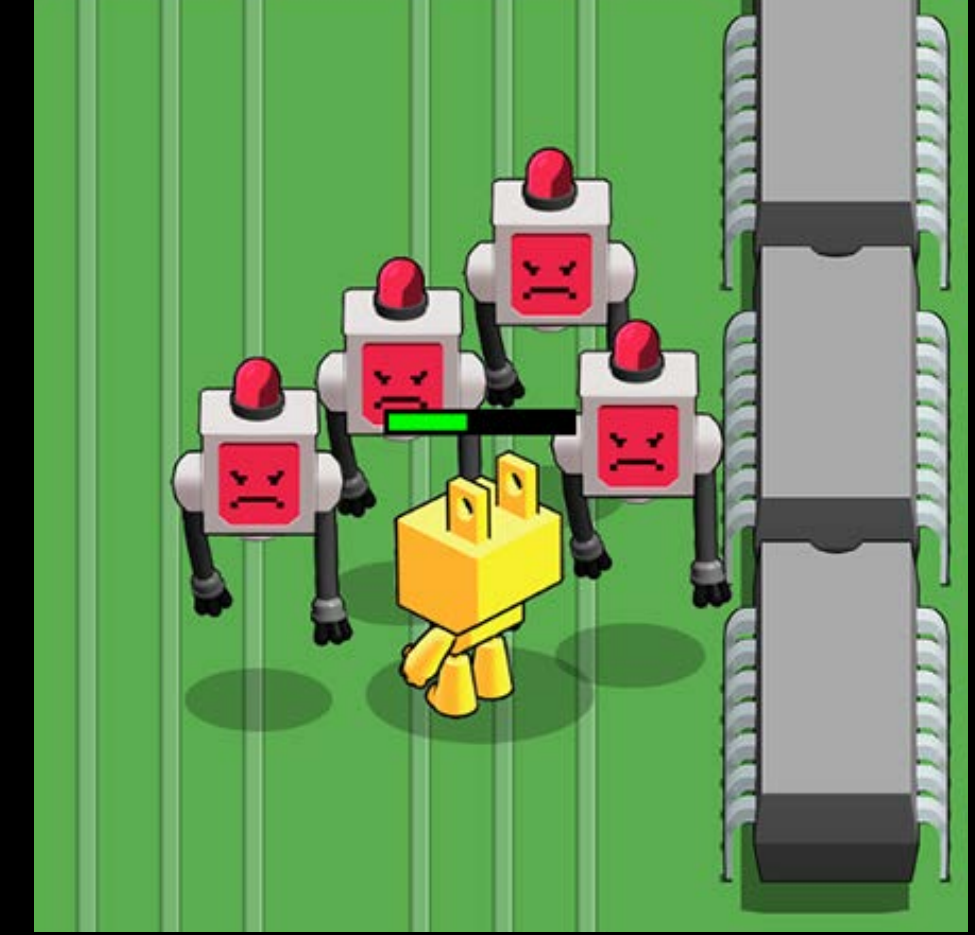
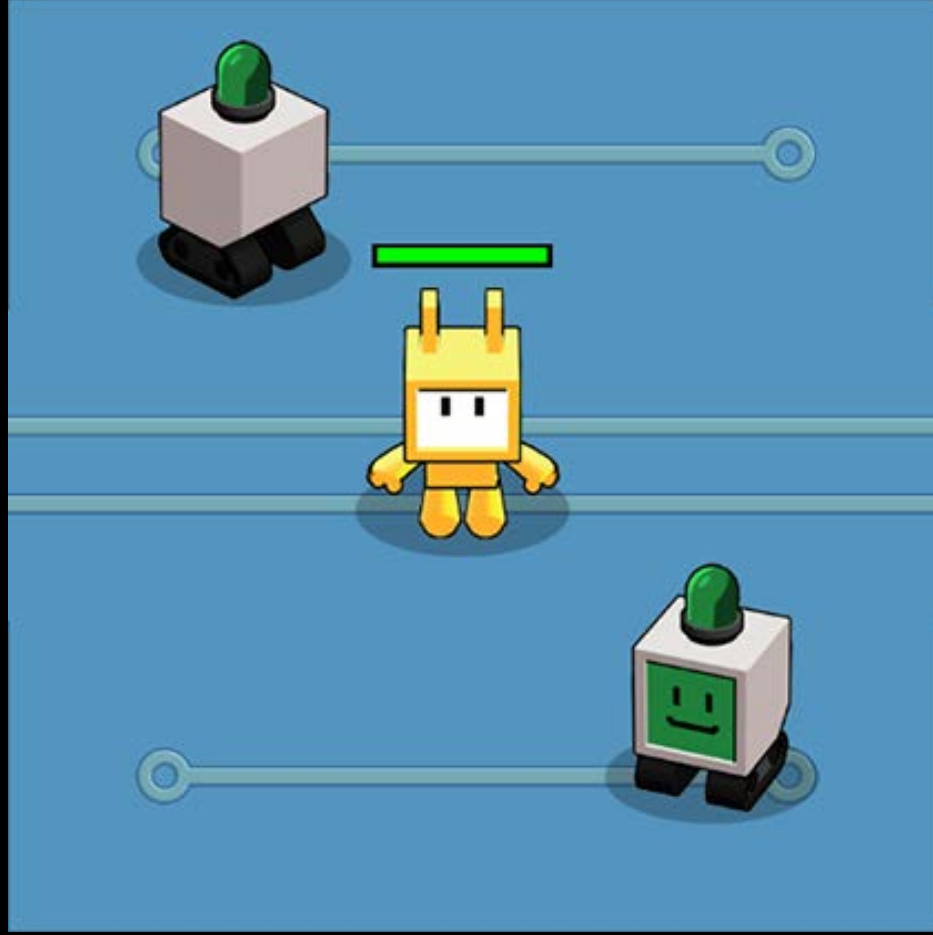
Texture atlases in asset catalogs

- Decrease the app size
- Improve gameplay with 16-way animations

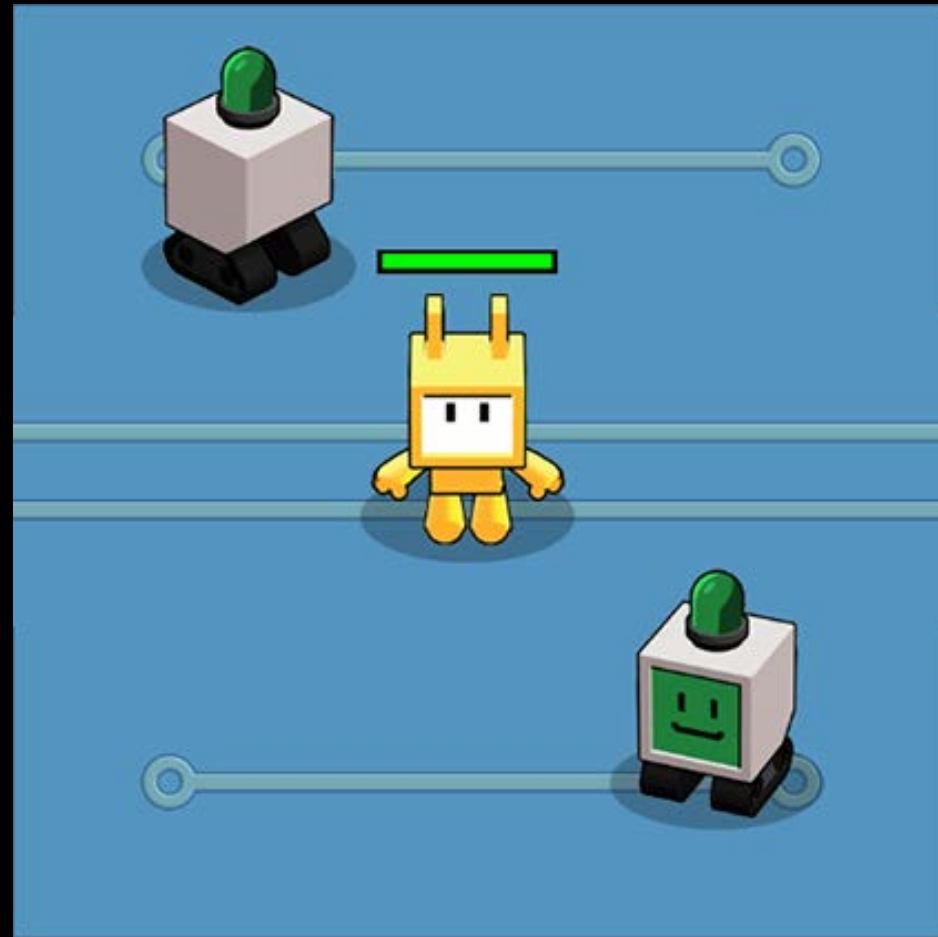
NEW

# On Demand Resources

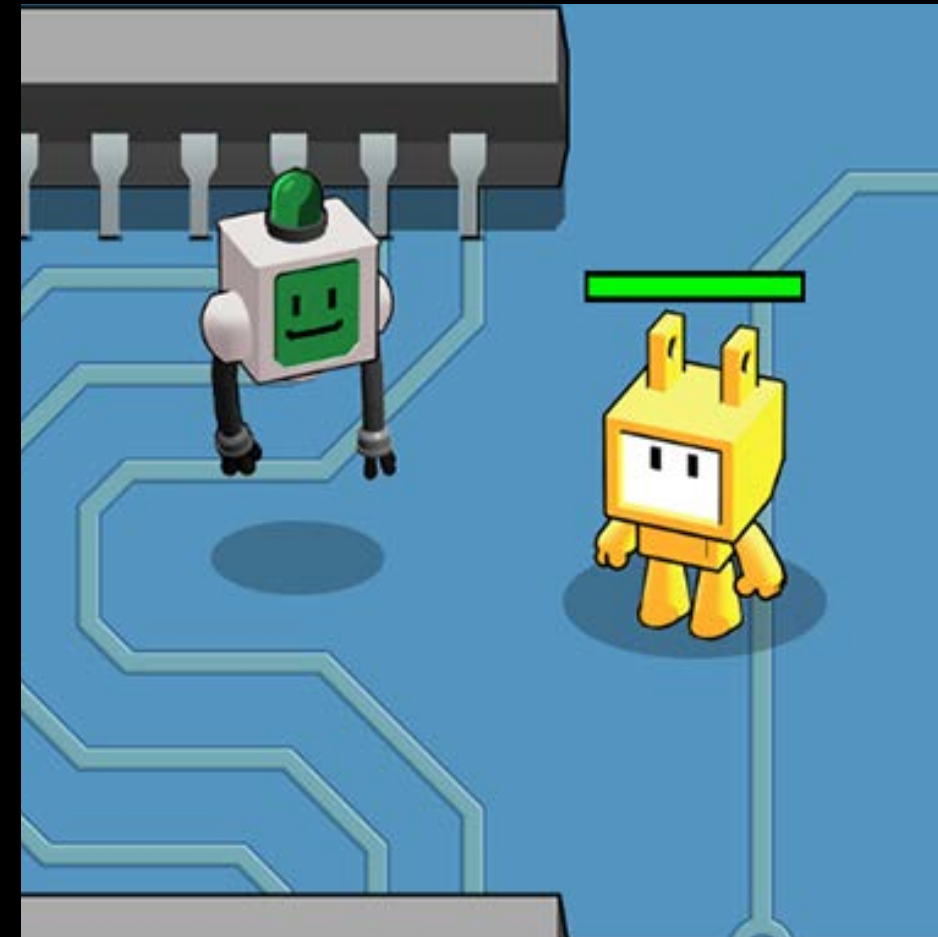
# Level Tags



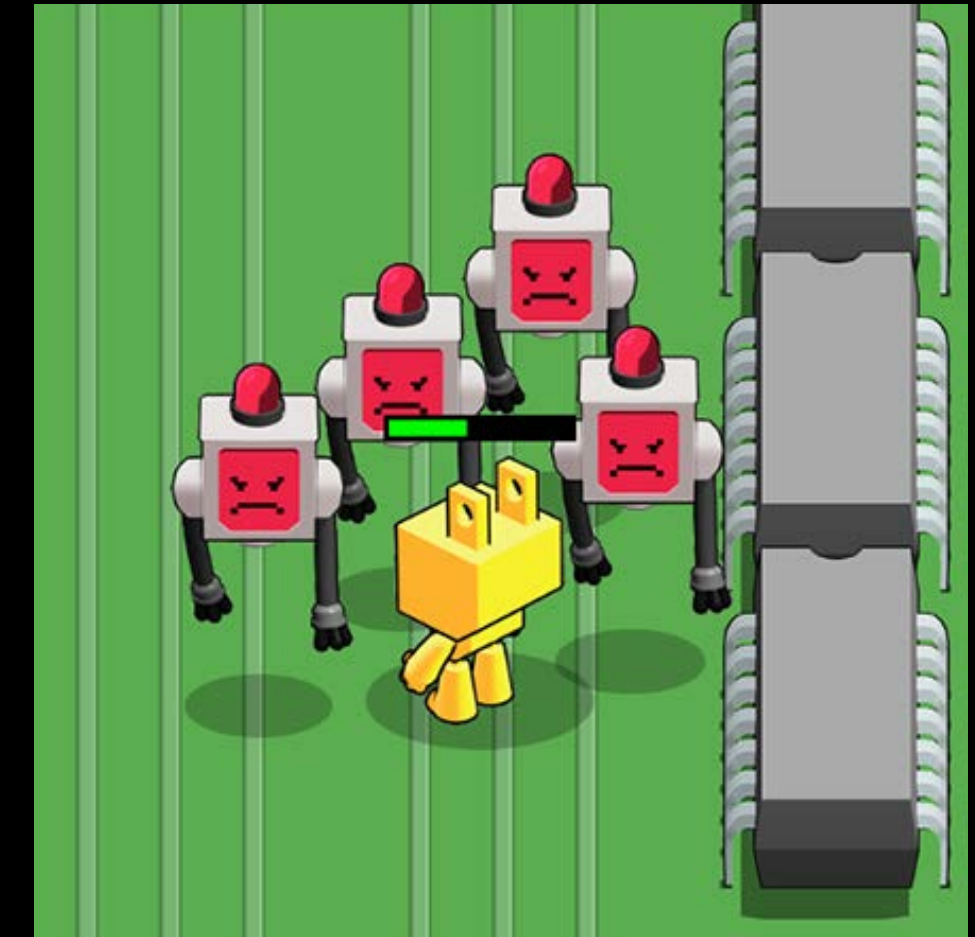
# Level Tags



Level1

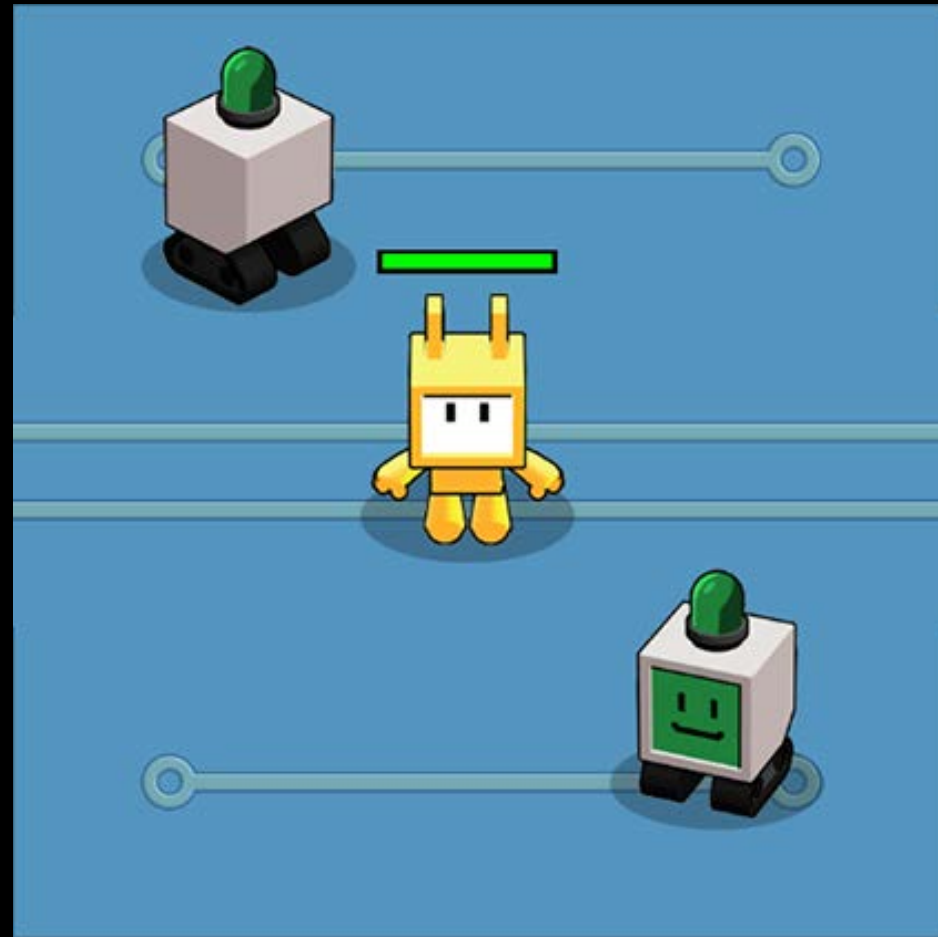


Level2

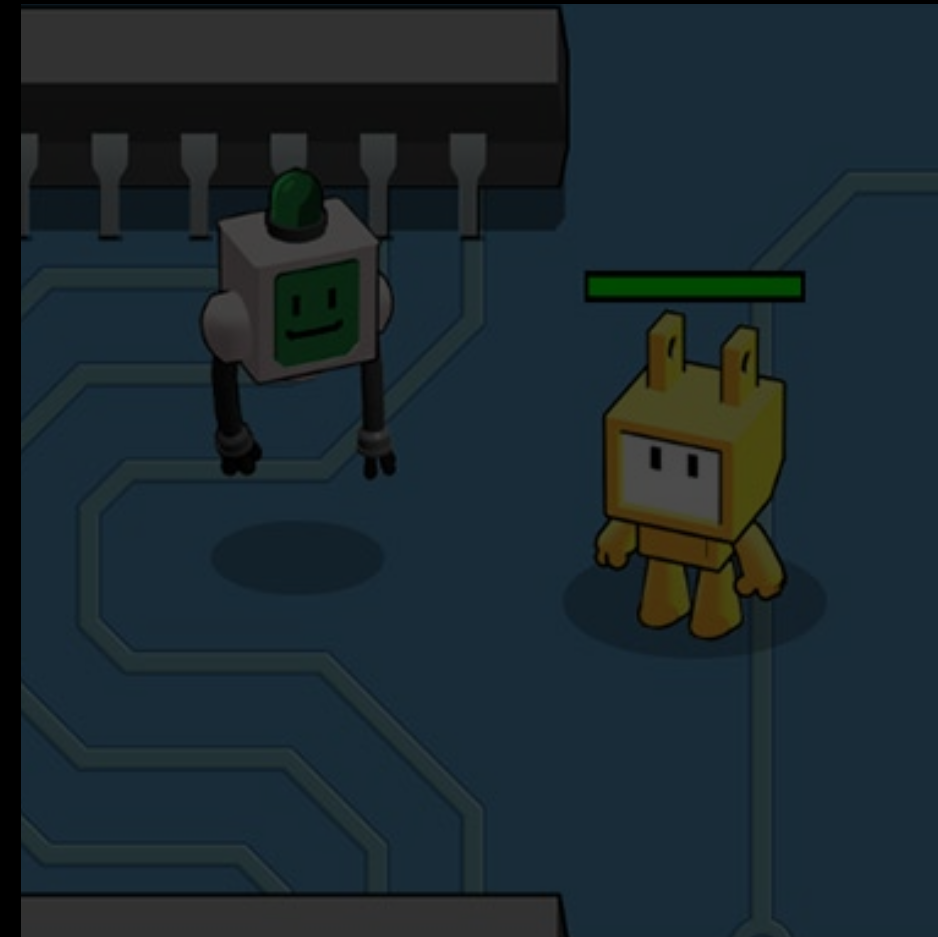


Level3

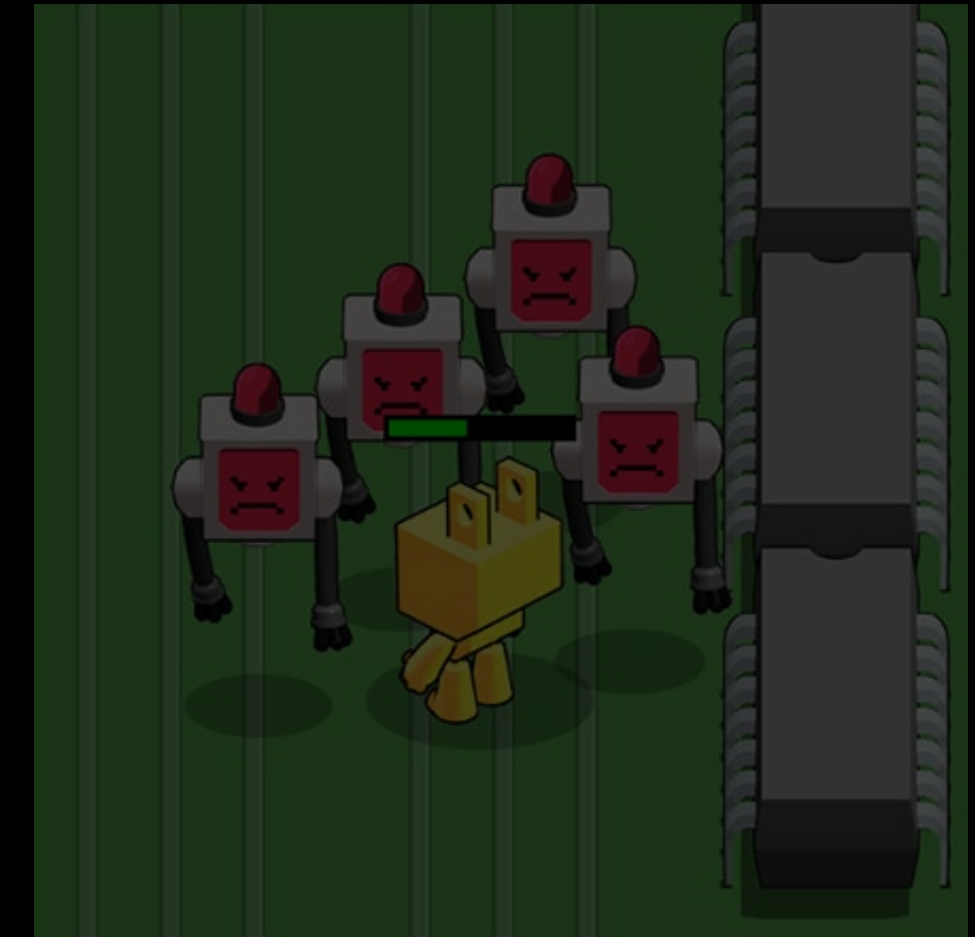
# Level Tags



Level1

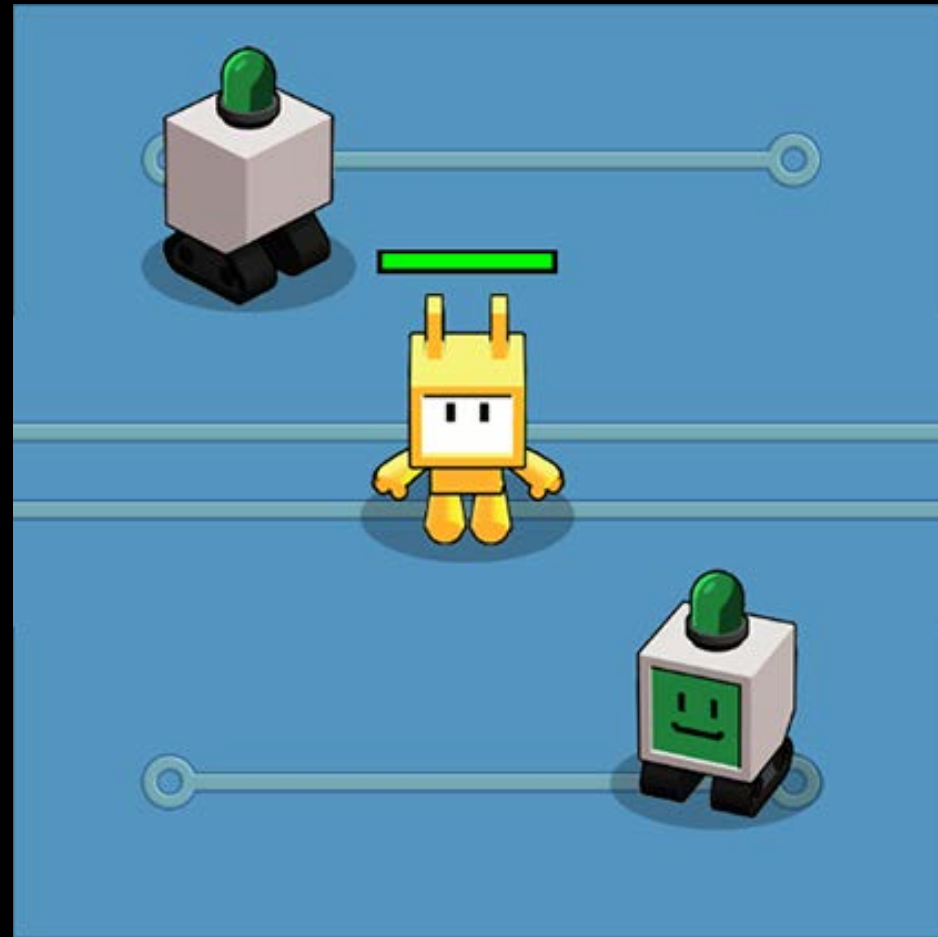


Level2

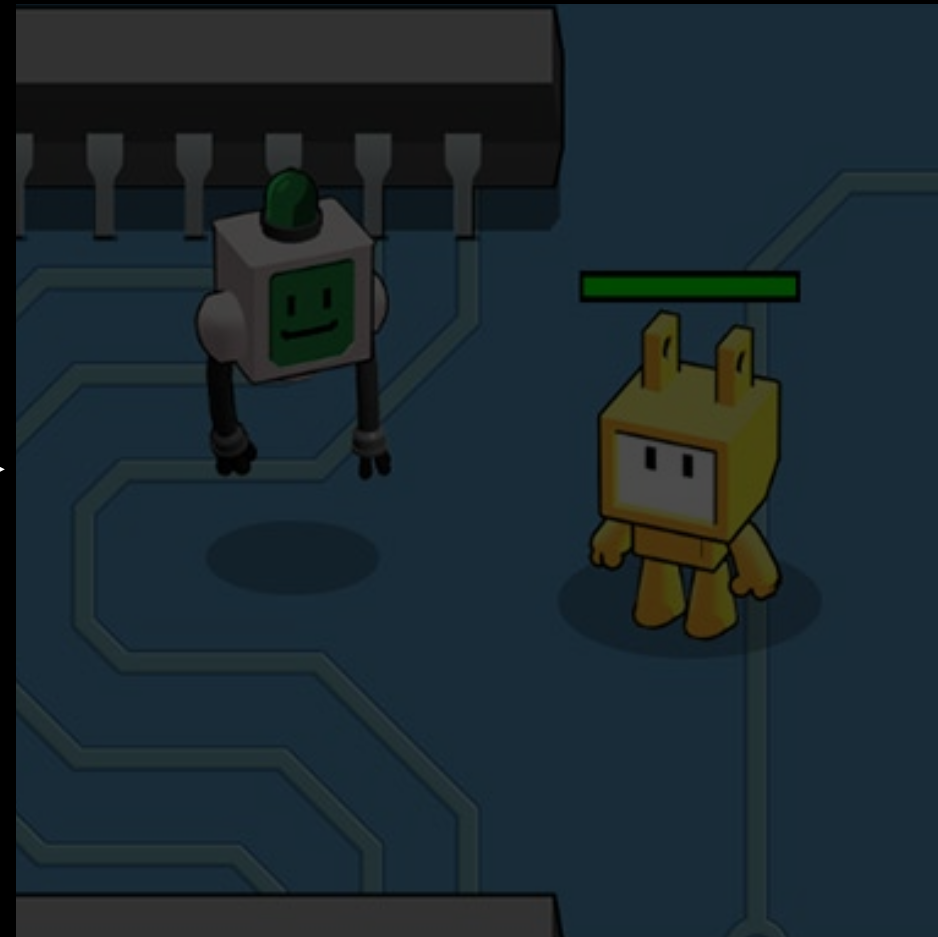


Level3

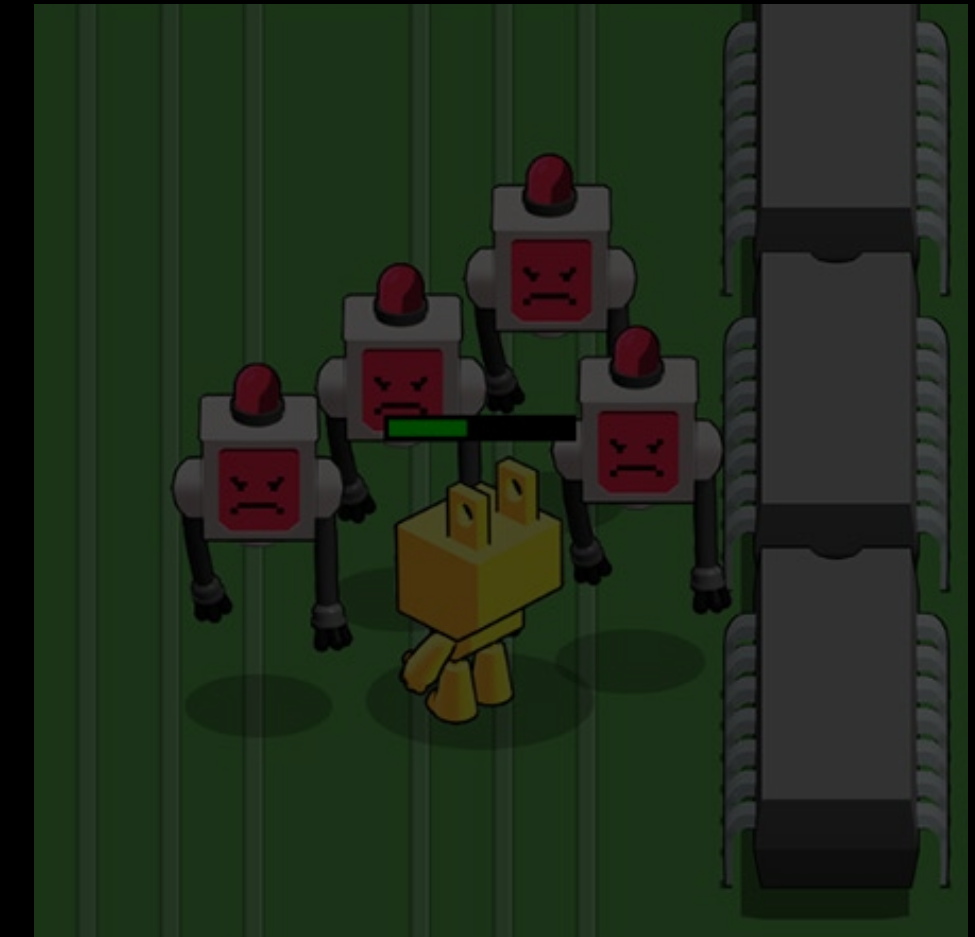
# Level Tags



Level1

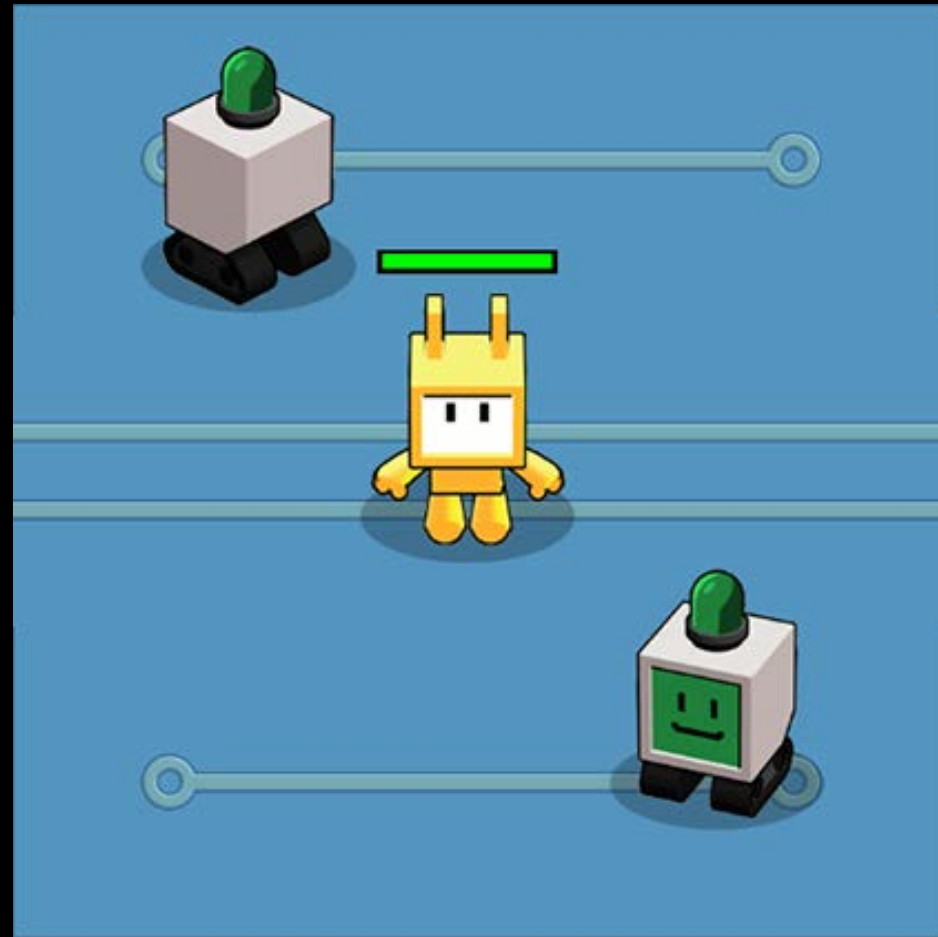


Level2

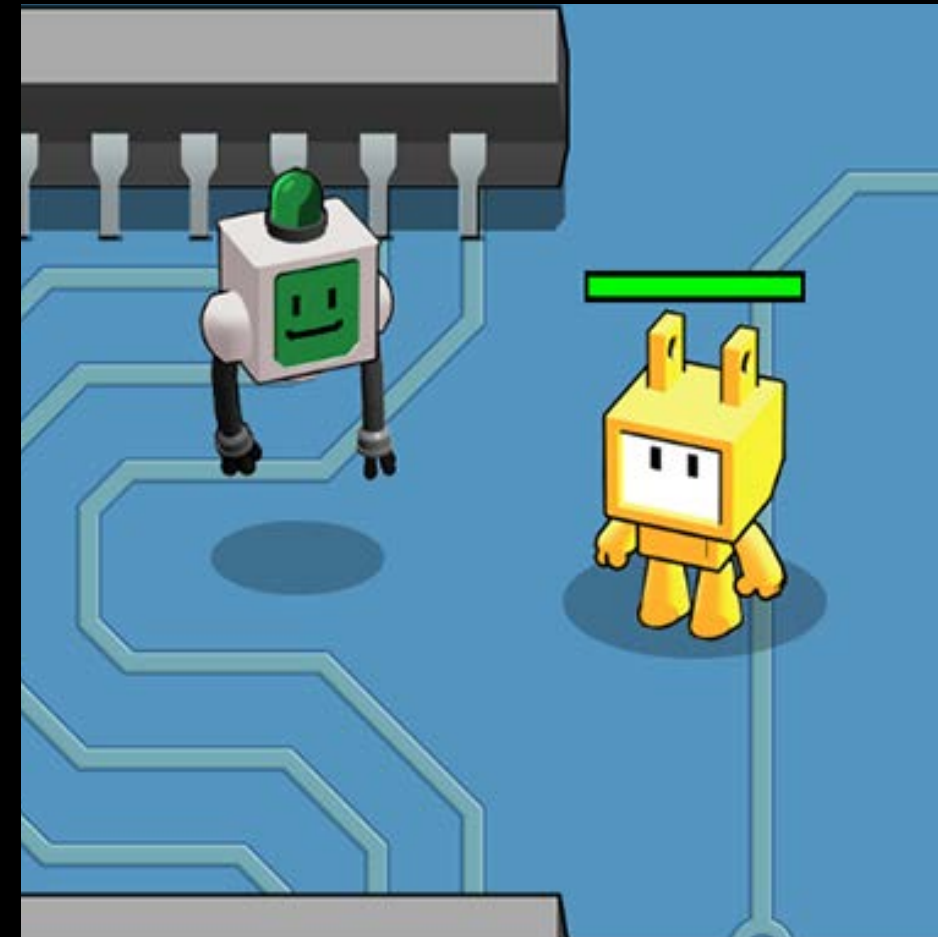


Level3

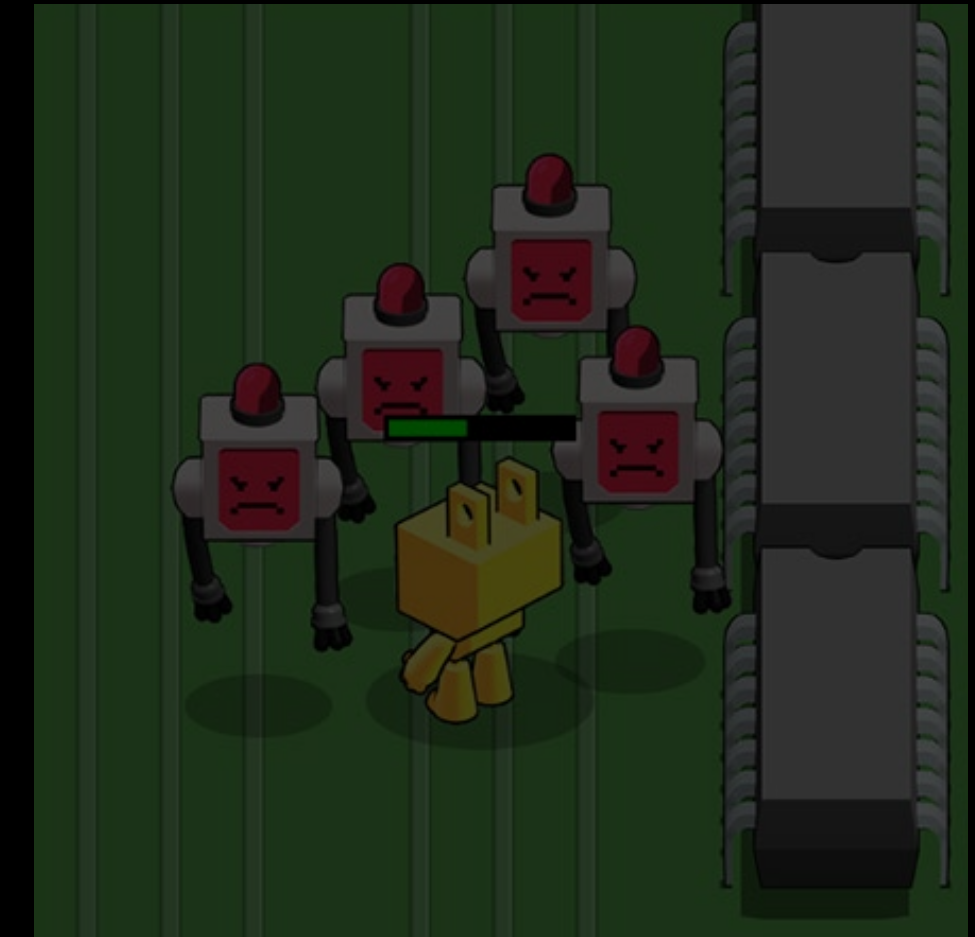
# Level Tags



Level1

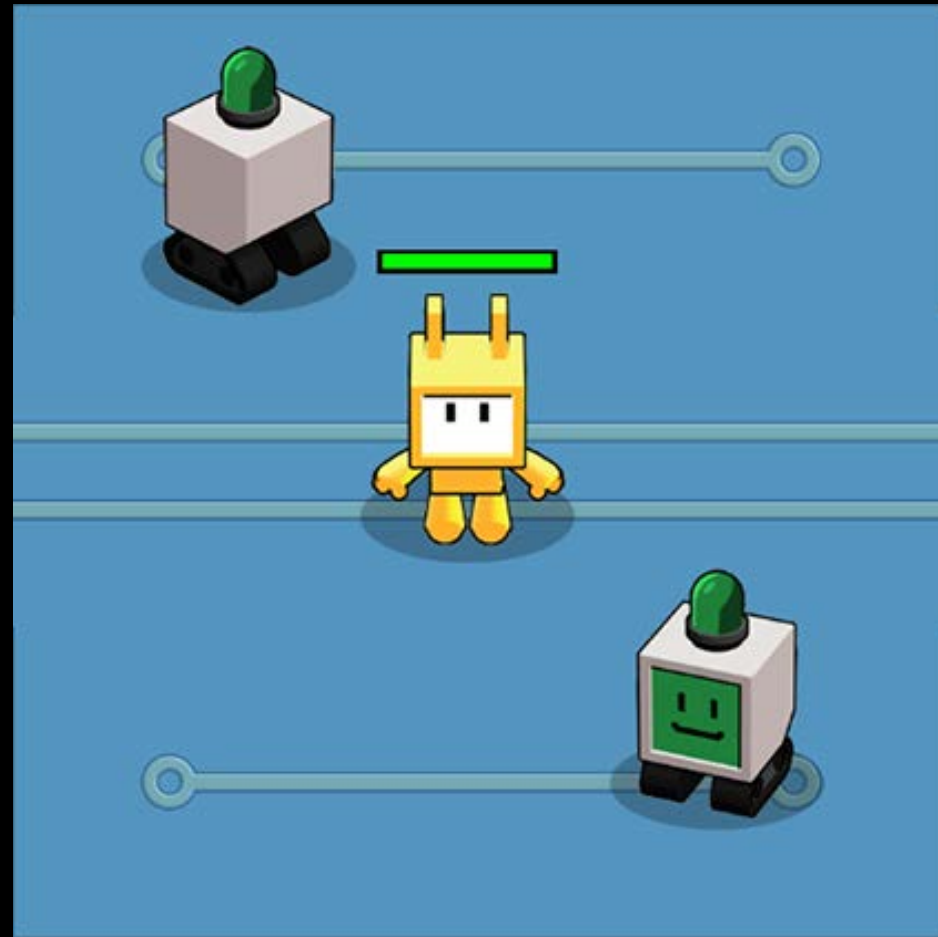


Level2

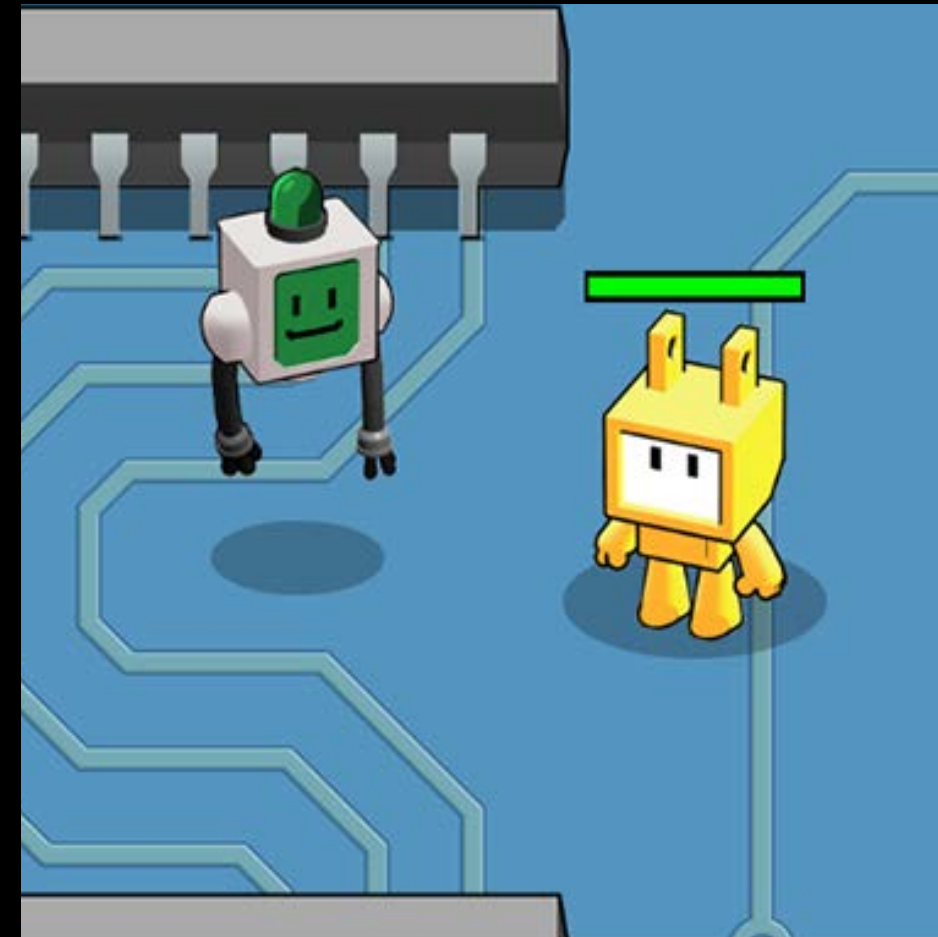


Level3

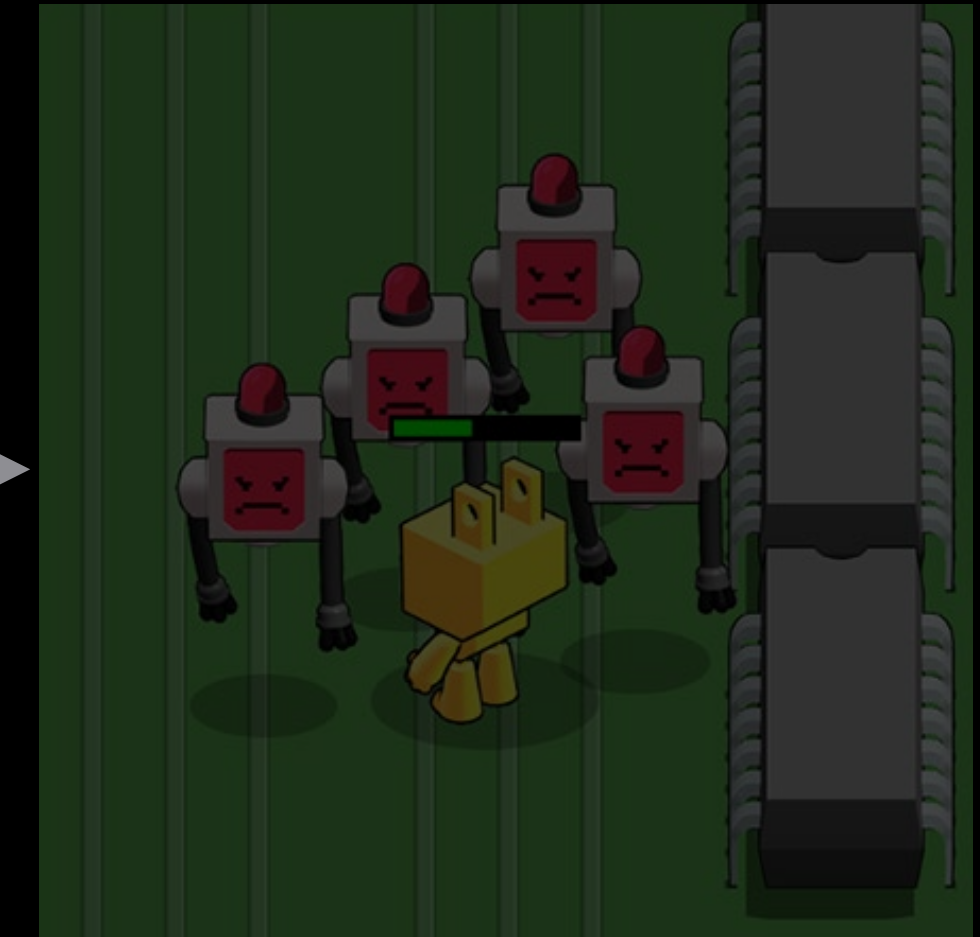
# Level Tags



Level1

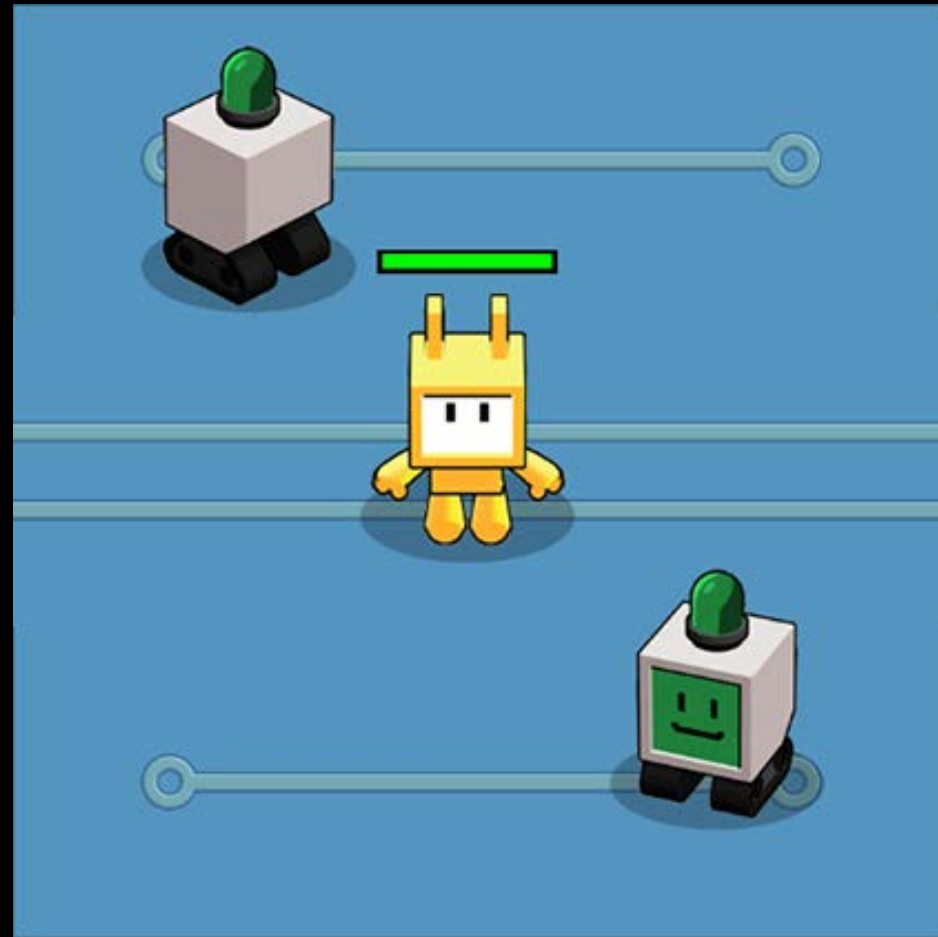


Level2



Level3

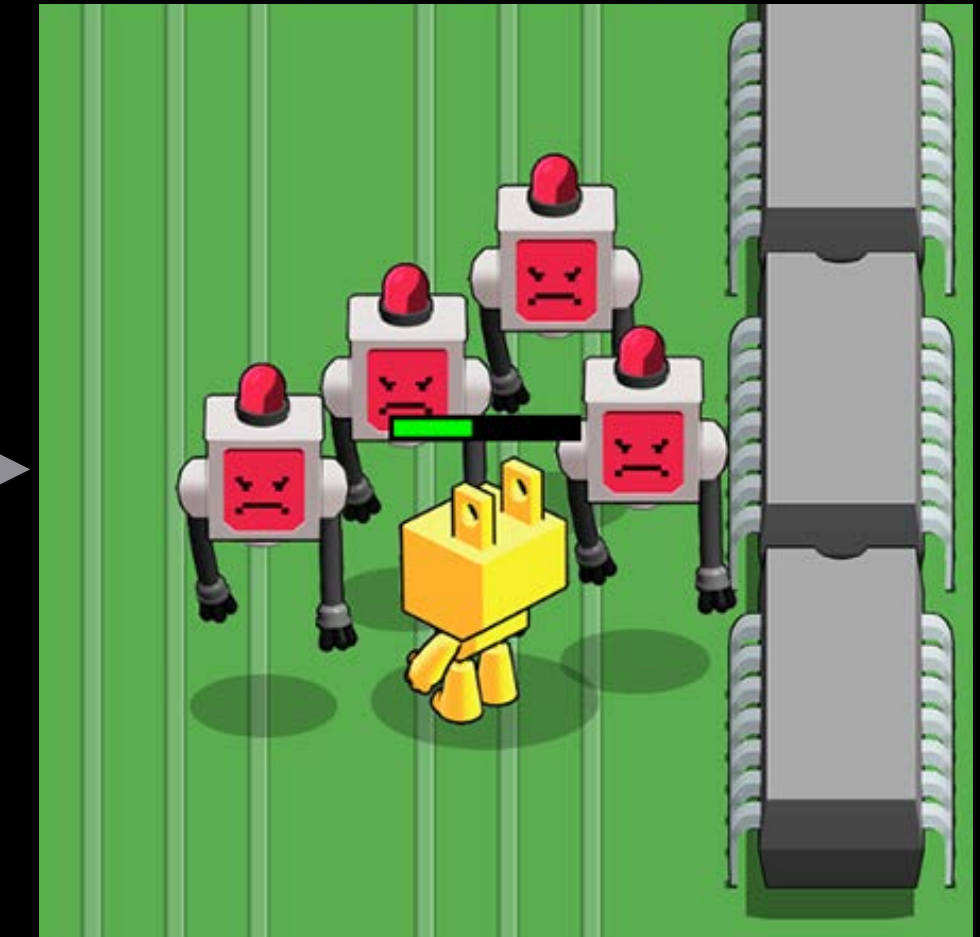
# Level Tags



Level1

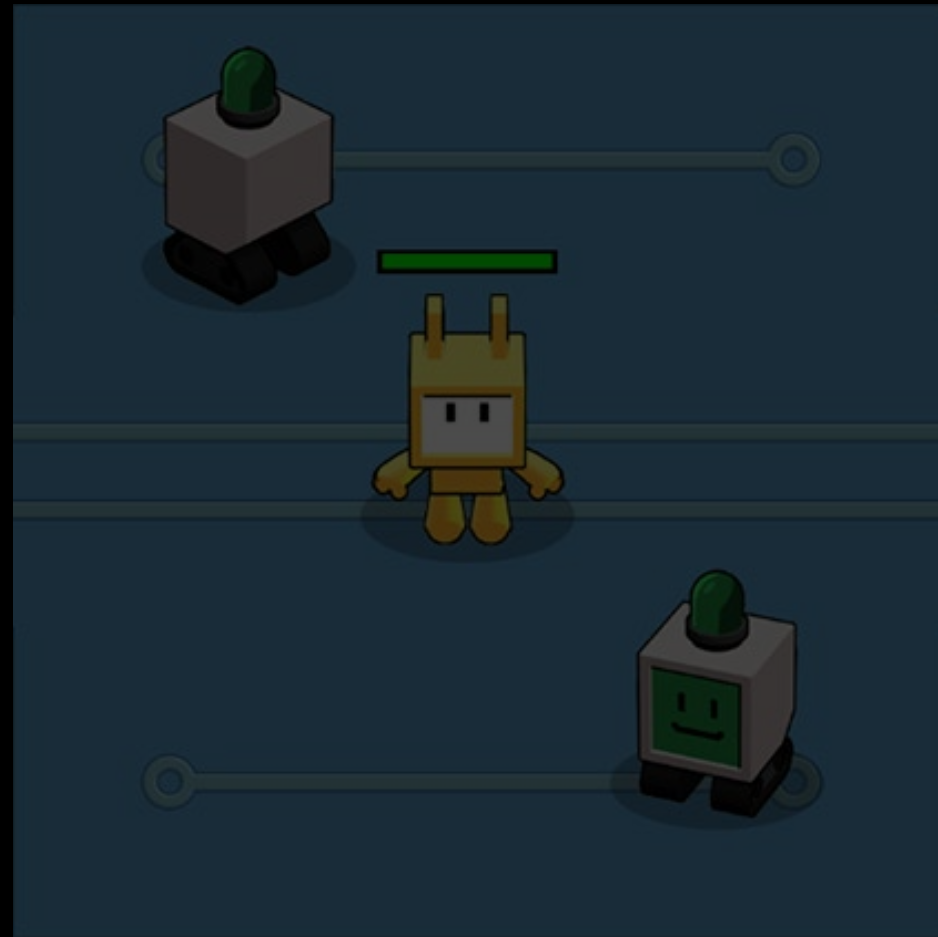


Level2

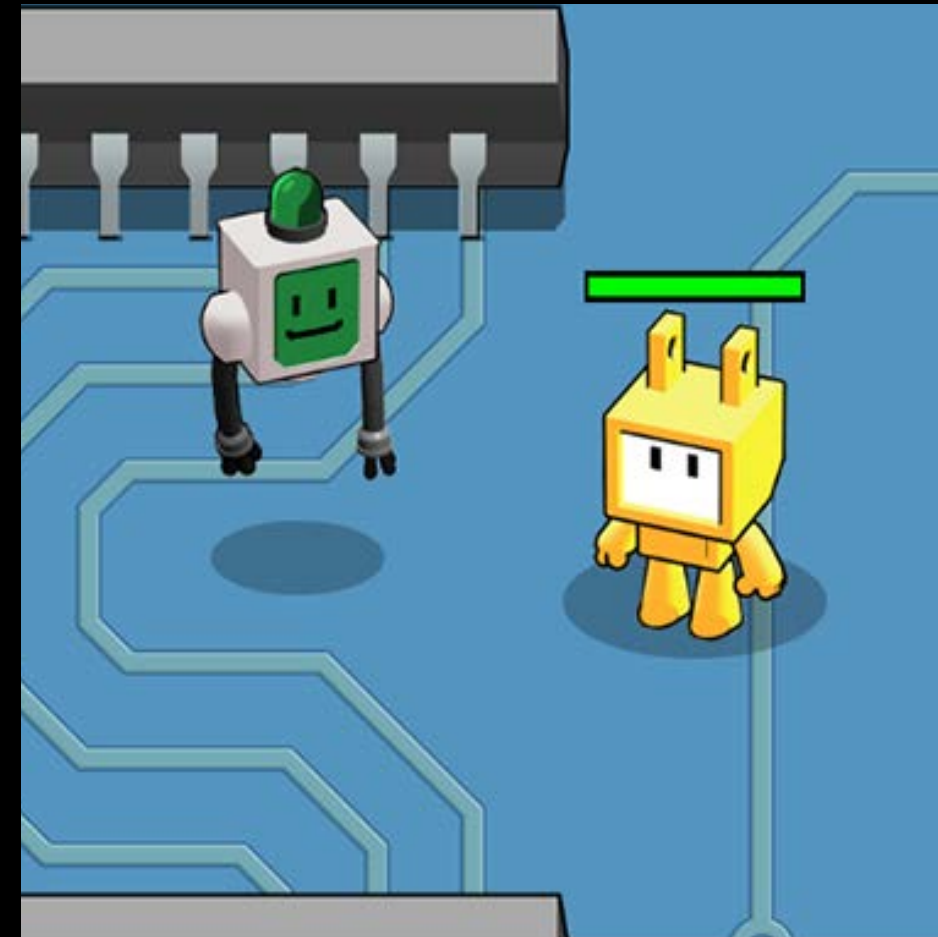


Level3

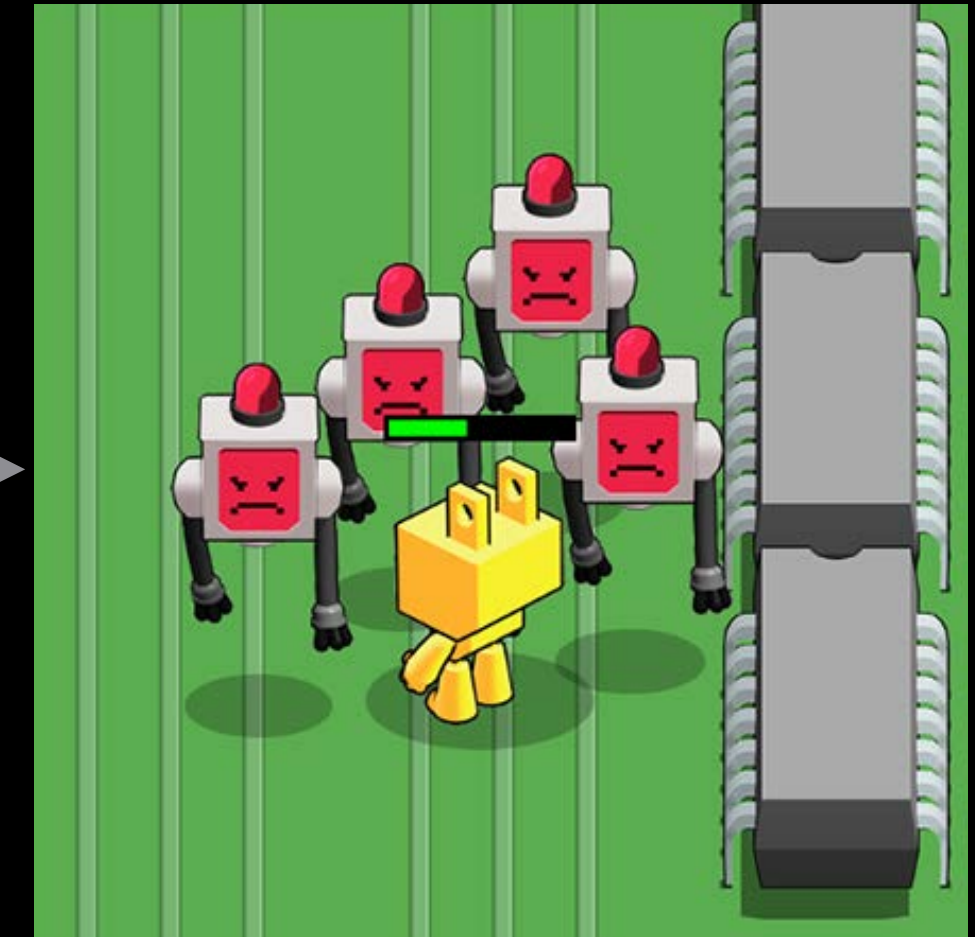
# Level Tags



Level1



Level2



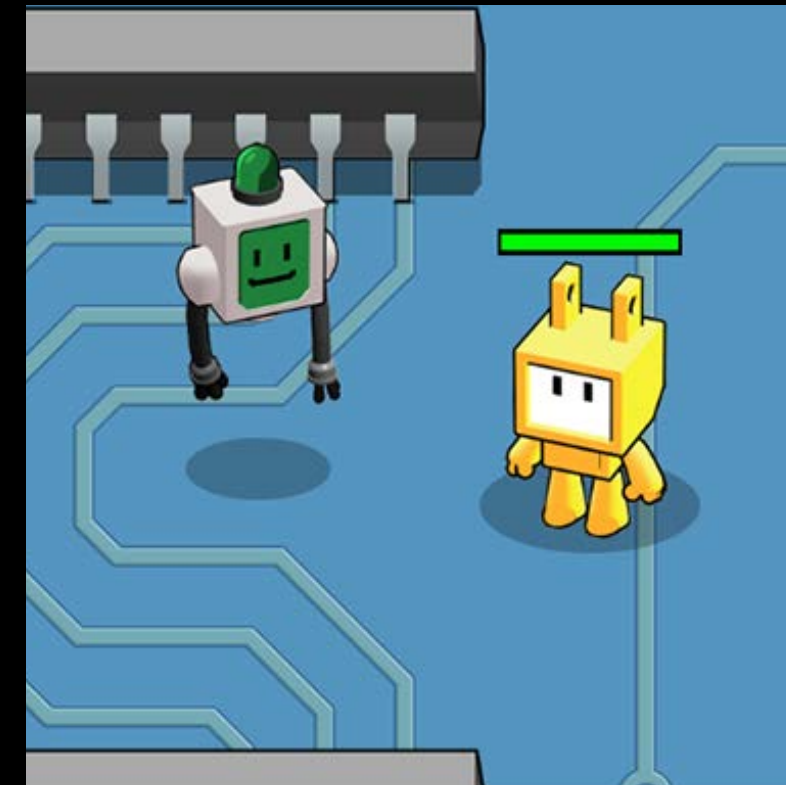
Level3

# Level Tags

Level1

Level2

Level3



# Level Tags

Level1

Level2

Level3



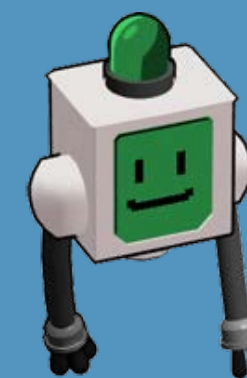
# Level Tags

Level1



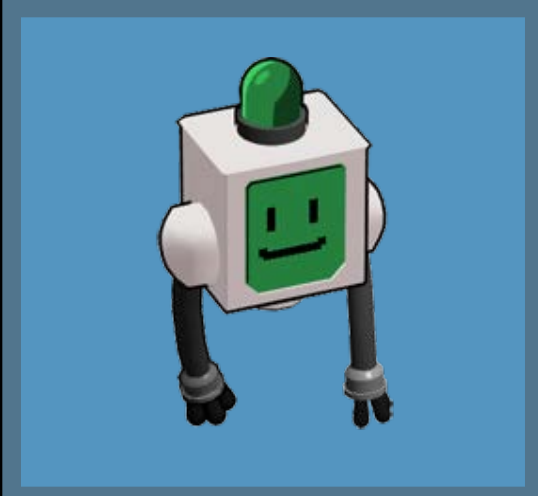
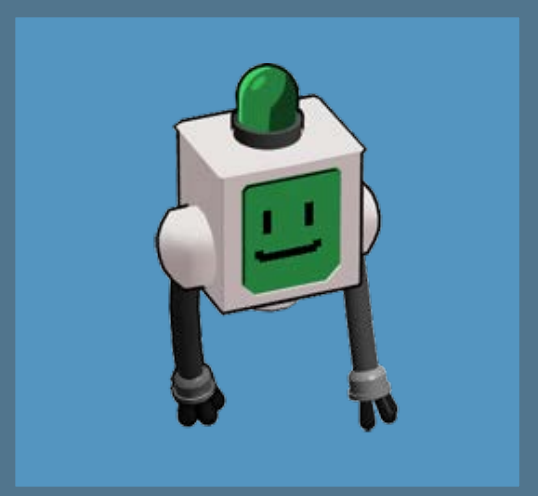
Level2

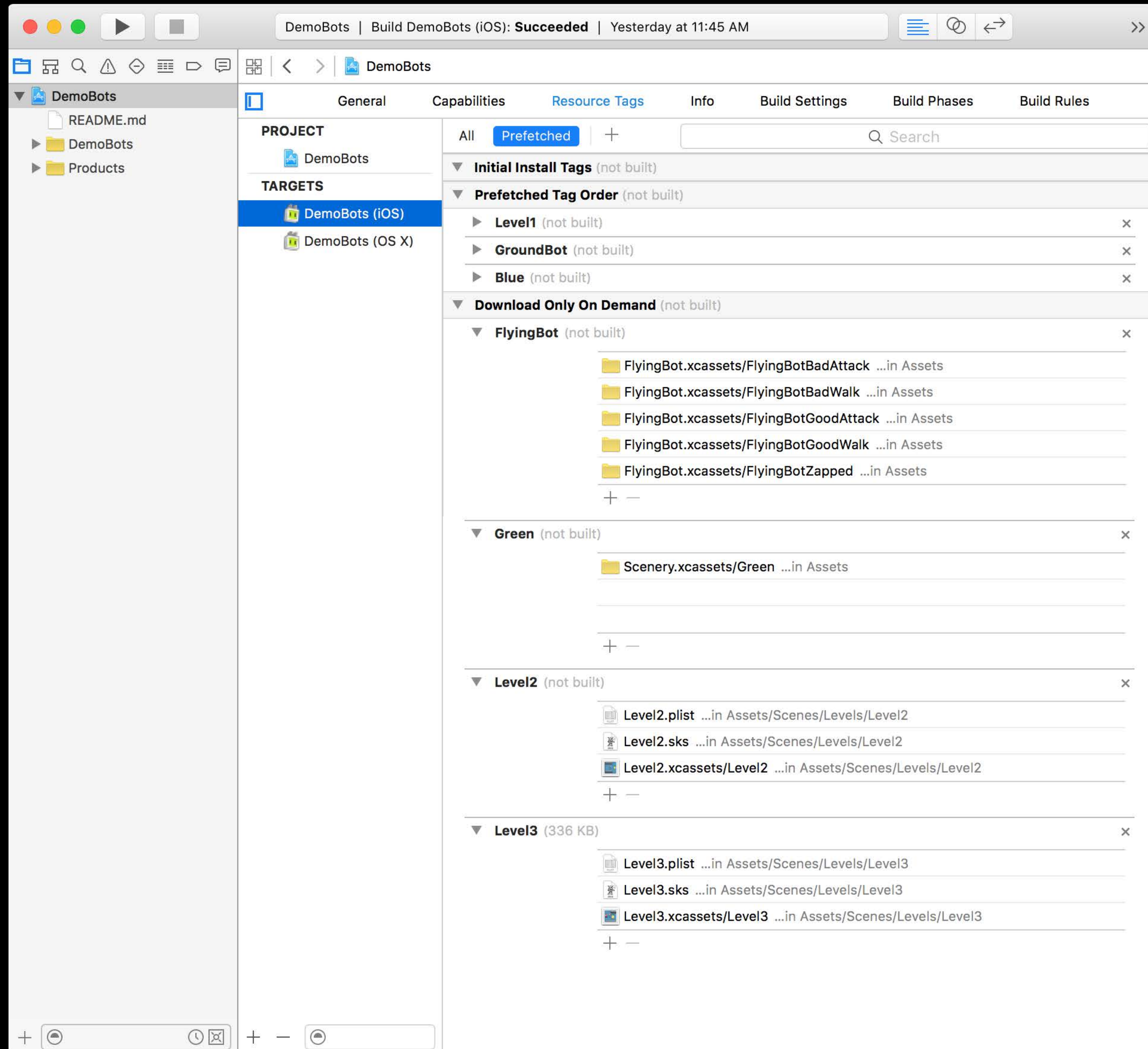
Level3

FlyingBot



# Level Tags

	Level1	Level2	Level3
GroundBot			
FlyingBot			



▼	<b>Prefetched Tag Order</b> (not built)	
▶	<b>Level1</b> (not built)	×
▶	<b>GroundBot</b> (not built)	×
▶	<b>Blue</b> (not built)	×
▼	<b>Download Only On Demand</b> (not built)	
▼	<b>FlyingBot</b> (not built)	×
	📁 FlyingBot.xcassets/FlyingBotBadAttack ...in Assets	
	📁 FlyingBot.xcassets/FlyingBotBadWalk ...in Assets	
	📁 FlyingBot.xcassets/FlyingBotGoodAttack ...in Assets	
	📁 FlyingBot.xcassets/FlyingBotGoodWalk ...in Assets	
	📁 FlyingBot.xcassets/FlyingBotZapped ...in Assets	
	+ —	

# On Demand Resources

In DemoBots

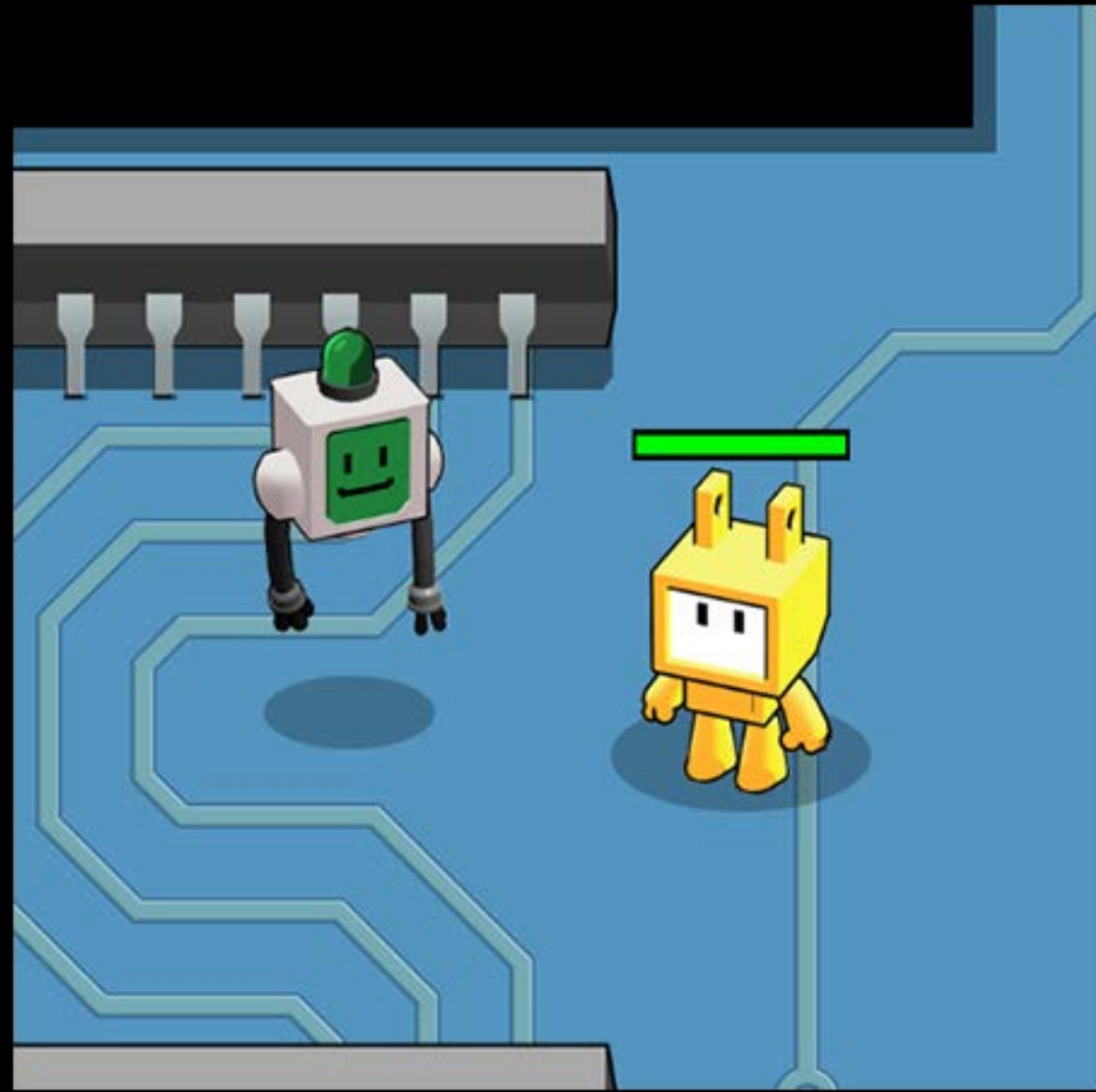
# On Demand Resources

## In DemoBots

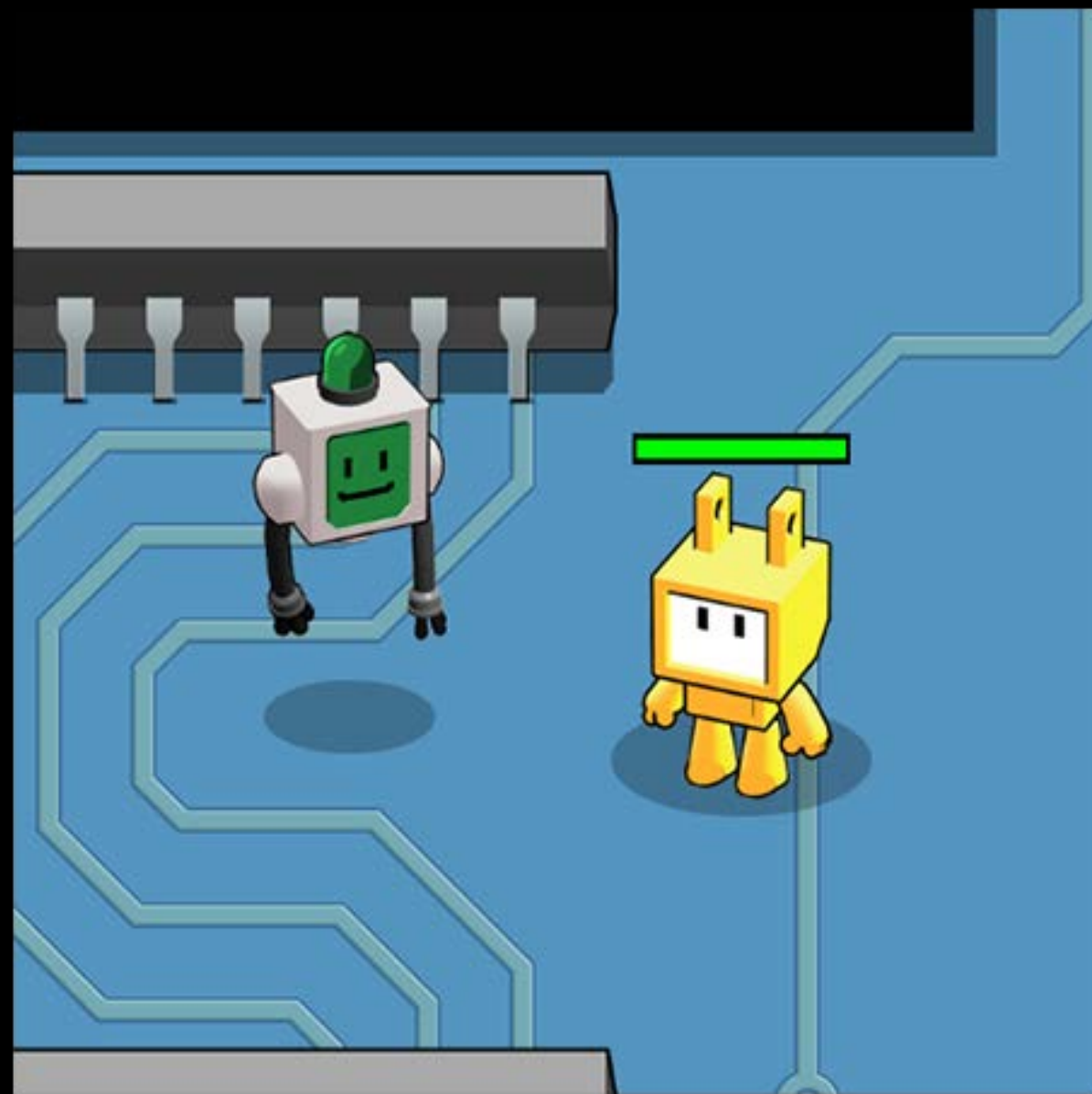
Tag resources for later download

- Faster initial download time
- Keep overall storage footprint small

# Present Next Scene



# Present Next Scene



In Local Storage

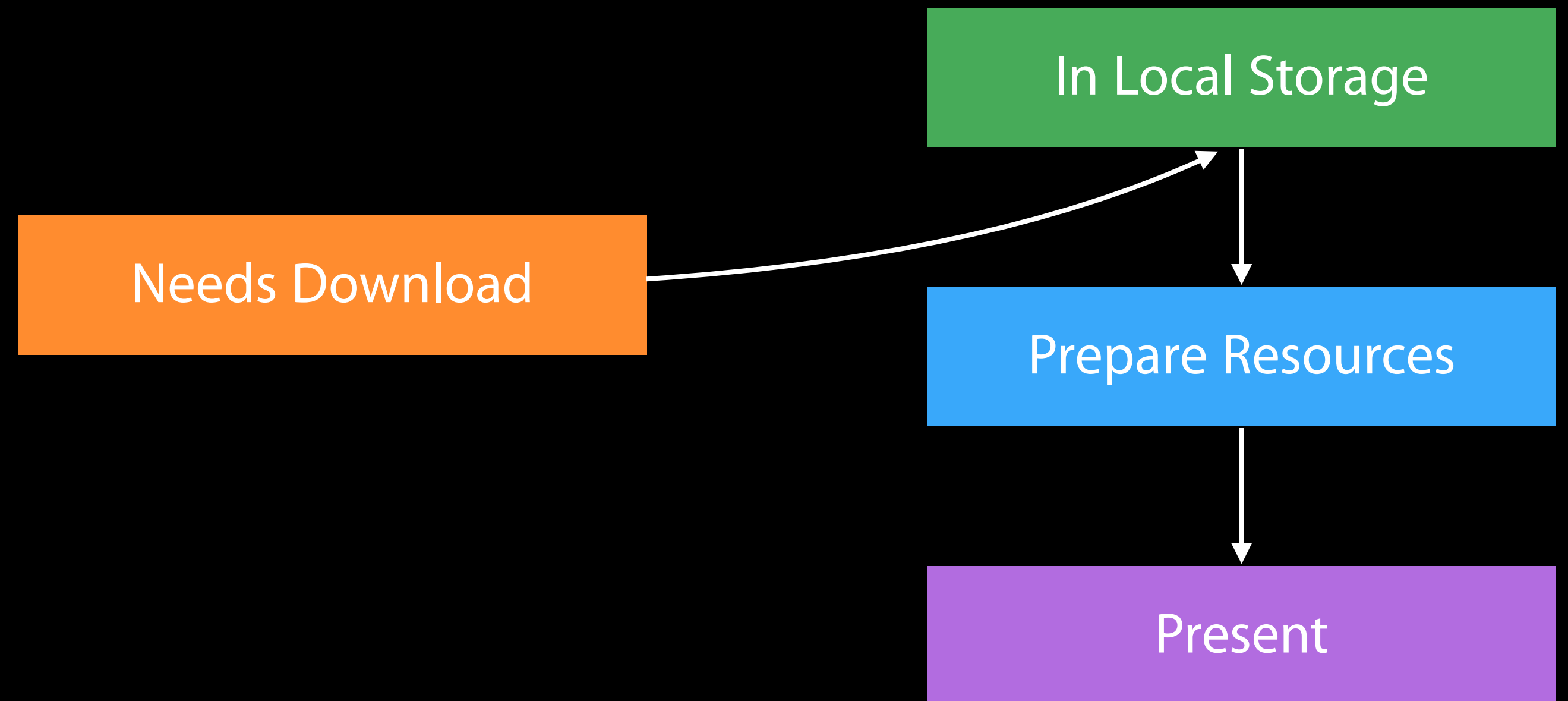


Prepare Resources

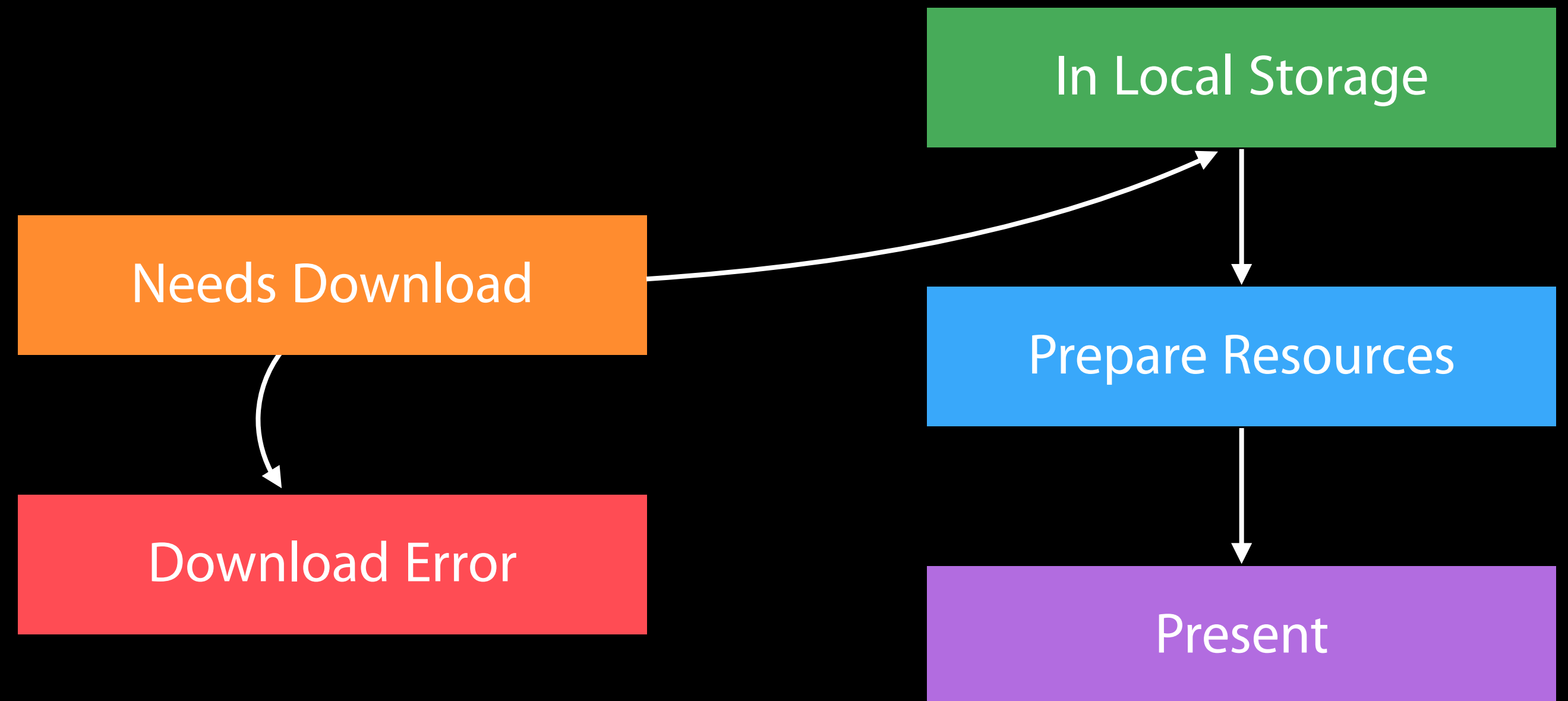
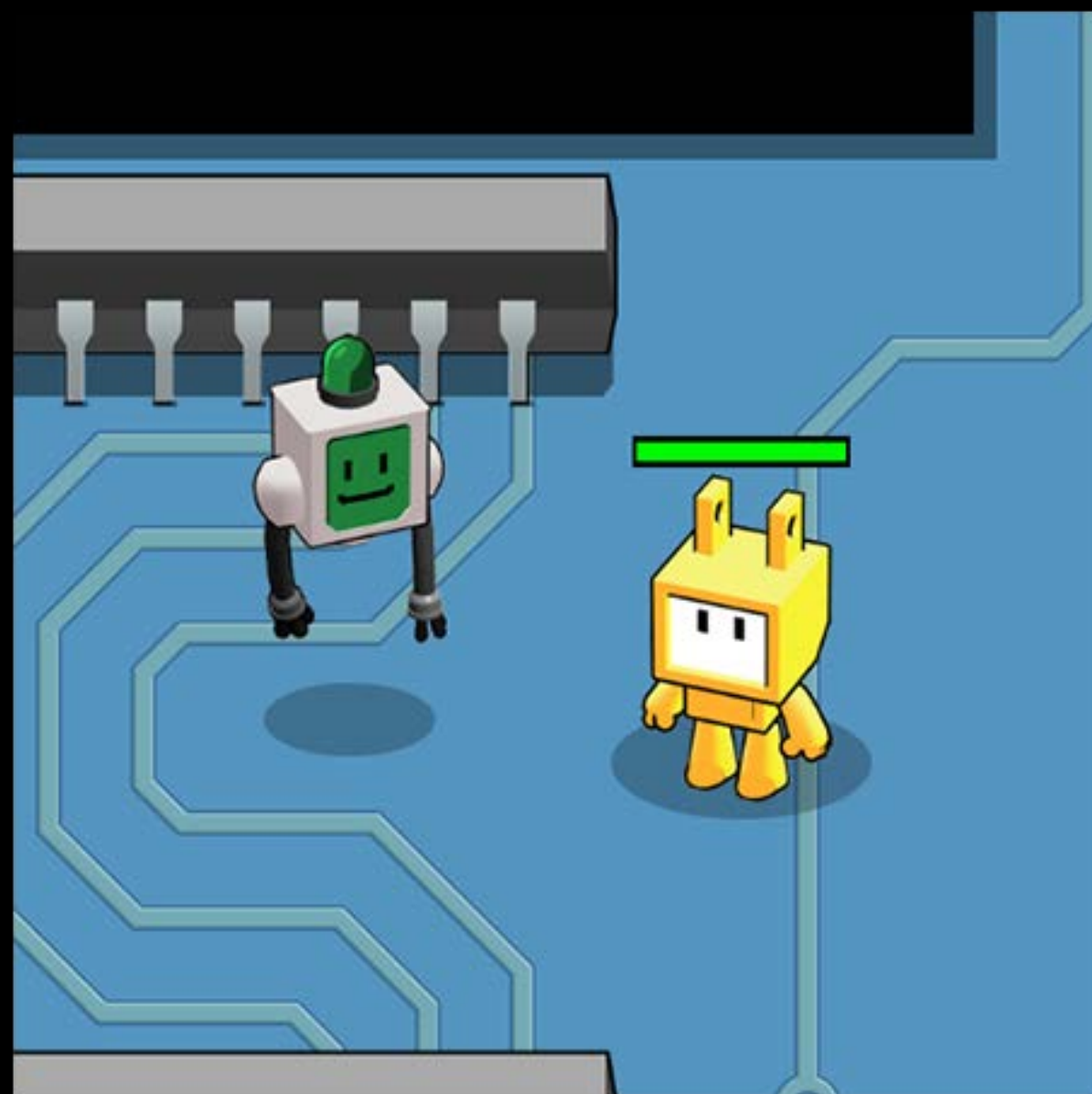


Present

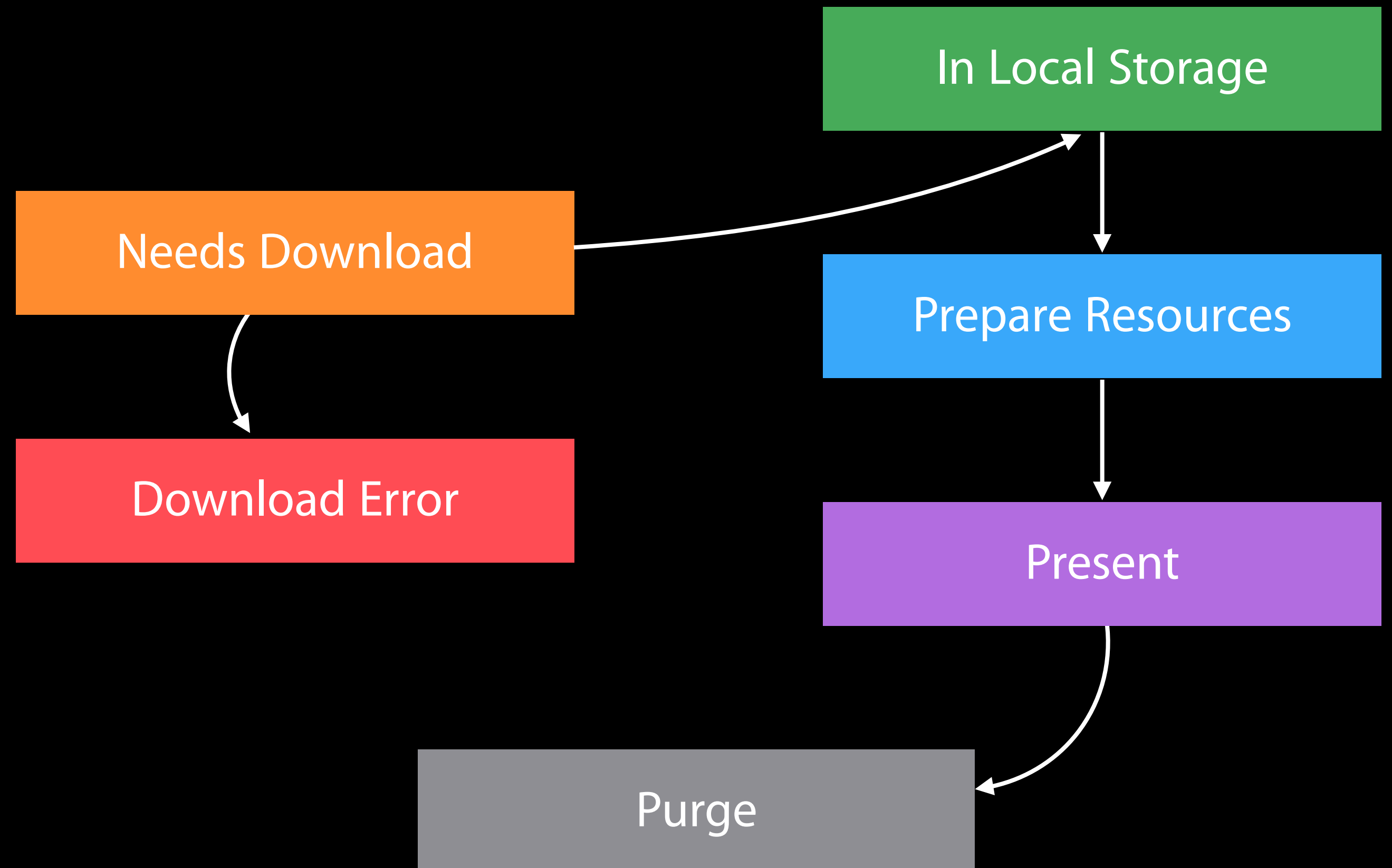
# Present Next Scene



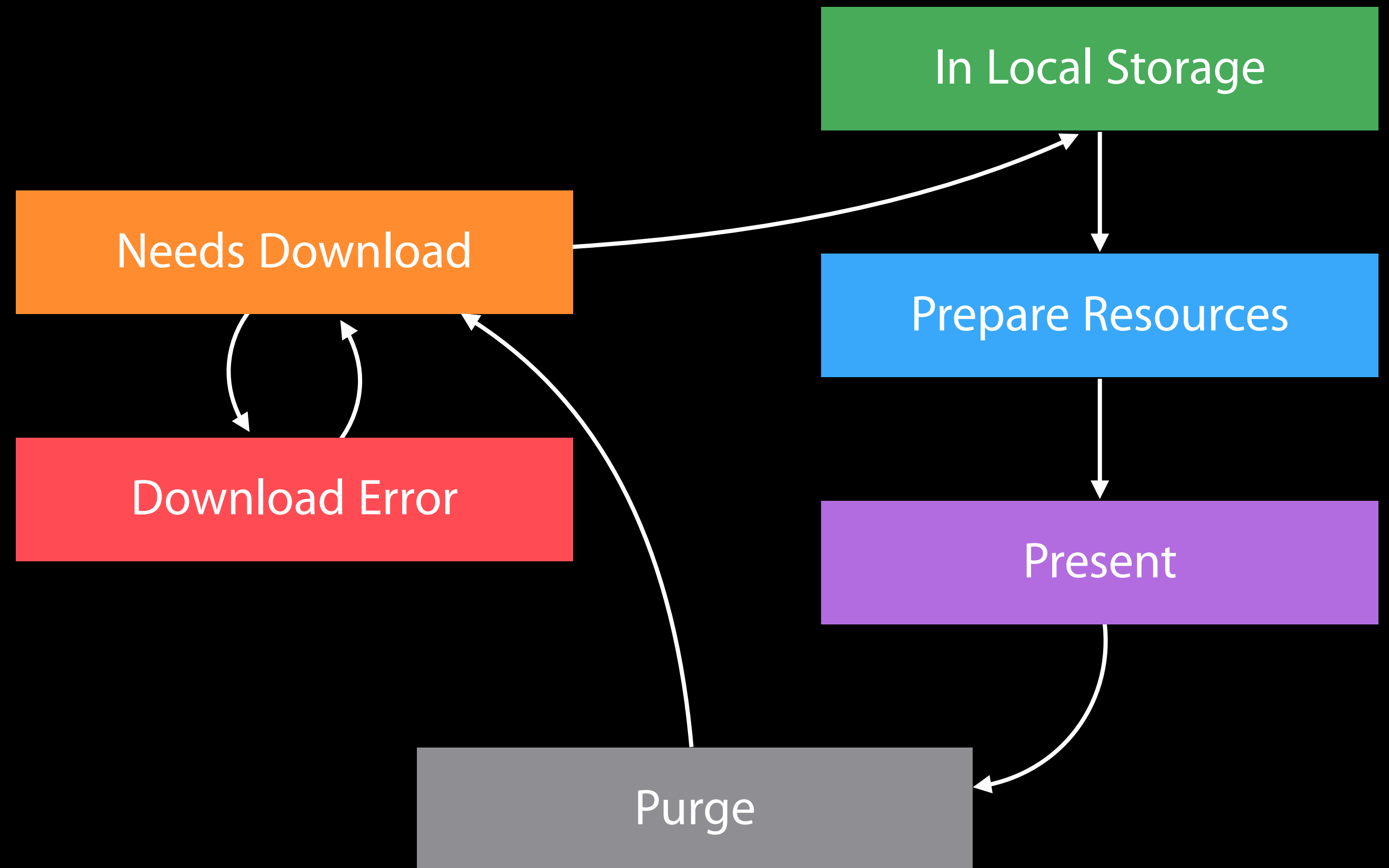
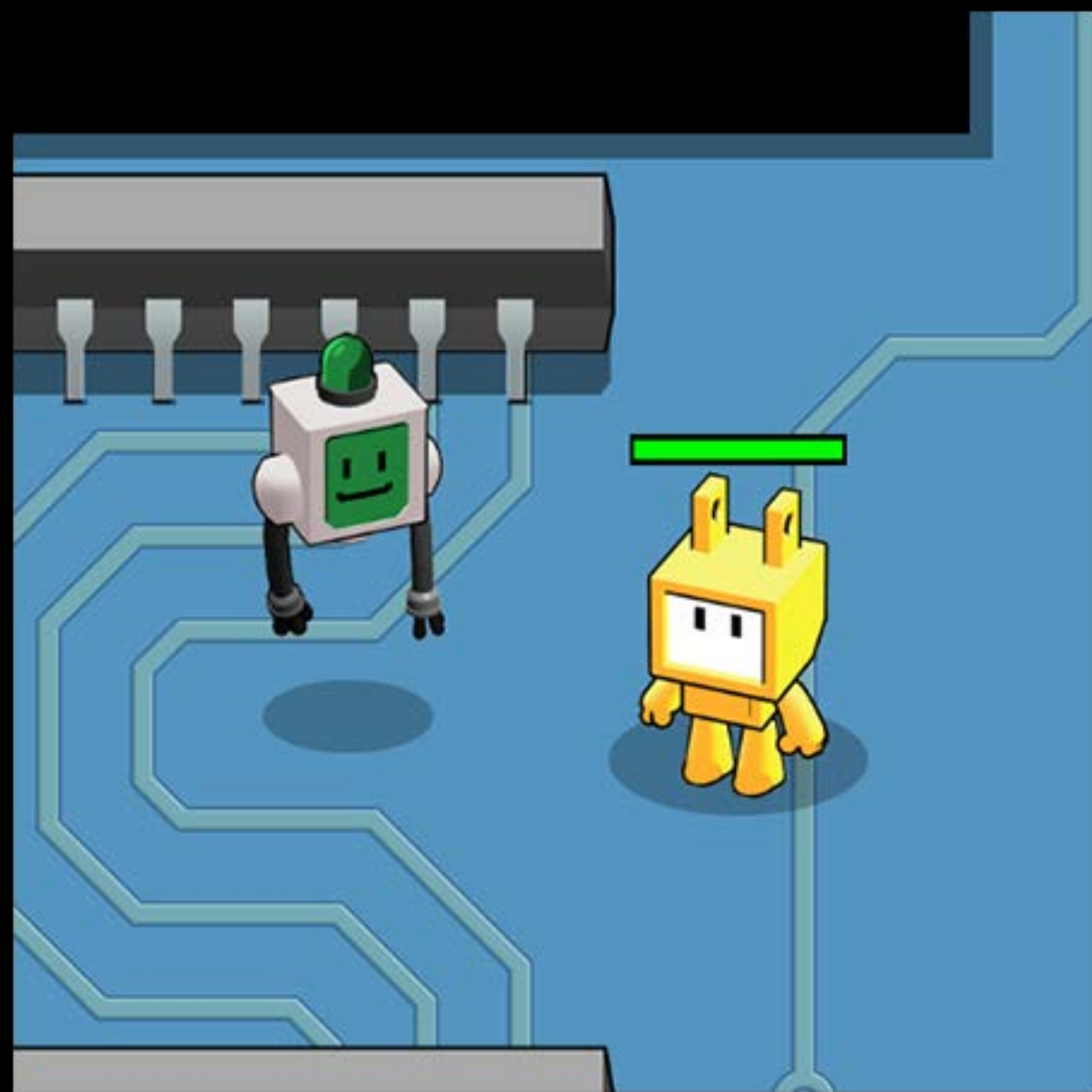
# Present Next Scene



# Present Next Scene



# Present Next Scene



# SceneLoader

# SceneLoader

Initial

Downloading Resources

Download Failed

Resources Available

Preparing Resources

Resources Ready State

# SceneLoader



# SceneLoader

Preparing Resources

# SceneLoader

Preparing Resources

```
override fun isValidNextState(stateClass: AnyClass) -> Bool {
```

```
}
```

# SceneLoader

Preparing Resources

```
override fun isValidNextState(stateClass: AnyClass) -> Bool {  
    switch stateClass {  
        case is SceneLoaderResourcesReadyState.Type  
            where sceneLoader.scene != nil:  
            return true  
  
        case is SceneLoaderResourcesAvailableState.Type:  
            return true  
  
        default:  
            return false  
    }  
}
```

# Final Tips

# Final Tips

Start downloading resources early

- Request **Level2** as soon as **Level1** begins

[illegible]

On Demand Resources

Tag

Tag	Size	Status	
Green	143 KB	Downloaded	Purge
Level1	229 KB	In Use	
FlyingBot	1.7 MB	Downloaded	Purge
Blue	156 KB	In Use	
GroundBot	2.1 MB	In Use	
Level2	356 KB	Downloaded	Purge
Level3	373 KB	Purged	

Tag

# Final Tips

Start downloading resources early

- Request **Level2** as soon as **Level1** begins

# Final Tips

Start downloading resources early

- Request **Level2** as soon as **Level1** begins

Modify the priority as needed

```
bundleResourceRequest.loadingPriority = 0.8
```

```
operationQueue.qualityOfService = .UserInitiated
```

# DemoBots

# DemoBots

## Wanted

---

Reduce number of animation frames

---

Fine tune assets for each device

---

Constrain camera to player and level

---

Enforce character state transitions

---

Share functionality between characters

---

Complex situational decision making

---

Elegant character navigation

---

Smooth natural movement

---

Add assets to improve gameplay

---

Speed up initial download

---

Model resource loading

---

# DemoBots

## Wanted

Reduce number of animation frames

Fine tune assets for each device

Constrain camera to player and level

Enforce character state transitions

Share functionality between characters

Complex situational decision making

Elegant character navigation

Smooth natural movement

Add assets to improve gameplay

Speed up initial download

Model resource loading

## Technology

SpriteKit actions editor

Texture atlases in asset catalogs

**SKCameraNode**

**GKStateMachine**

**GKEntity** and **GKComponent**

Fuzzy Logic with **GKRuleSystem**

Pathfinding via **GKObstacleGraph**

**GKAgent2D**, **GKBehavior**, and **GKGoal**

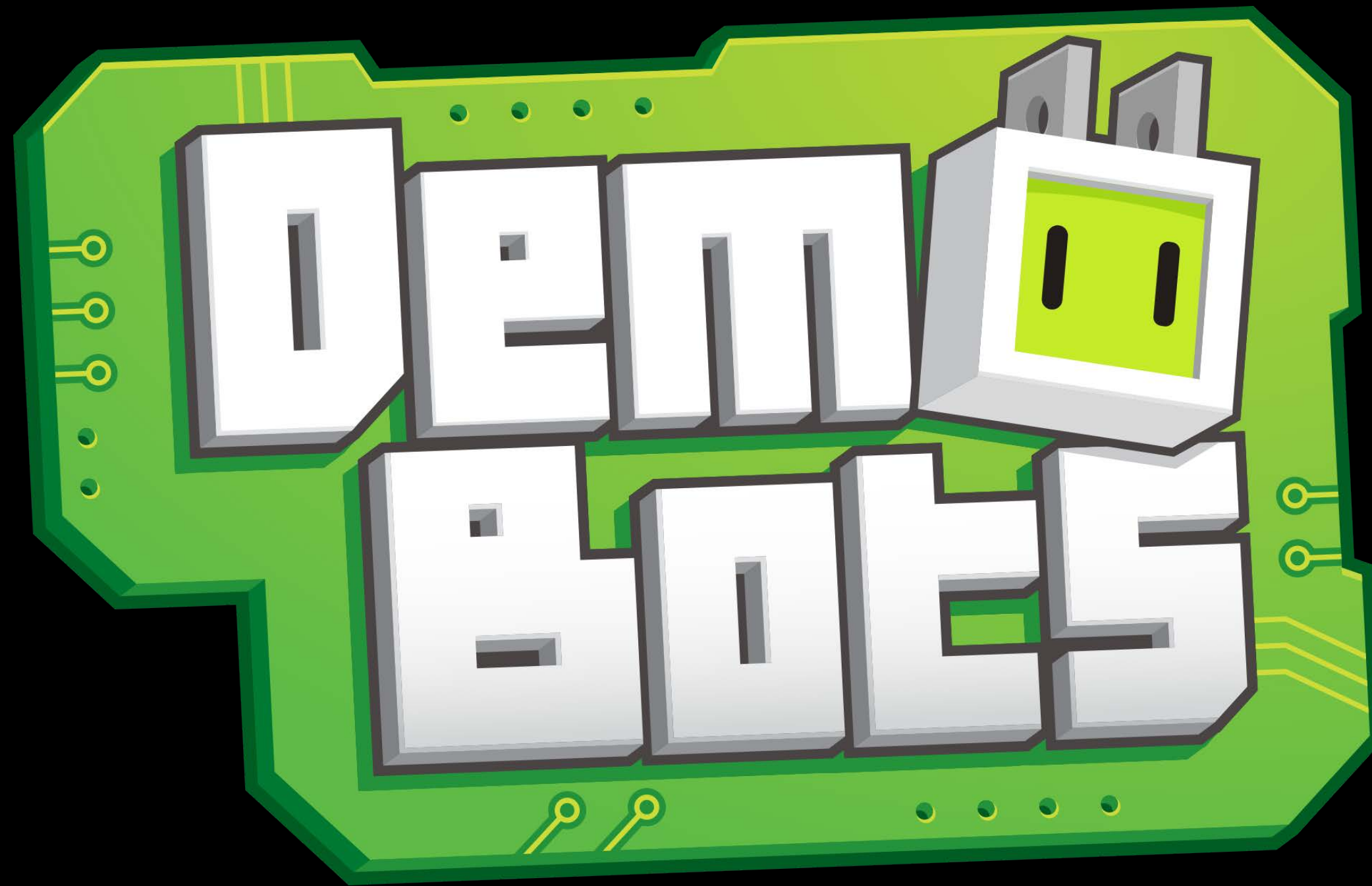
Asset catalogs with App Slicing

On Demand Resources

**GKStateMachine**

# Download Sample Files

<http://developer.apple.com/spritekit>



# More Information

Documentation and Videos

<http://developer.apple.com>

Apple Developer Forums

<http://developer.apple.com/forums>

Developer Technical Support

<http://developer.apple.com/support/technical>

General Inquiries

Allan Schaffer, Game Technologies Evangelist

[aschaffer@apple.com](mailto:aschaffer@apple.com)

# Related Sessions

App Thinning in Xcode	Presidio	Wednesday 9:00AM
What's New in SpriteKit	Mission	Wednesday 10:00AM
Going Social with ReplayKit and Game Center	Mission	Wednesday 1:30PM
Introducing On Demand Resources	Pacific Heights	Wednesday 4:30PM
Introducing GameplayKit	Mission	Thursday 11:00AM

# Labs

GameplayKit Lab	Graphics, Games, and Media Lab C	Thursday 2:30PM
SpriteKit Lab	Graphics, Games, and Media Lab C	Friday 9:00AM
GameplayKit Lab	Graphics, Games, and Media Lab C	Friday 12:00PM

