



# Maps on iOS

Justin Miller • Mapbox

# Introduction

- Cocoa developer since 2002
- Mostly work on iOS, Android, and core C++  
Mapbox map renderer
- Live in Portland, Oregon, USA
- Mapbox since 2010

# Apple MapKit

- Launched with iOS 3
- Default solution
- Free for unlimited use
- Originally raster imagery from Google, relaunched with iOS 6 in-house & vector
- [developer.apple.com/reference/mapkit](https://developer.apple.com/reference/mapkit)



# Mapbox iOS SDK

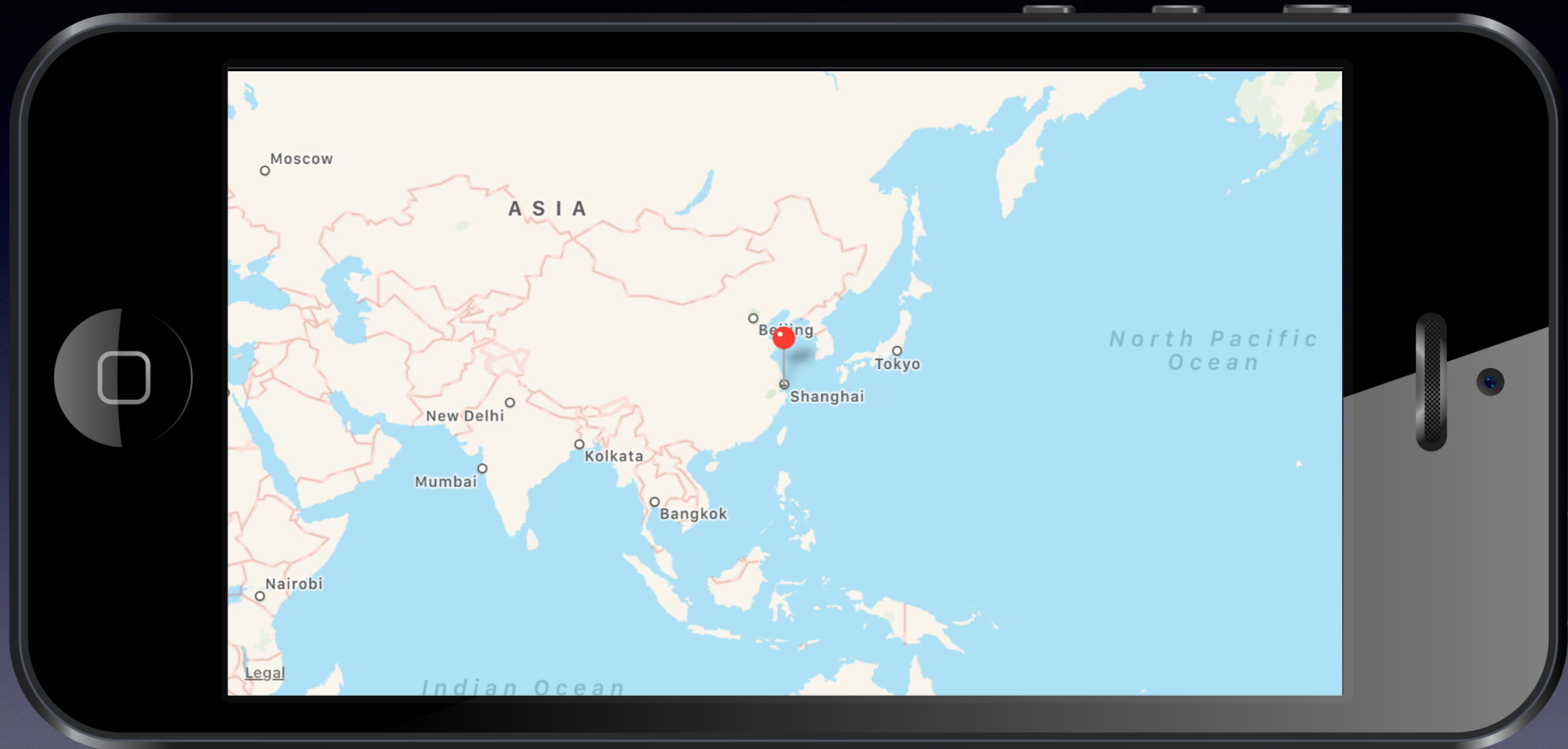
- Original roots in 2010 work (offline custom maps with Route-Me)
- Launched as SDK in 2012
- Relaunched as vector/OpenGL/cross-platform solution in 2014
- [mapbox.com/ios-sdk](http://mapbox.com/ios-sdk) (product) & [github.com/mapbox/mapbox-gl-native](https://github.com/mapbox/mapbox-gl-native) (project)



# Apple MapKit

- **MKMapView** functionality:
  - Viewport changes (location, zoom, rotation, pitch, and camera API)
  - Custom data: annotations (points and shapes) & overlays (imagery & rendering)
  - User tracking: location and heading
  - Customization: style (minor), controls, details

```
1  import UIKit
2  import MapKit
3
4  class ViewController: UIViewController {
5
6      override func viewDidLoad() {
7          super.viewDidLoad()
8
9          let map = MKMapView(frame: view.bounds)
10         map.autoresizingMask = [.flexibleWidth, .flexibleHeight]
11         view.addSubview(map)
12
13         map.centerCoordinate = CLLocationCoordinate2D(latitude: 31.228611,
14                                                       longitude: 121.474722)
15
16         let point = MKPointAnnotation()
17         point.coordinate = map.centerCoordinate
18         map.addAnnotation(point)
19     }
20 }
21
22
```



Moscow

ASIA

Beijing

Tokyo

Shanghai

New Delhi

Mumbai

Kolkata

Bangkok

Nairobi

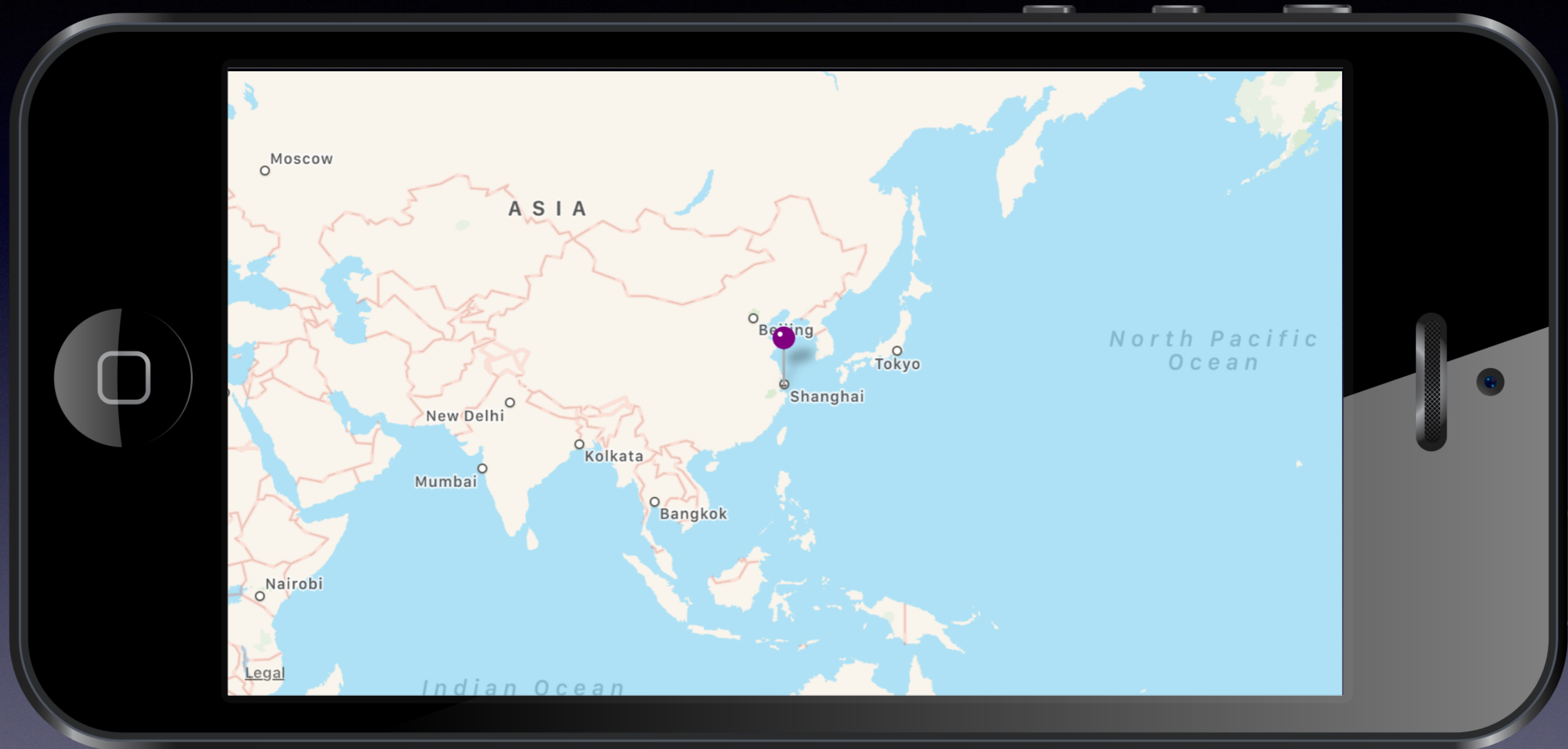
Legal

North Pacific Ocean

Indian Ocean

```
1 import UIKit
2 import MapKit
3
4 class ViewController: UIViewController, MKMapViewDelegate {
5
6     override func viewDidLoad() {
7         super.viewDidLoad()
8
9         let map = MKMapView(frame: view.bounds)
10        map.autoresizingMask = [.flexibleWidth, .flexibleHeight]
11        map.delegate = self
12        view.addSubview(map)
13
14        map.centerCoordinate = CLLocationCoordinate2D(latitude: 31.228611,
15                                                    longitude: 121.474722)
16
17        let point = MKPointAnnotation()
18        point.coordinate = map.centerCoordinate
19        map.addAnnotation(point)
20    }
21
22    func mapView(_ mapView: MKMapView, viewFor annotation: MKAnnotation) -> MKAnnotationView? {
23        if annotation is MKUserLocation {
24            return nil
25        }
26        let pin = MKPinAnnotationView()
27        pin.pinTintColor = .purple
28        return pin
29    }
30
31 }
32
```





Moscow

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Tokyo

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Mumbai

Kolkata

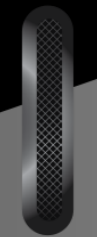
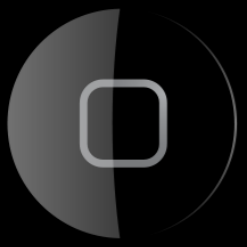
Bangkok

Nairobi

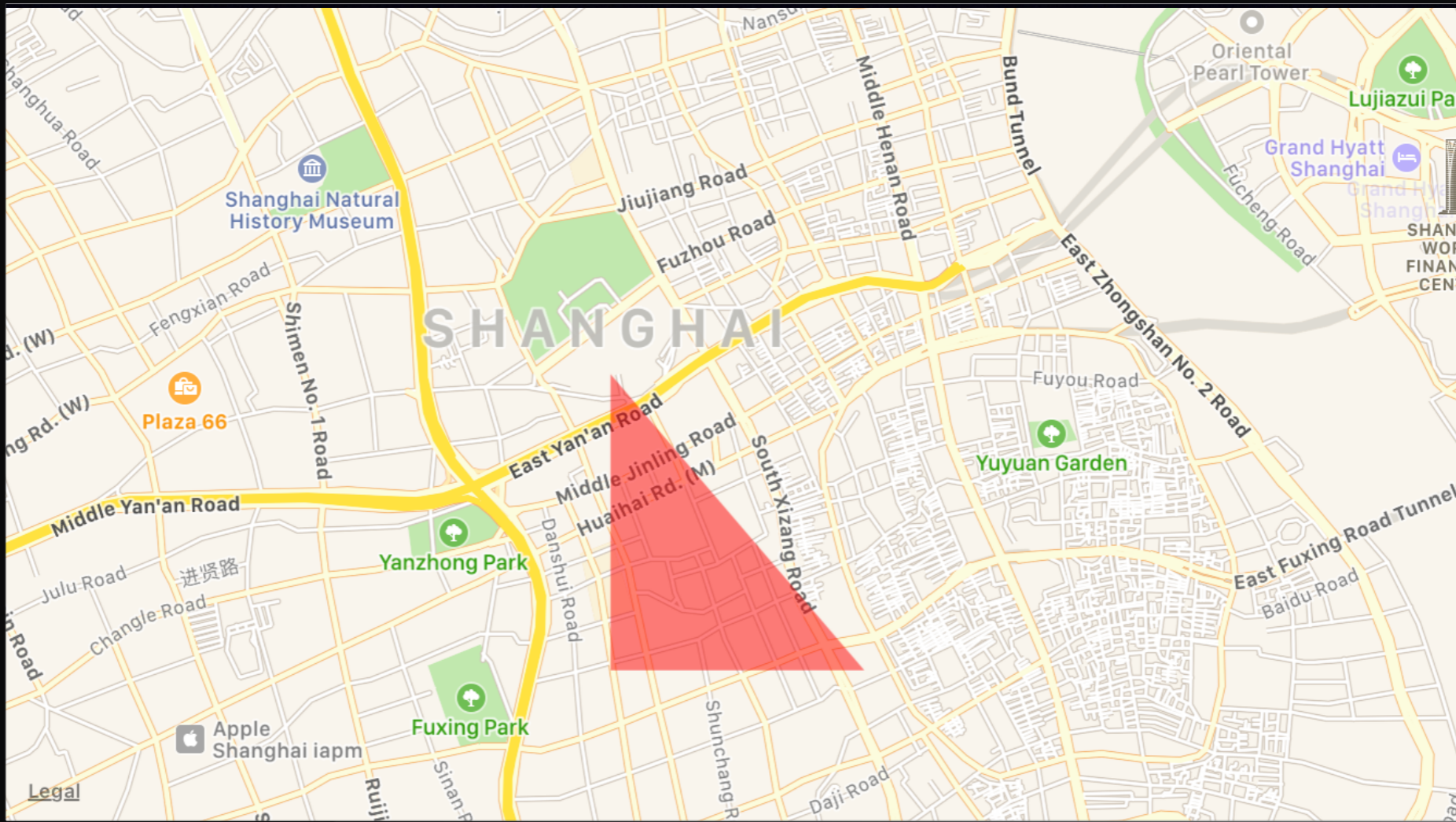
Legal

North Pacific Ocean

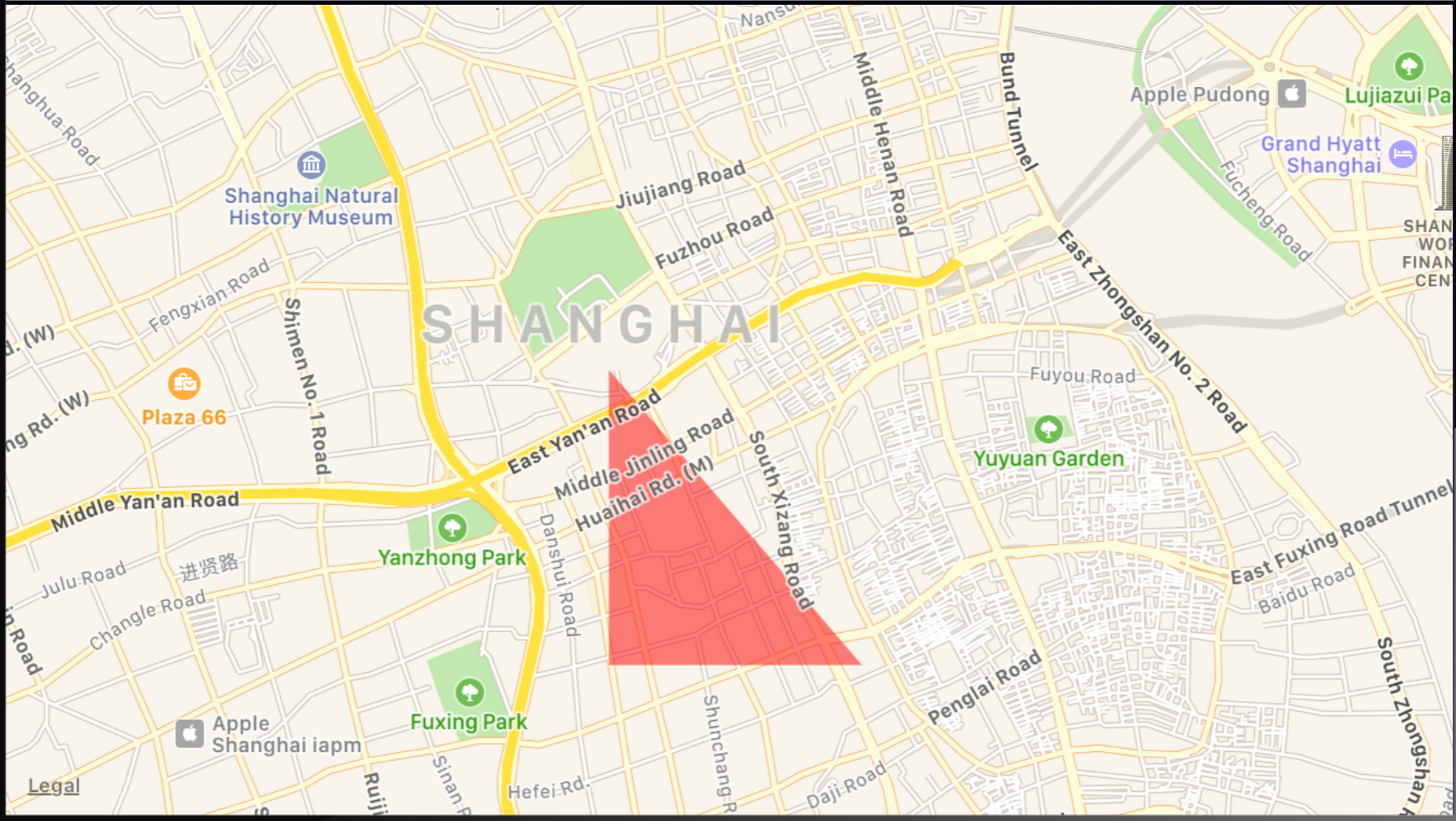
Indian Ocean



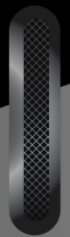
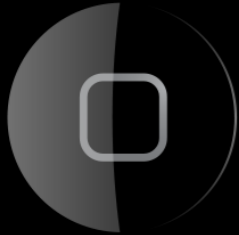
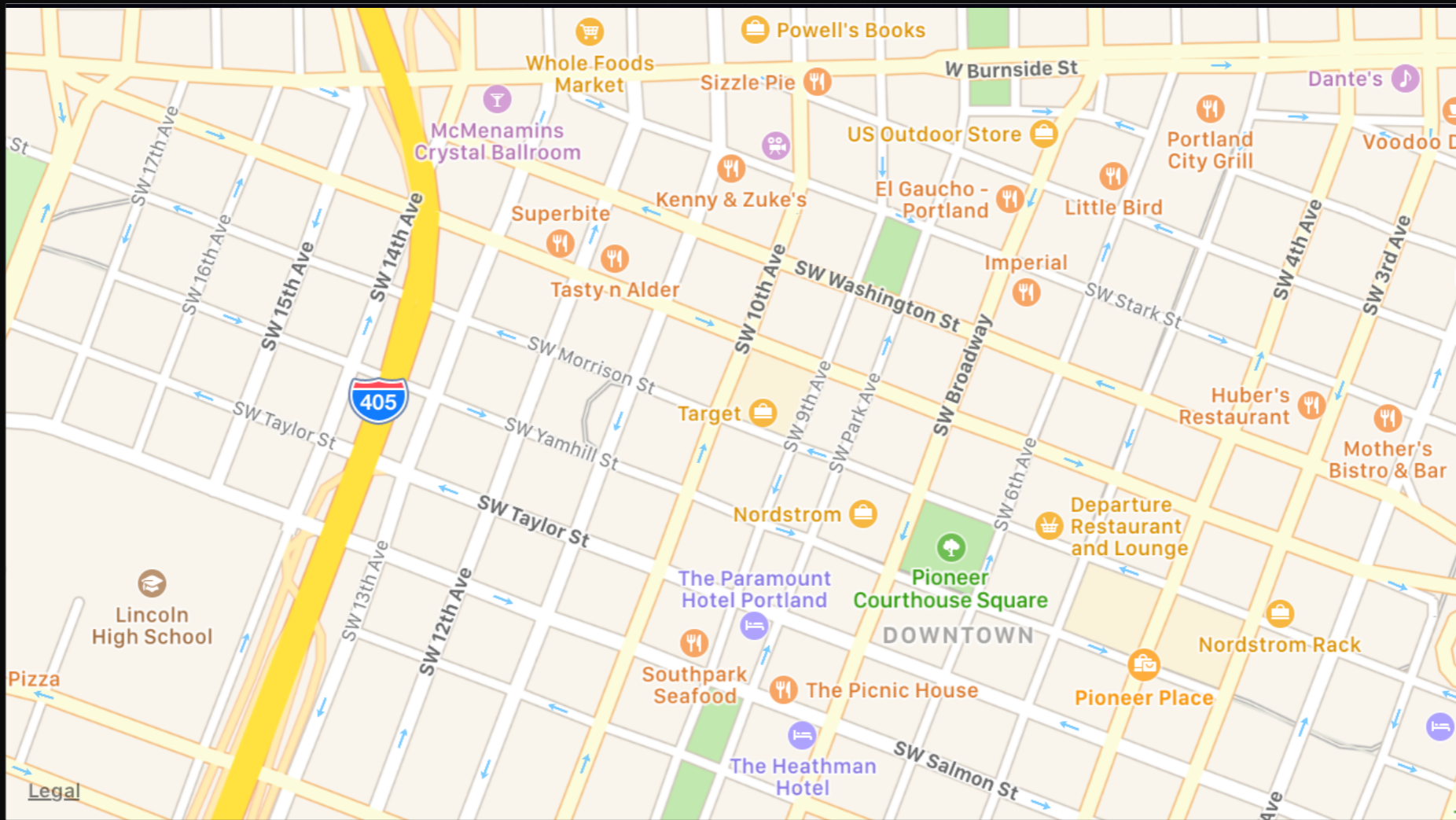
```
1  import UIKit
2  import MapKit
3
4  class ViewController: UIViewController, MKMapViewDelegate {
5
6      override func viewDidLoad() {
7          super.viewDidLoad()
8
9          let map = MKMapView(frame: view.bounds)
10         map.autoresizingMask = [.flexibleWidth, .flexibleHeight]
11         map.delegate = self
12         view.addSubview(map)
13
14         map.centerCoordinate = CLLocationCoordinate2D(latitude: 31.228611,
15                                                     longitude: 121.474722)
16
17         let points = [
18             CLLocationCoordinate2D(latitude: 31.23, longitude: 121.47),
19             CLLocationCoordinate2D(latitude: 31.22, longitude: 121.48),
20             CLLocationCoordinate2D(latitude: 31.22, longitude: 121.47)
21         ]
22         let polygon = MKPolygon(coordinates: points, count: points.count)
23         map.add(polygon)
24         map.region = MKCoordinateRegionMake(map.centerCoordinate,
25                                             MKCoordinateSpanMake(points[0].latitude - points[2].latitude,
26                                                                     points[2].longitude - points[0].longitude))
27     }
28
29     func mapView(_ mapView: MKMapView, rendererFor overlay: MKOverlay) -> MKOverlayRenderer {
30         let renderer = MKPolygonRenderer(overlay: overlay)
31         renderer.fillColor = UIColor.red.withAlphaComponent(0.5)
32         return renderer
33     }
34
35 }
36
```

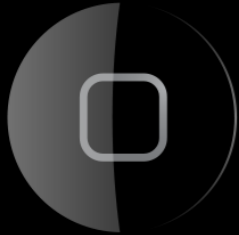
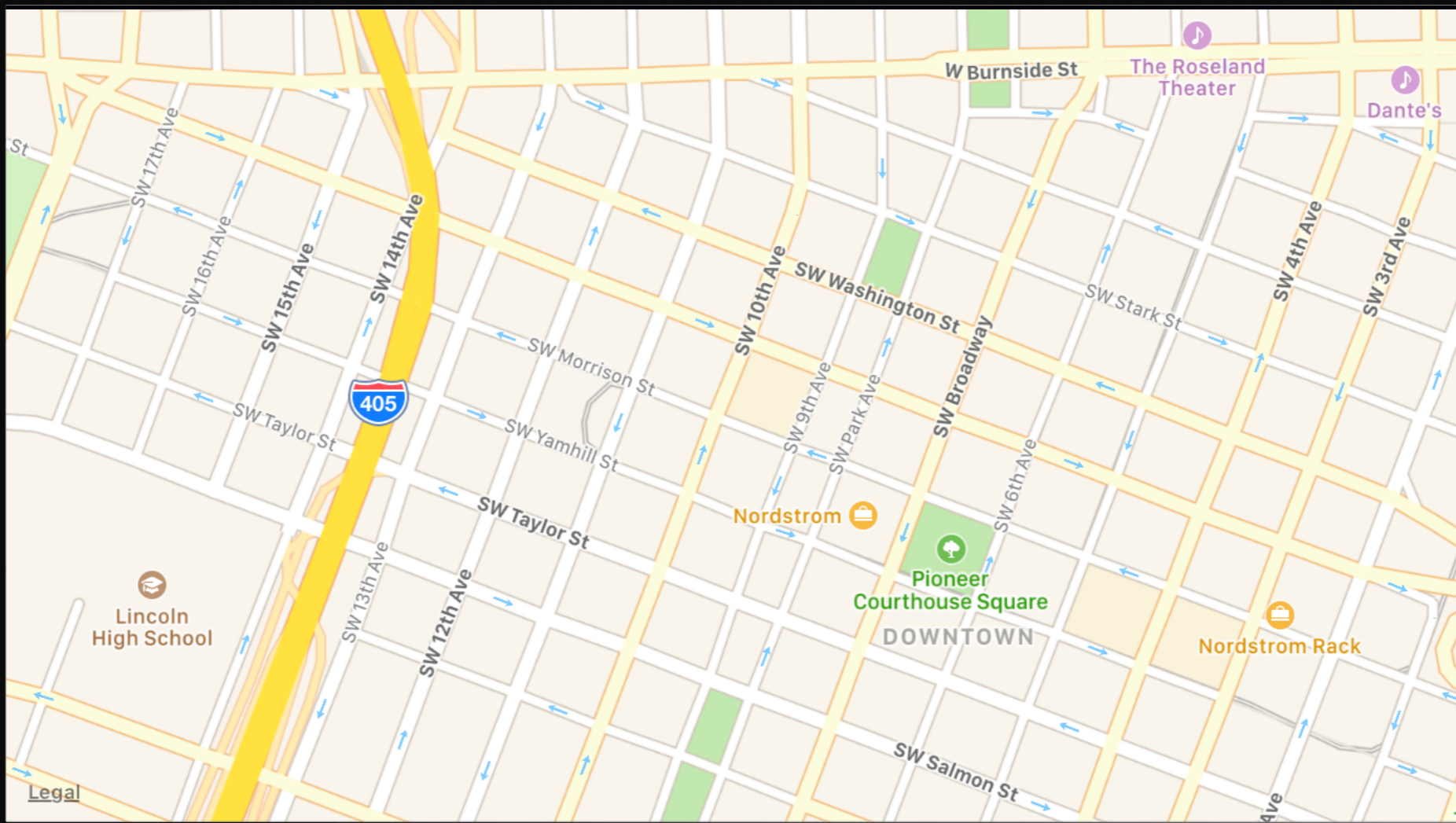


```
1 import UIKit
2 import MapKit
3
4 class ViewController: UIViewController, MKMapViewDelegate {
5
6     override func viewDidLoad() {
7         super.viewDidLoad()
8
9         let map = MKMapView(frame: view.bounds)
10        map.autoresizingMask = [.flexibleWidth, .flexibleHeight]
11        map.delegate = self
12        view.addSubview(map)
13
14        map.centerCoordinate = CLLocationCoordinate2D(latitude: 31.228611,
15                                                    longitude: 121.474722)
16
17        let points = [
18            CLLocationCoordinate2D(latitude: 31.23, longitude: 121.47),
19            CLLocationCoordinate2D(latitude: 31.22, longitude: 121.48),
20            CLLocationCoordinate2D(latitude: 31.22, longitude: 121.47)
21        ]
22        let polygon = MKPolygon(coordinates: points, count: points.count)
23        map.insert(polygon, at: 0, level: .aboveRoads)
24        map.region = MKCoordinateRegionMake(map.centerCoordinate,
25                                           MKCoordinateSpanMake(points[0].latitude - points[2].latitude,
26                                                                points[2].longitude - points[0].longitude))
27    }
28
29    func mapView(_ mapView: MKMapView, rendererFor overlay: MKOverlay) -> MKOverlayRenderer {
30        let renderer = MKPolygonRenderer(overlay: overlay)
31        renderer.fillColor = UIColor.red.withAlphaComponent(0.5)
32        return renderer
33    }
34
35 }
36
```



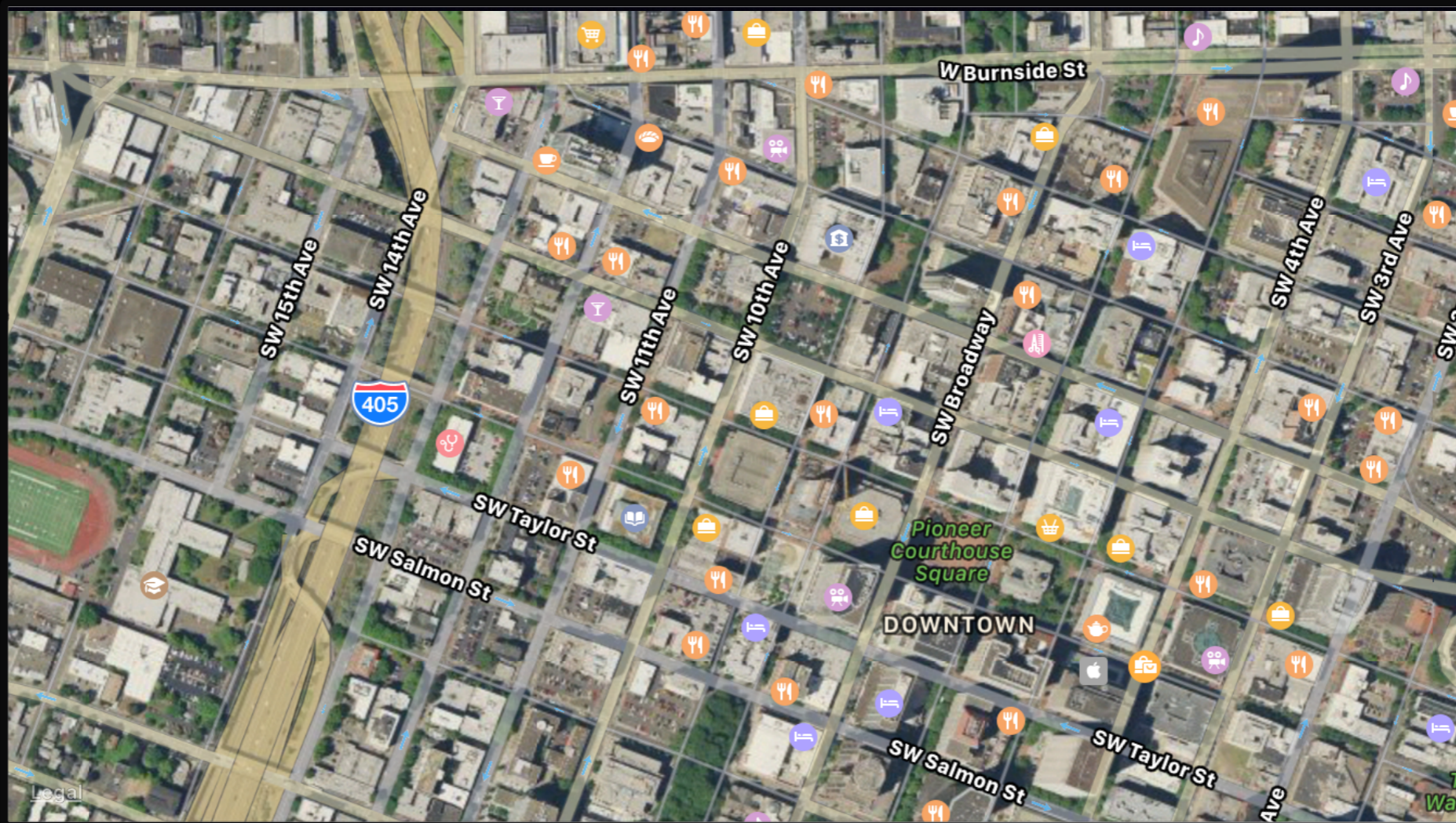
```
1 import UIKit
2 import MapKit
3
4 class ViewController: UIViewController {
5
6     override func viewDidLoad() {
7         super.viewDidLoad()
8
9         let map = MKMapView(frame: view.bounds)
10        map.autoresizingMask = [.flexibleWidth, .flexibleHeight]
11        view.addSubview(map)
12
13        map.centerCoordinate = CLLocationCoordinate2D(latitude: 45.52,
14                                                    longitude: -122.681944)
15
16        let points = [
17            CLLocationCoordinate2D(latitude: 45.52, longitude: -122.68),
18            CLLocationCoordinate2D(latitude: 45.525, longitude: -122.685),
19            CLLocationCoordinate2D(latitude: 45.525, longitude: -122.69)
20        ]
21        map.region = MKCoordinateRegionMake(map.centerCoordinate,
22                                          MKCoordinateSpanMake(points[2].latitude - points[0].latitude,
23                                                                points[0].longitude - points[2].longitude))
24
25        map.showsPointsOfInterest = false
26    }
27
28 }
29
```







```
1 import UIKit
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3
4 class ViewController: UIViewController {
5
6     override func viewDidLoad() {
7         super.viewDidLoad()
8
9         let map = MKMapView(frame: view.bounds)
10        map.autoresizingMask = [.flexibleWidth, .flexibleHeight]
11        view.addSubview(map)
12
13        map.centerCoordinate = CLLocationCoordinate2D(latitude: 45.52,
14                                                    longitude: -122.681944)
15
16        let points = [
17            CLLocationCoordinate2D(latitude: 45.52, longitude: -122.68),
18            CLLocationCoordinate2D(latitude: 45.525, longitude: -122.685),
19            CLLocationCoordinate2D(latitude: 45.525, longitude: -122.69)
20        ]
21        map.region = MKCoordinateRegionMake(map.centerCoordinate,
22                                          MKCoordinateSpanMake(points[2].latitude - points[0].latitude,
23                                                                points[0].longitude - points[2].longitude))
24
25        map.mapType = .hybrid
26    }
27
28 }
29
```



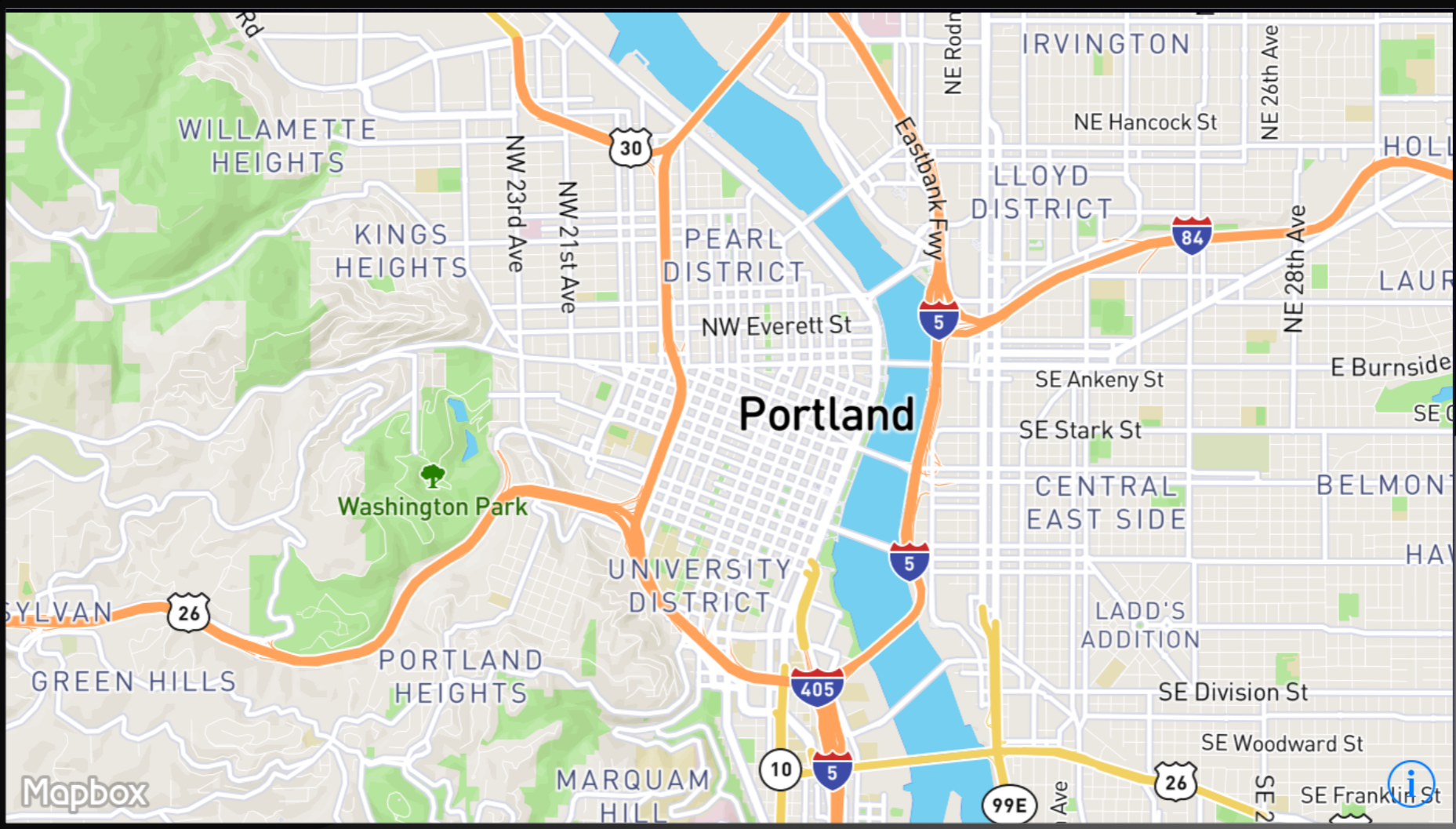
# Mapbox iOS SDK

- **MGLMapView** functionality:
  - Viewport changes (location, zoom, rotation, pitch, and camera API)
  - Custom data: annotations (points and shapes) & **layers** (imagery & rendering)
  - User tracking: location and heading
  - Customization: controls, **pre-designed styling**, **runtime styling**
  - Also works **offline** (**MGLOfflineStorage**)

```
pod 'Mapbox-iOS-SDK'
```

Info.plist &gt; No Selection

Key	Type	Value
▼ Information Property List	Dictionary	(15 items)
Localization native development re...	String	en
Executable file	String	\$(EXECUTABLE_NAME)
Bundle identifier	String	\$(PRODUCT_BUNDLE_IDENTIFIER)
InfoDictionary version	String	6.0
Bundle name	String	\$(PRODUCT_NAME)
Bundle OS Type code	String	APPL
Bundle versions string, short	String	1.0
Bundle version	String	1
Application requires iPhone enviro...	Boolean	YES
Launch screen interface file base...	String	LaunchScreen
Main storyboard file base name	String	Main
▶ Required device capabilities	Array	(1 item)
▶ Supported interface orientations	Array	(3 items)
MGLMapboxAccessToken	String	pk.eyJ1IjoianVzdGluliwiYSI6IlpDbUJLSUE...
▶ Supported interface orientations (i...	Array	(4 items)



```
1 import UIKit
2 import Mapbox
3
4 class ViewController: UIViewController {
5
6     override func viewDidLoad() {
7         super.viewDidLoad()
8
9         let map = MGLMapView(frame: view.bounds)
10        map.autoresizingMask = [.flexibleWidth, .flexibleHeight]
11        view.addSubview(map)
12
13        map.centerCoordinate = CLLocationCoordinate2D(latitude: 45.52,
14                                                    longitude: -122.681944)
15        map.zoomLevel = 12
16
17        map.styleURL = MGLStyle.darkStyleURL(withVersion: MGLStyleDefaultVersion)
18    }
19
20 }
21
```



WILLAMETTE  
HEIGHTS

KINGS  
HEIGHTS

PEARL  
DISTRICT

IRVINGTON

LLOYD  
DISTRICT

HOLI

NW 23rd Ave

NW 21st Ave

NW 18th Ave

Eastbank Fwy

T. H. Banfield Fwy

LAUR

NW Everett St

Portland

E Burnside

SW Taylor St

Washington Park

SE Stark St

CENTRAL  
EAST SIDE

BELMON

SYLVAN

UNIVERSITY  
DISTRICT

HAI

GREEN HILLS

PORTLAND  
HEIGHTS

LADD'S  
ADDITION

SE Division St

Mapbox

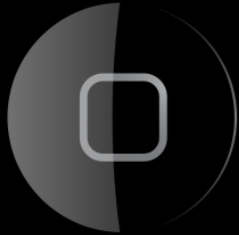
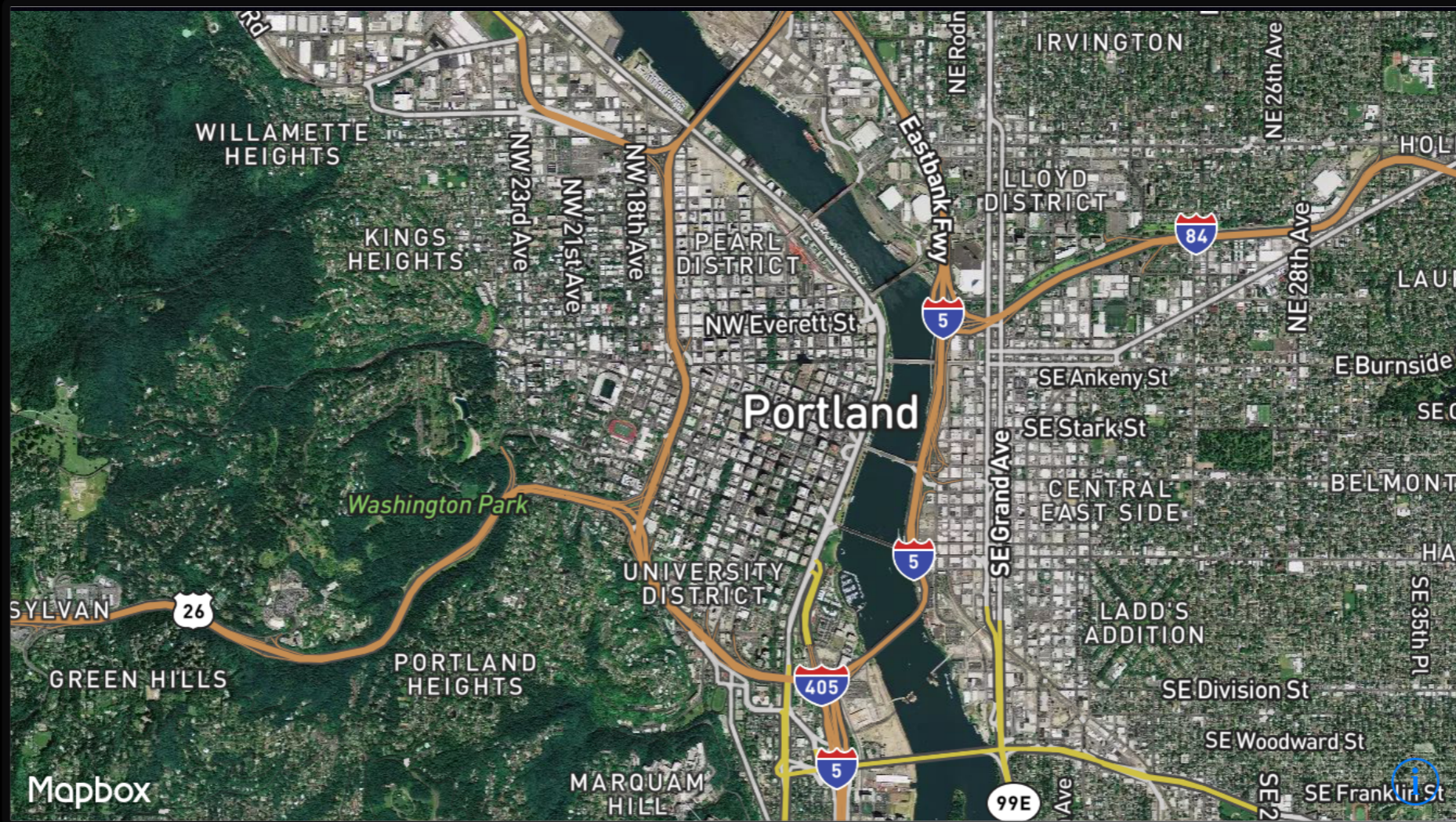
MARQUAM  
HILL

SE 2





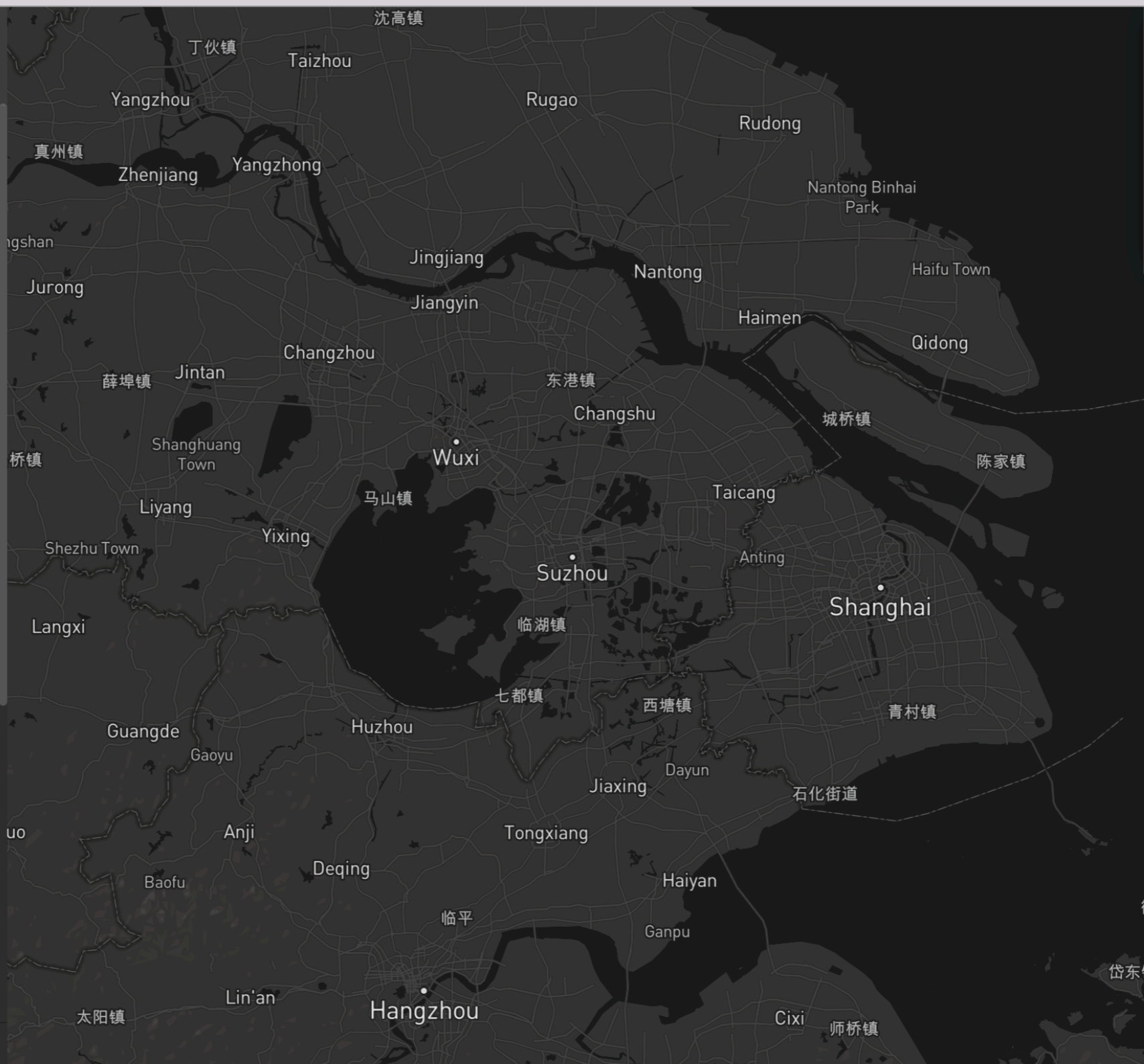
```
1 import UIKit
2 import Mapbox
3
4 class ViewController: UIViewController {
5
6     override func viewDidLoad() {
7         super.viewDidLoad()
8
9         let map = MGLMapView(frame: view.bounds)
10        map.autoresizingMask = [.flexibleWidth, .flexibleHeight]
11        view.addSubview(map)
12
13        map.centerCoordinate = CLLocationCoordinate2D(latitude: 45.52,
14                                                    longitude: -122.681944)
15
16        map.zoomLevel = 12
17
18        map.styleURL = MGLStyle.satelliteStreetsStyleURL(withVersion: MGLStyleDefaultVersion)
19    }
20 }
21
```



# Mapbox Studio

- Web-based design tool for custom styles
- Renders same JSON-based styles in WebGL
- Can add/remove layers, add custom data, and change styling

- WeWork Sh...** Publish
- + New Layer
- Country labels 3 layers
  - State labels 3 layers
  - Marine labels 6 layers
  - City labels 5 layers
    - place-islands
    - place-town
    - place-village
    - place-hamlet
    - place-suburb
    - place-neighbourhood
    - place-islets-archipelago-aboriginal
    - airport-label
  - POI labels (scalerank 1) 2 layers
  - Water labels 1 layer
  - POI labels (scalerank 2) 2 layers
  - Road labels 3 layers
  - POI labels (scalerank 3) 2 layers
  - waterway-label
  - Admin boundaries 5 layers
  - Bridges 34 layers
  - Roads 27 layers
  - Tunnels 24 layers
  - building
  - Aeroways 3 layers
  - barrier\_line-land-line
  - barrier\_line-land-polygon
- Properties



7.5 120.922,31.350

Search

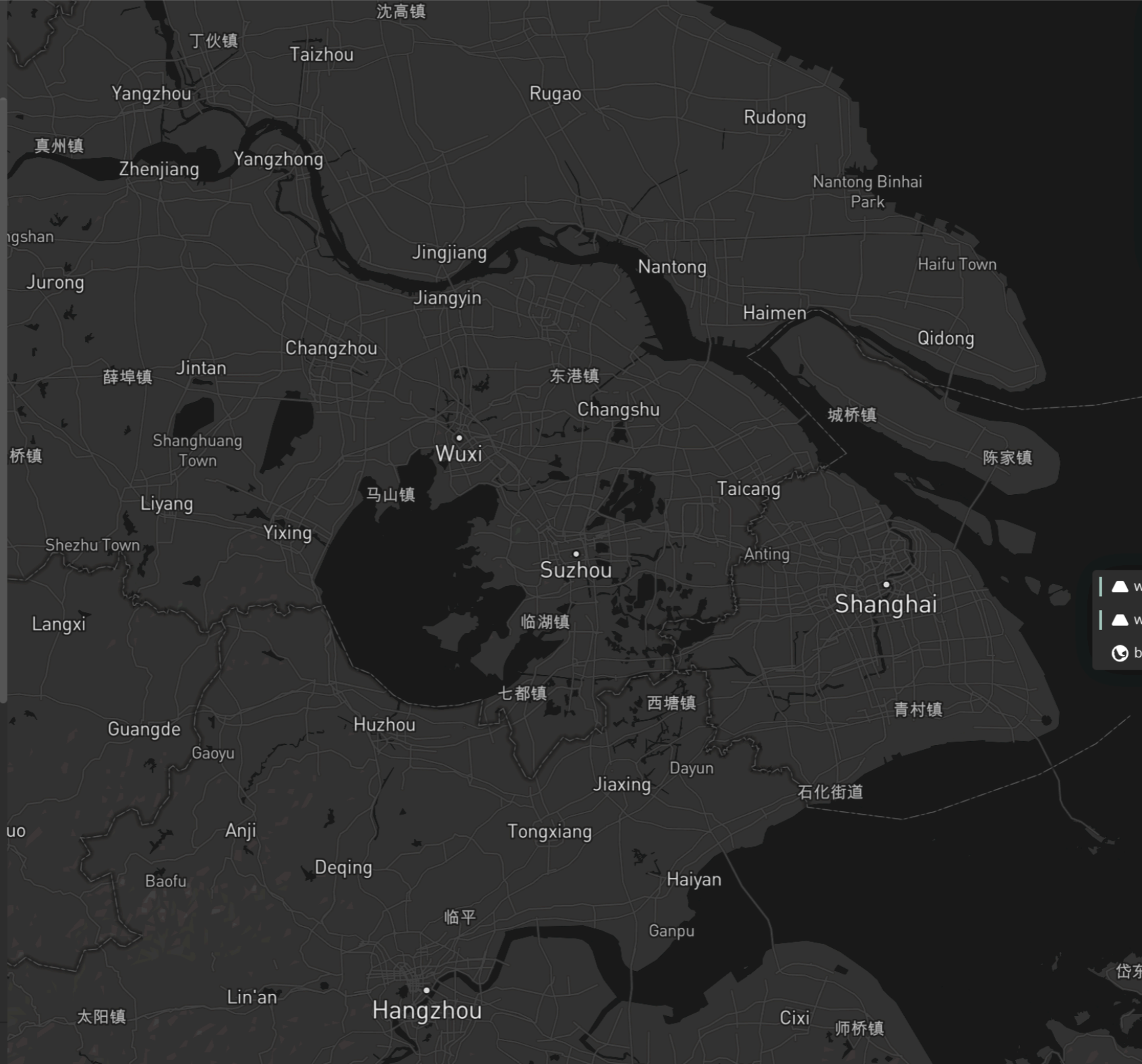
Map position

Debug

History

Help

- Home
- Layers
  - Country labels 3 layers
  - State labels 3 layers
  - Marine labels 6 layers
  - City labels 5 layers
    - place-islands
    - place-town
    - place-village
    - place-hamlet
    - place-suburb
    - place-neighbourhood
    - place-islets-archipelago-aboriginal
    - airport-label
  - POI labels (scalerank 1) 2 layers
  - Water labels 1 layer
  - POI labels (scalerank 2) 2 layers
  - Road labels 3 layers
  - POI labels (scalerank 3) 2 layers
  - waterway-label
  - Admin boundaries 5 layers
  - Bridges 34 layers
  - Roads 27 layers
  - Tunnels 24 layers
  - building
  - Aeroways 3 layers
  - barrier\_line-land-line
  - barrier\_line-land-polygon
- Properties



7.5 120.922,31.350

- Search
- Map position
- Debug
- History
- Help

- water
- water shadow
- background

WeWork Sh...

Publish

+ New layer

Country labels 3 layers

State labels 3 layers

Marine labels 6 layers

City labels 5 layers

place-islands

place-town

place-village

place-hamlet

place-suburb

place-neighbourhood

place-islets-archipelago-aboriginal

airport-label

POI labels (scalerank 1) 2 layers

Water labels 1 layer

POI labels (scalerank 2) 2 layers

Road labels 3 layers

POI labels (scalerank 3) 2 layers

waterway-label

Admin boundaries 5 layers

Bridges 34 layers

Roads 27 layers

Tunnels 24 layers

building

Aeroways 3 layers

barrier\_line-land-line

barrier\_line-land-polygon

Properties

water

Style Select data

Basics

Color hsl(52, 85%, 49%)

Pattern none

Opacity 1

Antialias

1px stroke hsl(185, 2%, 10%)

Translate 0 px x

0 px y

Translate anchor

Edit Values

RGB HSV

H 52

S 92

V 91

100

7.5 120.922, 31.350

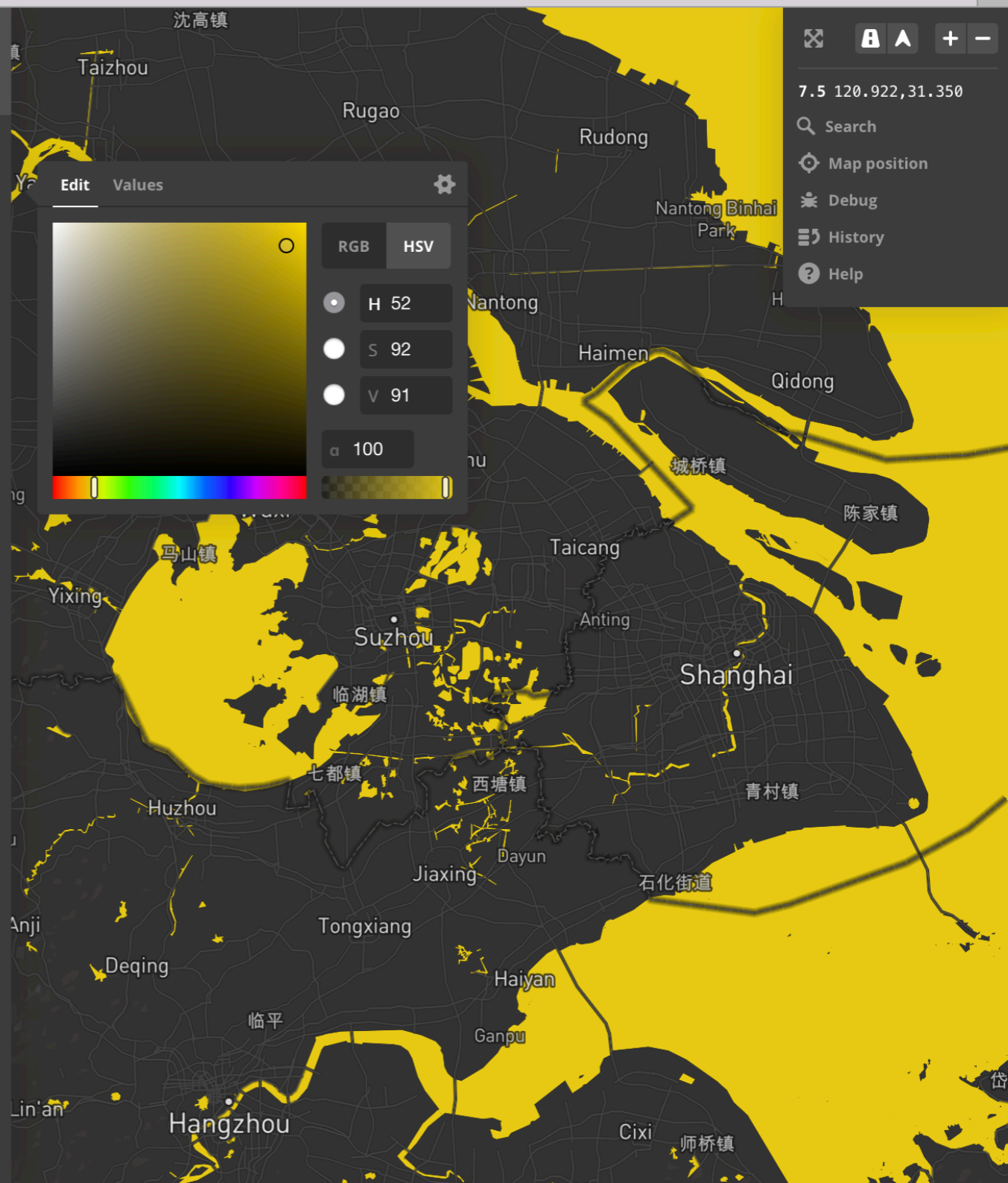
Search

Map position

Debug

History

Help



WeWork Sh...

Publish

+ New layer

Country labels 3 layers

State labels 3 layers

Marine labels 6 layers

City labels 5 layers

place-islands

place-town

place-village

place-hamlet

place-suburb

place-neighbourhood

place-islets-archipelago-aboriginal

airport-label

POI labels (scalerank 1) 2 layers

Water labels 1 layer

POI labels (scalerank 2) 2 layers

Road labels 3 layers

POI labels (scalerank 3) 2 layers

waterway-label

Admin boundaries 5 layers

Bridges 34 layers

Roads 27 layers

Tunnels 24 layers

building

Aeroways 3 layers

barrier\_line-land-line

barrier\_line-land-polygon

Properties

water

Style Select data

Basics

Color hsl(353, 92%, 74%)

Pattern none

Opacity 1

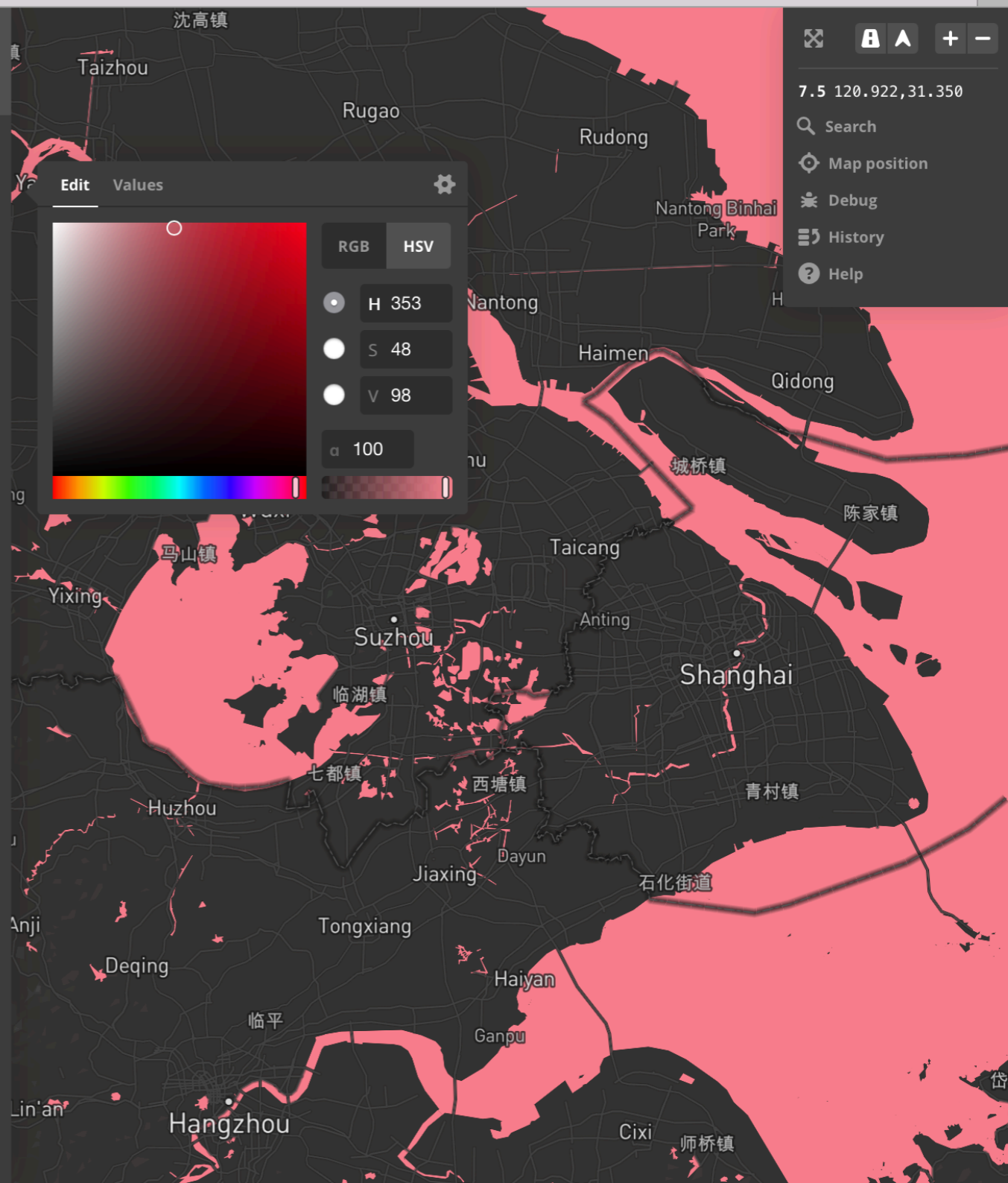
Antialias

1px stroke hsl(185, 2%, 10%)

Translate 0 px x

0 px y

Translate anchor



7.5 120.922, 31.350

Search

Map position

Debug

History

Help

Edit Values

RGB HSV

H 353

S 48

V 98

100



## WeWork Shanghai Dark

Share your style with friends, integrate it into an application, or use it with other mapping software:

- Preview
- View style details
- Edit style

### Share and preview



Share URL:  

```
https://api.mapbox.com/styles/v1/justin/ciwpmahqb00ap2qqy2lky08jc.html?title=true&access_token=pk.eyJ1IjoianVzdGluIiwiaSI6Ij1RmhSN2cifQ.-R7zSJ3glf2uXy5XzMWYnA#7.5/31.349522/120.922066/0
```

Share your design with your friends and coworkers. Everyone will be able to see the latest published version of this style through this **share URL** link.

### Pick an access token

Default Public Token 

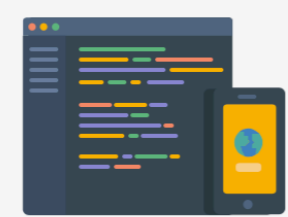
Use tokens for better access control and analytics.

### Attribution

© Mapbox © OpenStreetMap

When using this map style, you must include attribution. For details, [read the FAQ](#).

### Develop with this style



Mapbox  Learn it

Style URL:  

Access token:  

Note the **style URL** and **access token** and select a platform to get started:





```
1 import UIKit
2 import Mapbox
3
4 class ViewController: UIViewController {
5
6     override func viewDidLoad() {
7         super.viewDidLoad()
8
9         let map = MGLMapView(frame: view.bounds)
10        map.autoresizingMask = [.flexibleWidth, .flexibleHeight]
11        view.addSubview(map)
12
13        map.centerCoordinate = CLLocationCoordinate2D(latitude: 45.52,
14                                                    longitude: -122.681944)
15        map.zoomLevel = 12
16
17        map.styleURL = URL(string: "mapbox://styles/justin/ciwq6kufq00ar2pnxsdmoro1v")
18    }
19
20 }
21
```

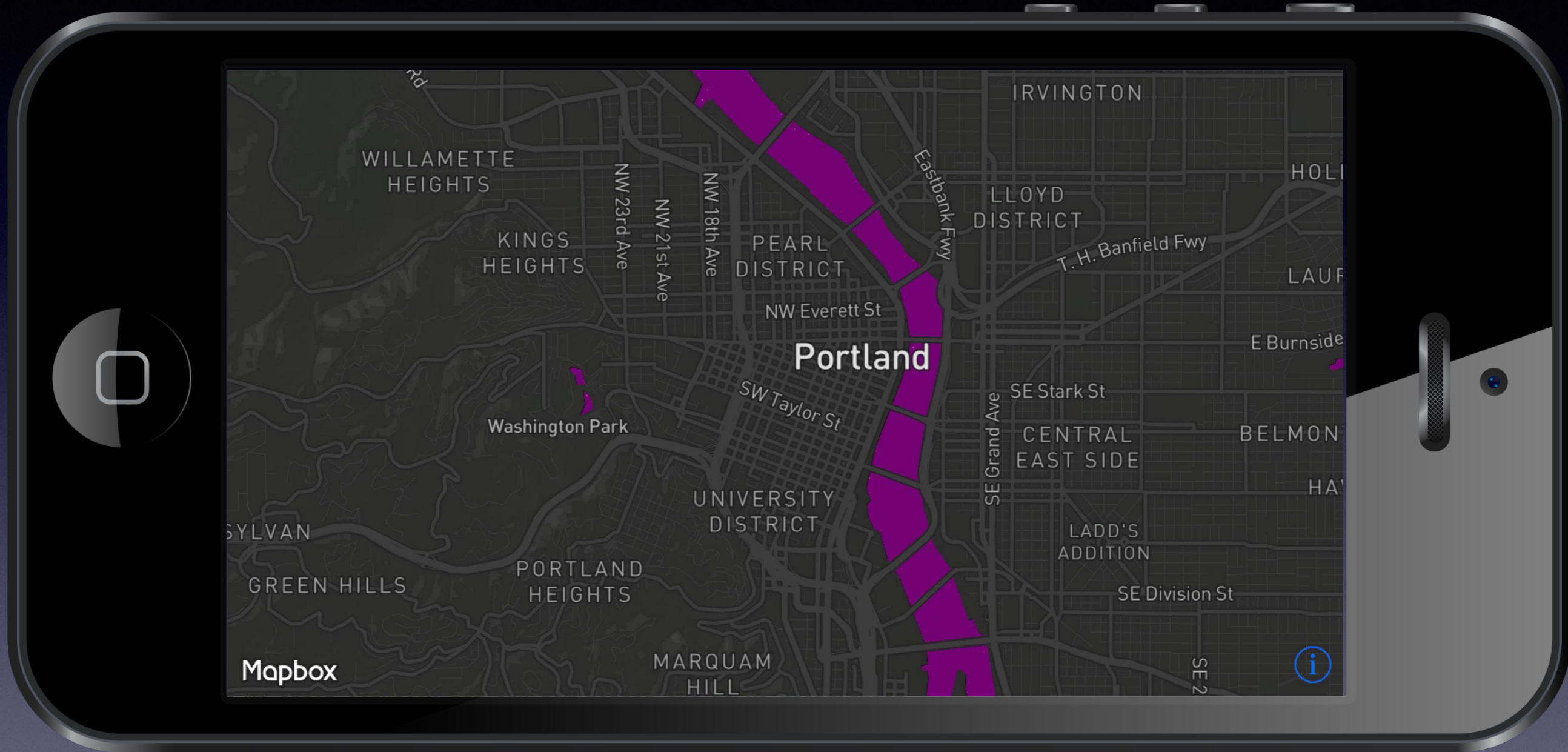


Mapbox

Portland



```
1 import UIKit
2 import Mapbox
3
4 class ViewController: UIViewController, MGLMapViewDelegate {
5
6     var timer: Timer?
7
8     override func viewDidLoad() {
9         super.viewDidLoad()
10
11         let map = MGLMapView(frame: view.bounds)
12         map.delegate = self
13         map.autoresizingMask = [.flexibleWidth, .flexibleHeight]
14         view.addSubview(map)
15
16         map.centerCoordinate = CLLocationCoordinate2D(latitude: 45.52,
17                                                     longitude: -122.681944)
18         map.zoomLevel = 12
19
20         map.styleURL = URL(string: "mapbox://styles/justin/ciwq6kufq00ar2pnxsdmoro1v")
21     }
22
23     func mapView(_ mapView: MGLMapView, didFinishLoading style: MGLStyle) {
24         if let buildings = style.layer(withIdentifier: "building") as? MGLFillStyleLayer {
25             buildings.fillColor = MGLStyleValue(rawValue: UIColor.white)
26             timer = Timer(timeInterval: 1, repeats: true) { (timer) in
27                 buildings.isVisible = !buildings.isVisible
28             }
29             RunLoop.main.add(timer!, forMode: .commonModes)
30         }
31
32         if let water = style.layer(withIdentifier: "water") as? MGLFillStyleLayer {
33             water.fillColor = MGLStyleValue(rawValue: UIColor.purple)
34         }
35     }
36
37 }
38
```



WILLAMETTE HEIGHTS

KINGS HEIGHTS

PEARL DISTRICT

Portland

UNIVERSITY DISTRICT

IRVINGTON

LLOYD DISTRICT

CENTRAL EAST SIDE

Mapbox





# Mapbox Pricing

- Unlike Apple, we don't make our money on hardware 😊
- But Mapbox on mobile is free to use for  $\leq$  50,000 monthly active users
- Beyond that, we have enterprise plans



**FOURSQUARE**

**STRAVA™**

**GitHub**



*Pinterest*



**Deloitte.**



*Instacart*



**Qlik Q**



**DigitalGlobe™**

FINANCIAL TIMES



*Roadtrippers*

*metromile*



**theguardian**



**Etsy**

The Washington Post

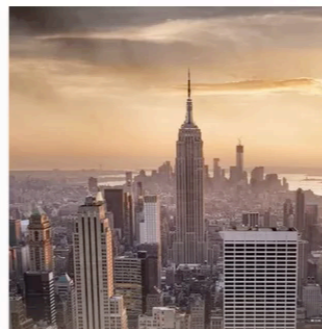
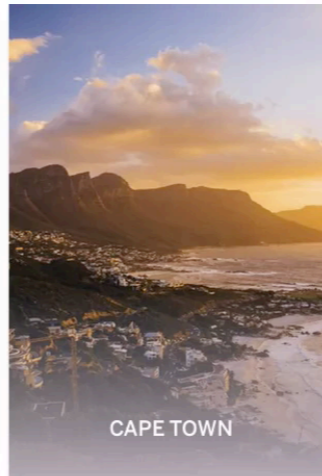


**DIE ZEIT**





My City Guides

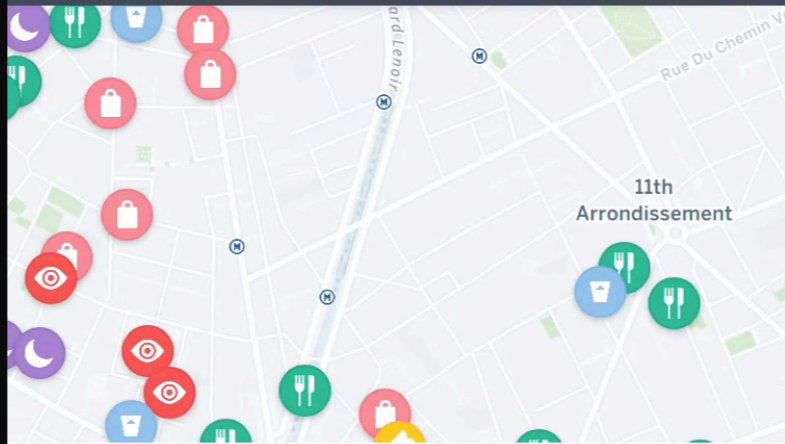






# Discover Paris

TAP TO DOWNLOAD OFFLINE MAP



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## INTERESTS



# Thank You!

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