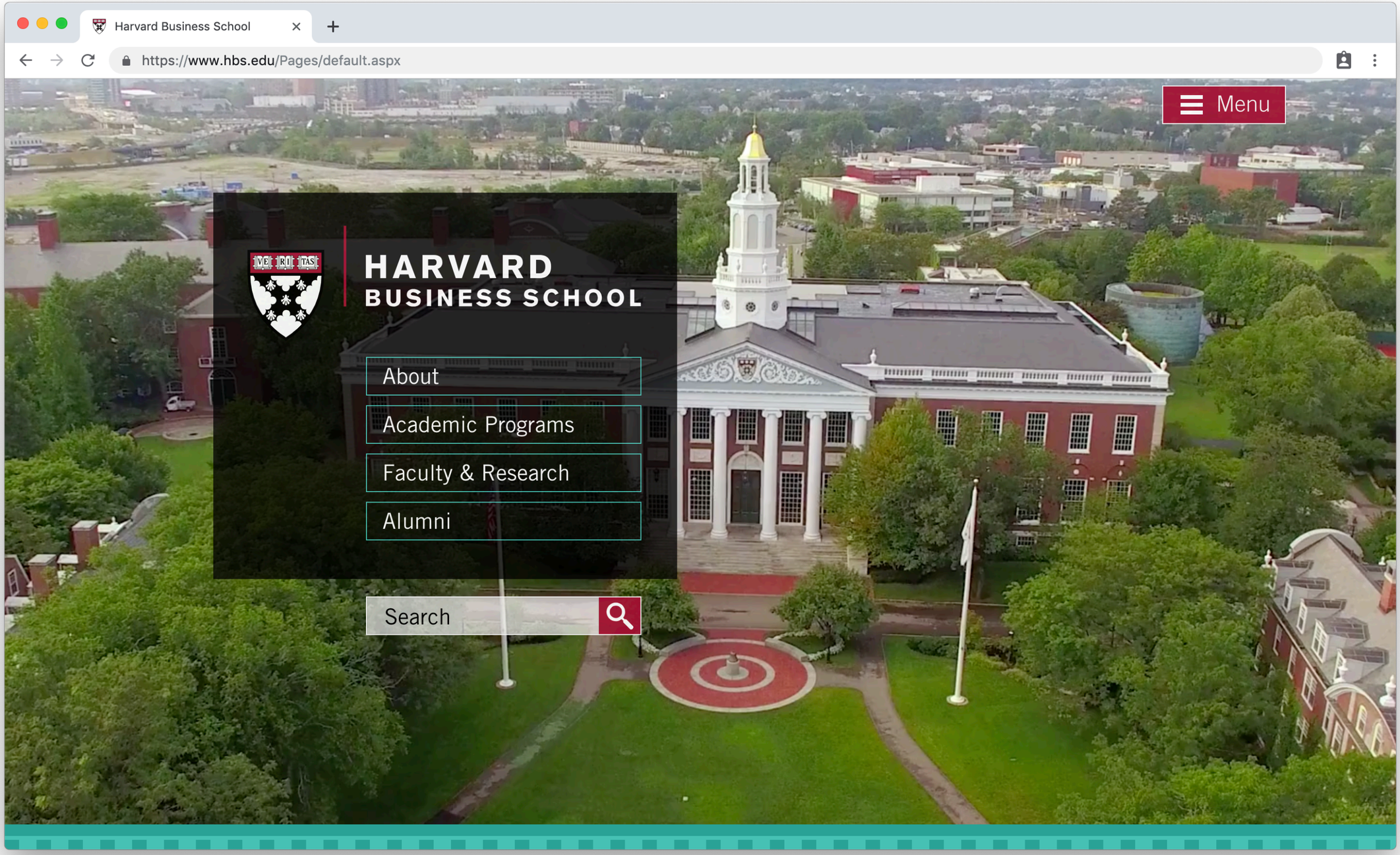
CS50 for MBAs

Mobile Strategies

Web Apps
Native Apps
Hybrid Apps

Web Apps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User Agents

Mozilla/5.0 (iPhone; CPU iPhone OS 12_1 like Mac OS X) AppleWebKit/605.1.15 (KHTML, like Gecko) Version/12.0 Mobile/15E148 Safari/604.1

Mozilla/5.0 (**iPhone; CPU iPhone OS 12_1 like Mac OS X**) AppleWebKit/605.1.15 (KHTML, like Gecko) Version/12.0 Mobile/15E148 Safari/604.1

Mozilla/5.0 (Macintosh; Intel Mac OS X 10_14_3) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/72.0.3626.119 Safari/537.36

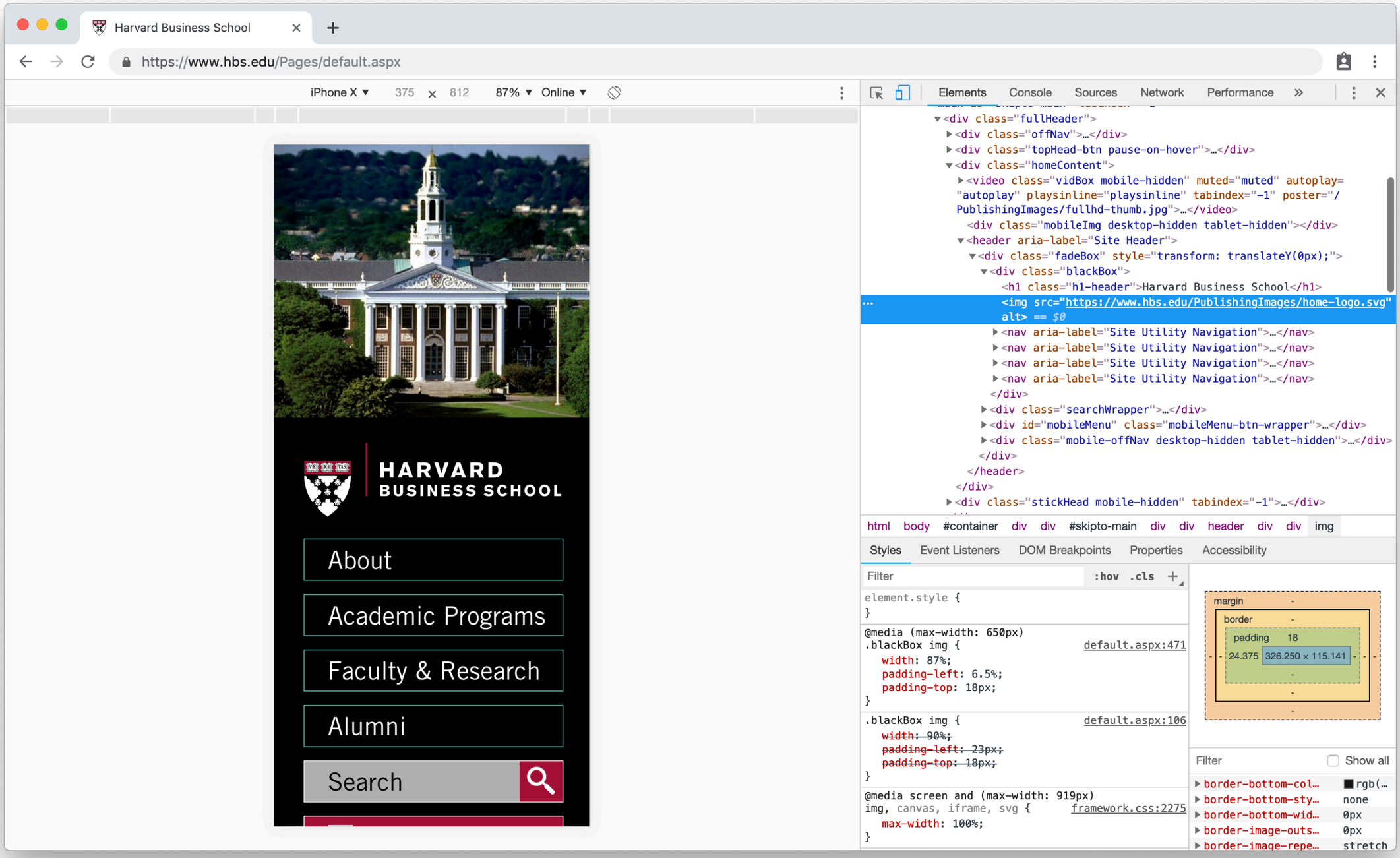
Mozilla/5.0 (**Macintosh; Intel Mac OS X 10_14_3**) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/72.0.3626.119 Safari/537.36

```
if 'iphone' in user_agent:
    ...
else:
    ...
```

Media Queries

```
@media screen and (min-width: 920px) {
    ...
}

@media
(max-width: 919px) and
(min-width: 650px) {
    ...
}
```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<nav aria-label="Site Utility Navigation">…</nav>
<nav aria-label="Site Utility Navigation">…</nav>
<nav aria-label="Site Utility Navigation">…</nav>

…
…
…

</header>

…
html body #container div div #skipto-main div div header div div img
Styles Event Listeners DOM Breakpoints Properties Accessibility
Filter :hov .cls +
element.style {
}
@media (max-width: 650px)
.blackBox img { default.aspx:471
width: 87%;
padding-left: 6.5%;
padding-top: 18px;
}
.blackBox img { default.aspx:106
width: 90%;
padding-left: 23px;
padding-top: 18px;
}
@media screen and (max-width: 919px)
img, canvas, iframe, svg { framework.css:2275
max-width: 100%;
}
margin -
border -
padding 18
24.375 326.250 × 115.141
Filter Show all
border-bottom-col… rgb(…
border-bottom-sty… none
border-bottom-wid… 0px
border-image-outs… 0px
border-image-repe… stretch

CSS Frameworks

- Bootstrap
- Foundation
- Material UI
- Semantic UI
- …

Native Apps

Native Platforms

- Android
- BlackBerry
- iOS
- Windows
- ...

Native Platforms

- Android (Java/Kotlin)
- BlackBerry (Java)
- iOS (Objective-C/Swift)
- Windows (C#)
- ...

iOS

```
override func viewDidLoad() {
  let button = UIButton(frame:
    CGRect(x: 0, y: 0, width: 100, height: 50)
  )
  button.setTitle("Hello", for: .normal)
  button.addTarget(self, action:
#selector(buttonAction), for: .touchUpInside)
  self.view.addSubview(button)
  // ...
}
```

Android

```
@Override
protected void onCreate(Bundle state) {
  LinearLayout l = new LinearLayout(this);
  l.setOrientation(LinearLayout.VERTICAL);
  Button button = new Button(this);
  button.setText("Hello");
  layout.addView(button);
  // ...
}
```

Usage

99.6 percent of new smartphones run Android or iOS

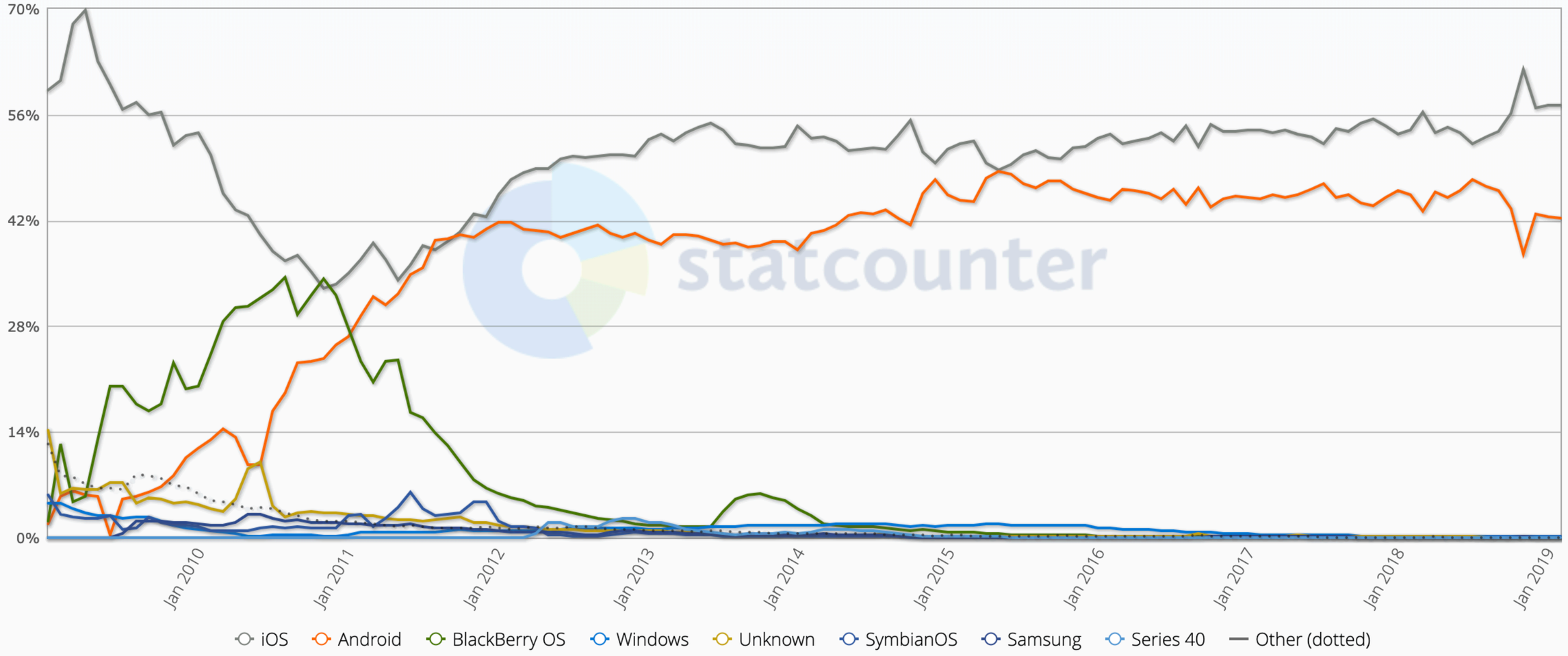
While BlackBerry's market share is a rounding error

by James Vincent | @jjvincent | Feb 16, 2017, 6:11am EST

theverge.com

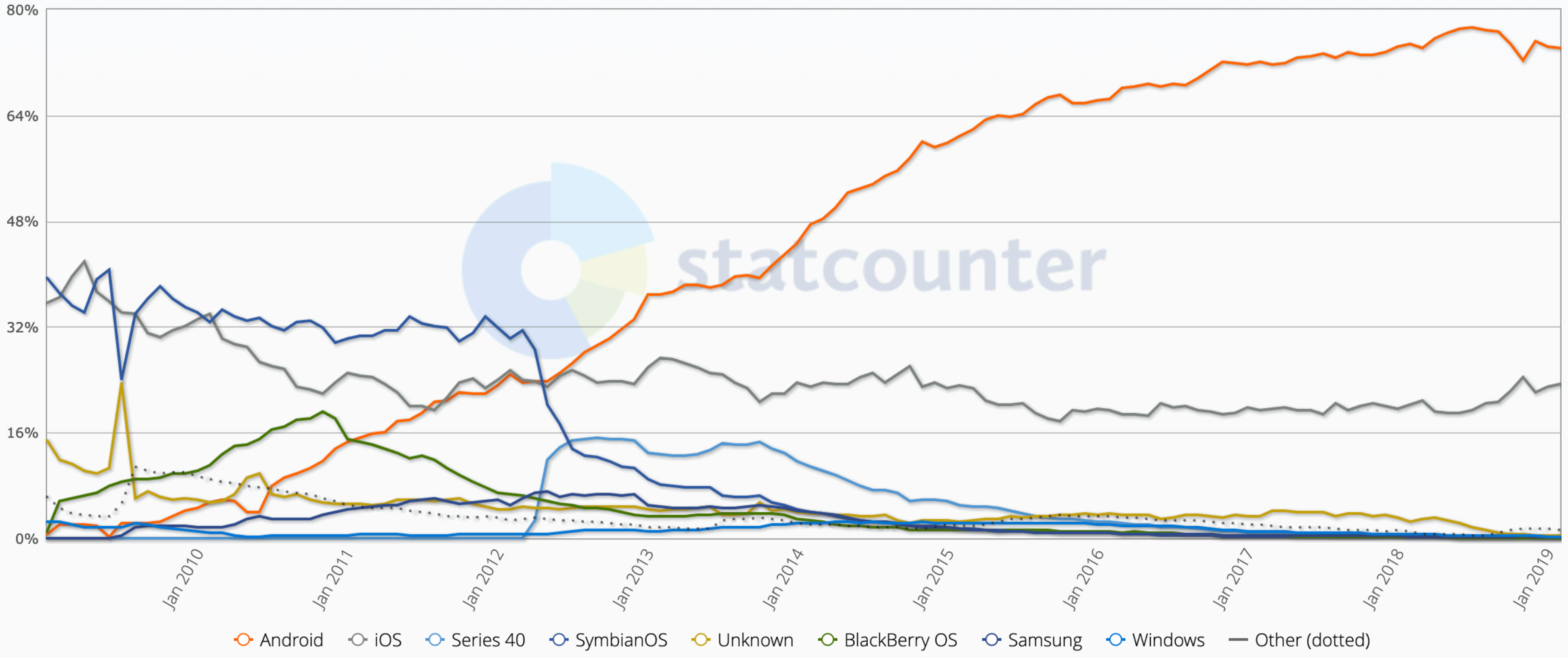
Mobile Operating System Market Share United States Of America

Jan 2009 - Feb 2019



Mobile Operating System Market Share Worldwide

Jan 2009 - Feb 2019



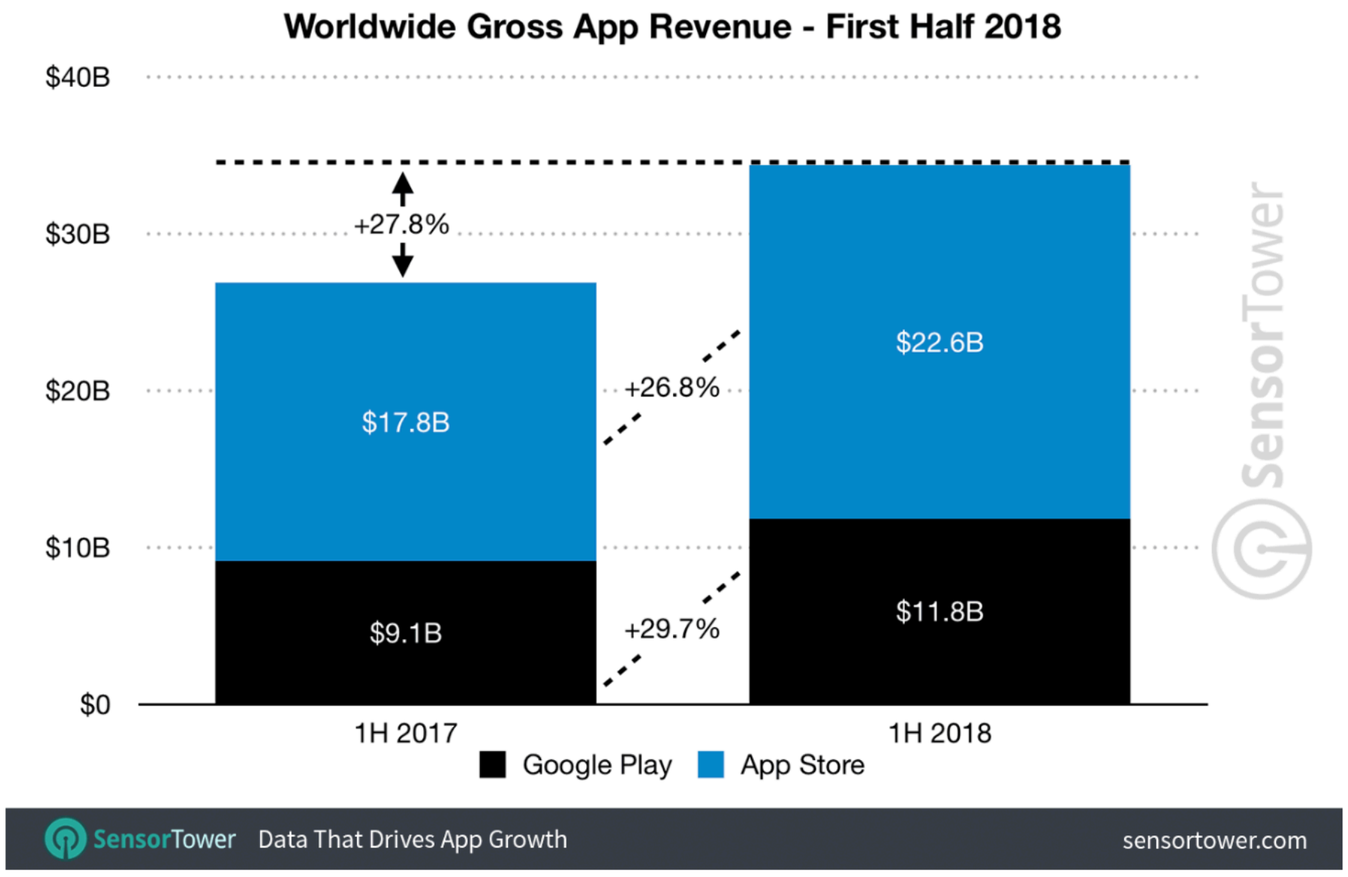
Revenue

Apple's App Store revenue nearly double that of Google Play in first half of 2018

Sarah Perez @sarahintampa / 8 months ago

Comment

techcrunch.com


Worldwide Gross App Revenue - First Half 2018
$40B
$30B
$20B
$10B
$0
+27.8%
$17.8B
$9.1B
+26.8%
+29.7%
$22.6B
$11.8B
1H 2017
1H 2018
Google Play
App Store
SensorTower
SensorTower Data That Drives App Growth
sensortower.com

Hybrid Apps

Web View

Hybrid Frameworks

- Cordova
- React Native
- Titanium
- ...

React

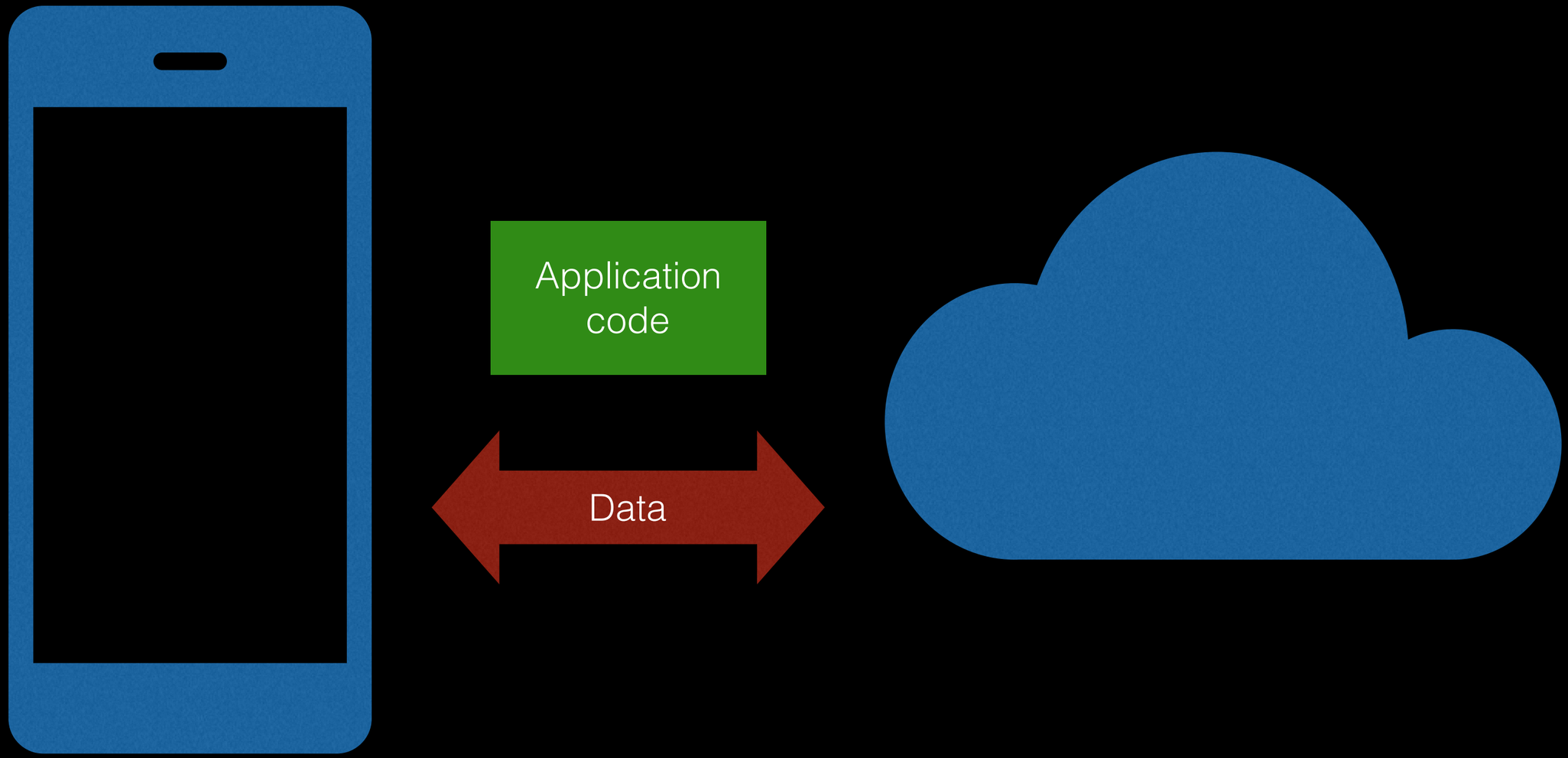
```
class Board extends React.Component {
  renderSquare(i) {
    return <Square value={i} />;
  }
}

class Square extends React.Component {
  ...
}
```

React Native

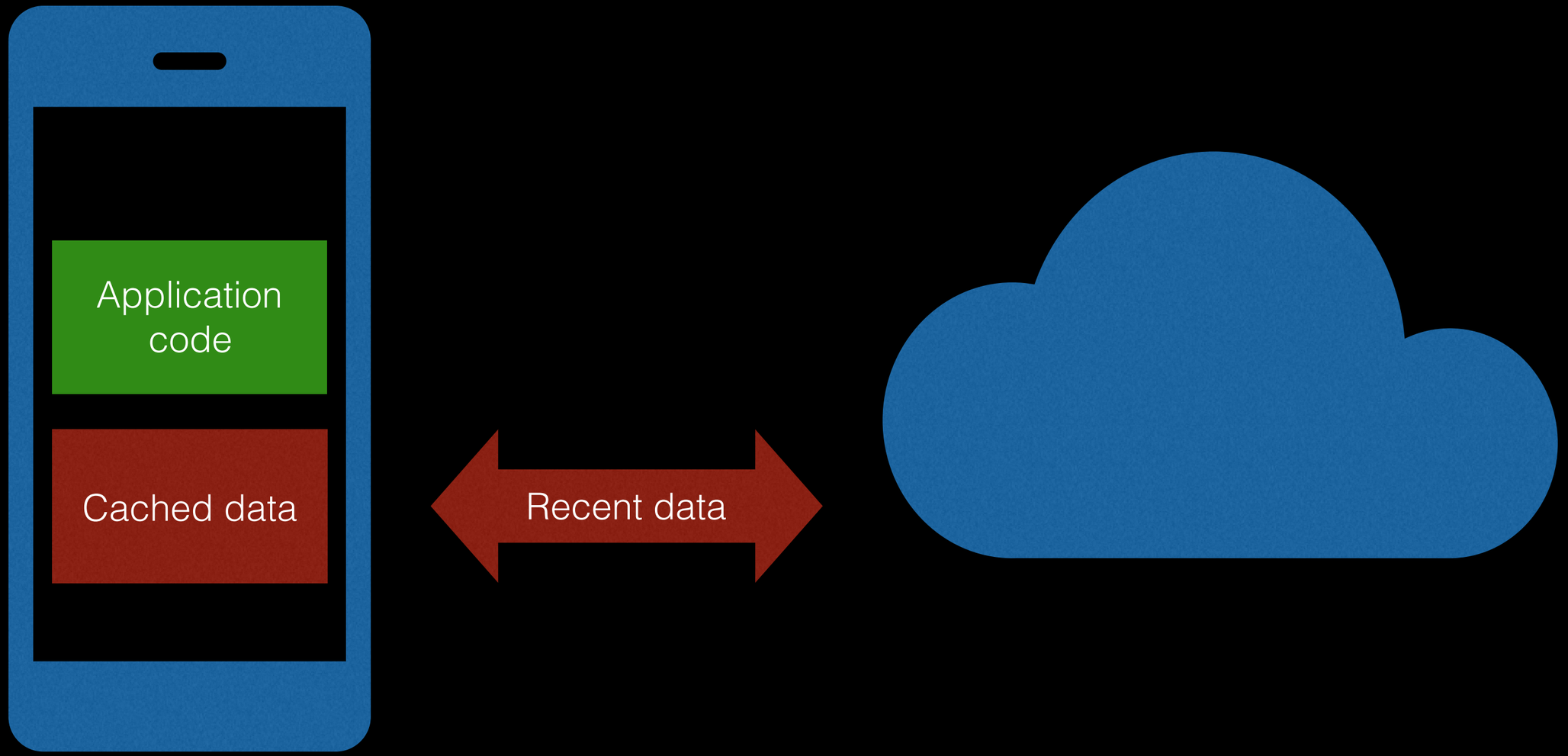
```
<SegmentedControlIOS
  values={['One', 'Two']}
  selectedIndex={this.state.selectedIndex}
  onChange={(event) => {
    this.setState({
      selectedIndex:
event.nativeEvent.selectedSegmentIndex
    });
  }}
/>
```

Comparing Approaches

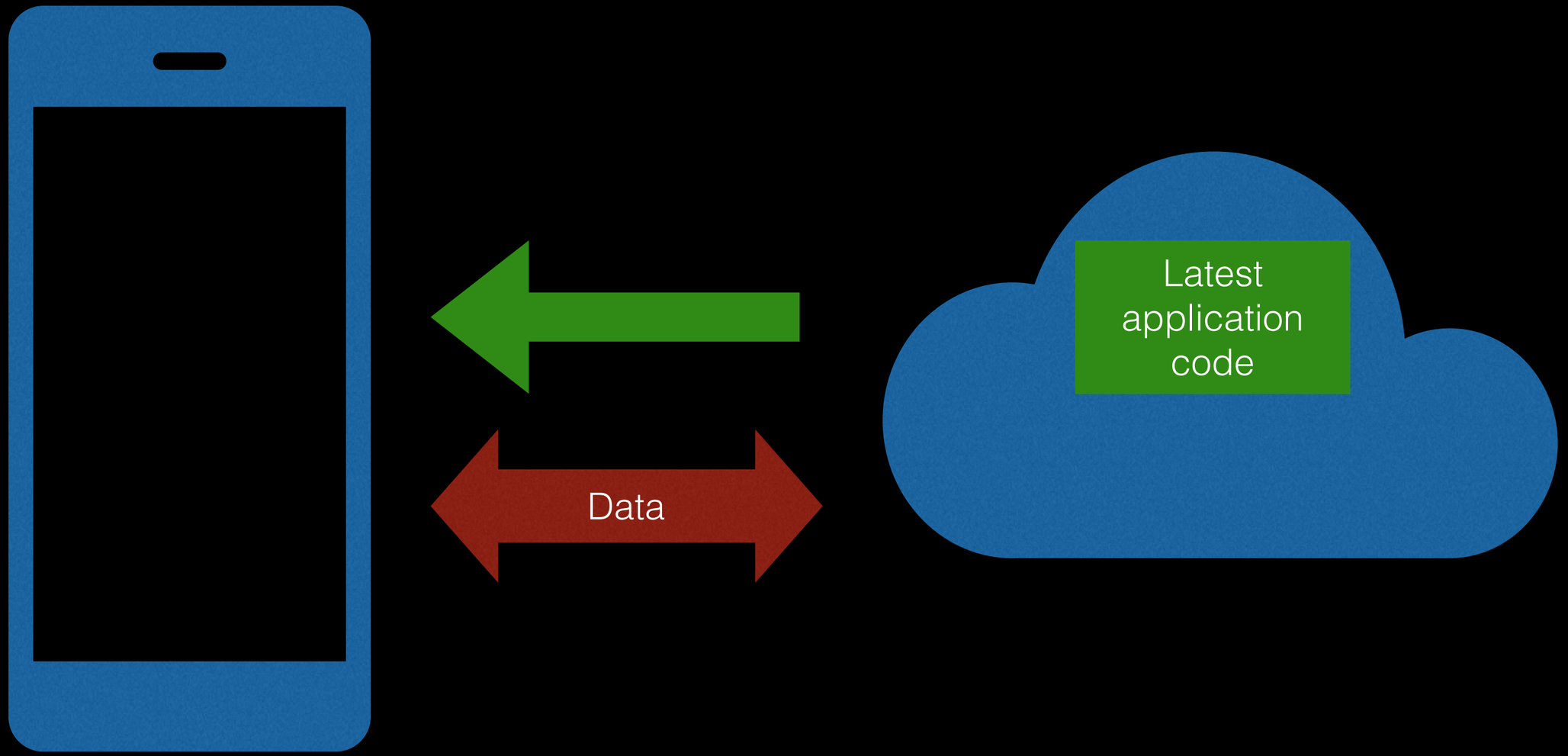
Comparing Approaches



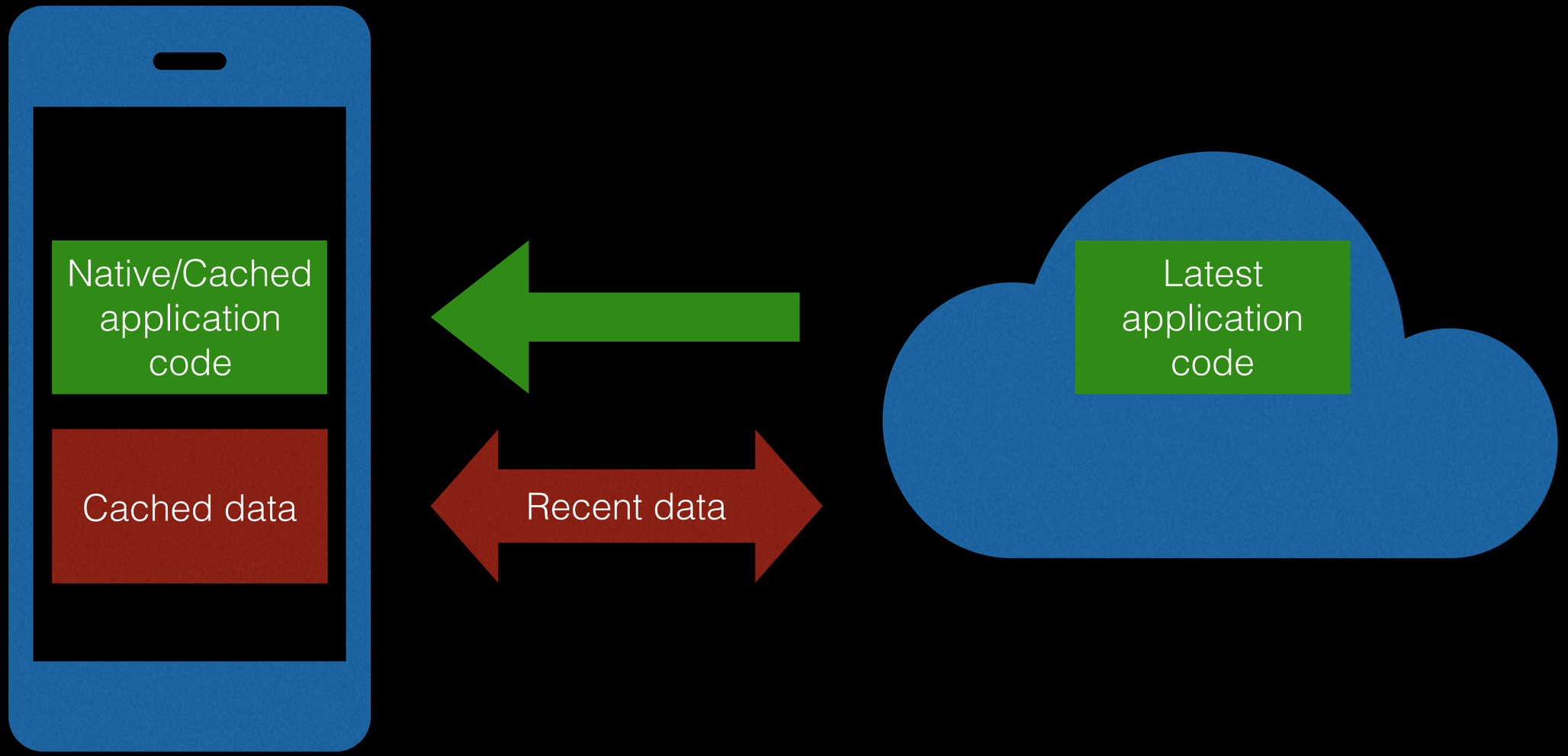
Native Apps



Web Apps



Hybrid Apps


Native/Cached application code
Cached data
Recent data
Latest application code

Tradeoffs

Web Apps

Web Apps

+ write code once
+ faster iteration
+ lower learning curve

- slower performance
- limited access to device APIs
- no App/Play Store, home screen icon

Native Apps

Native Apps

+ fast performance
+ no limitations on device APIs
+ higher learning curve

- new language per platform
- slower iteration speed
- APIs constantly changing

Hybrid Apps

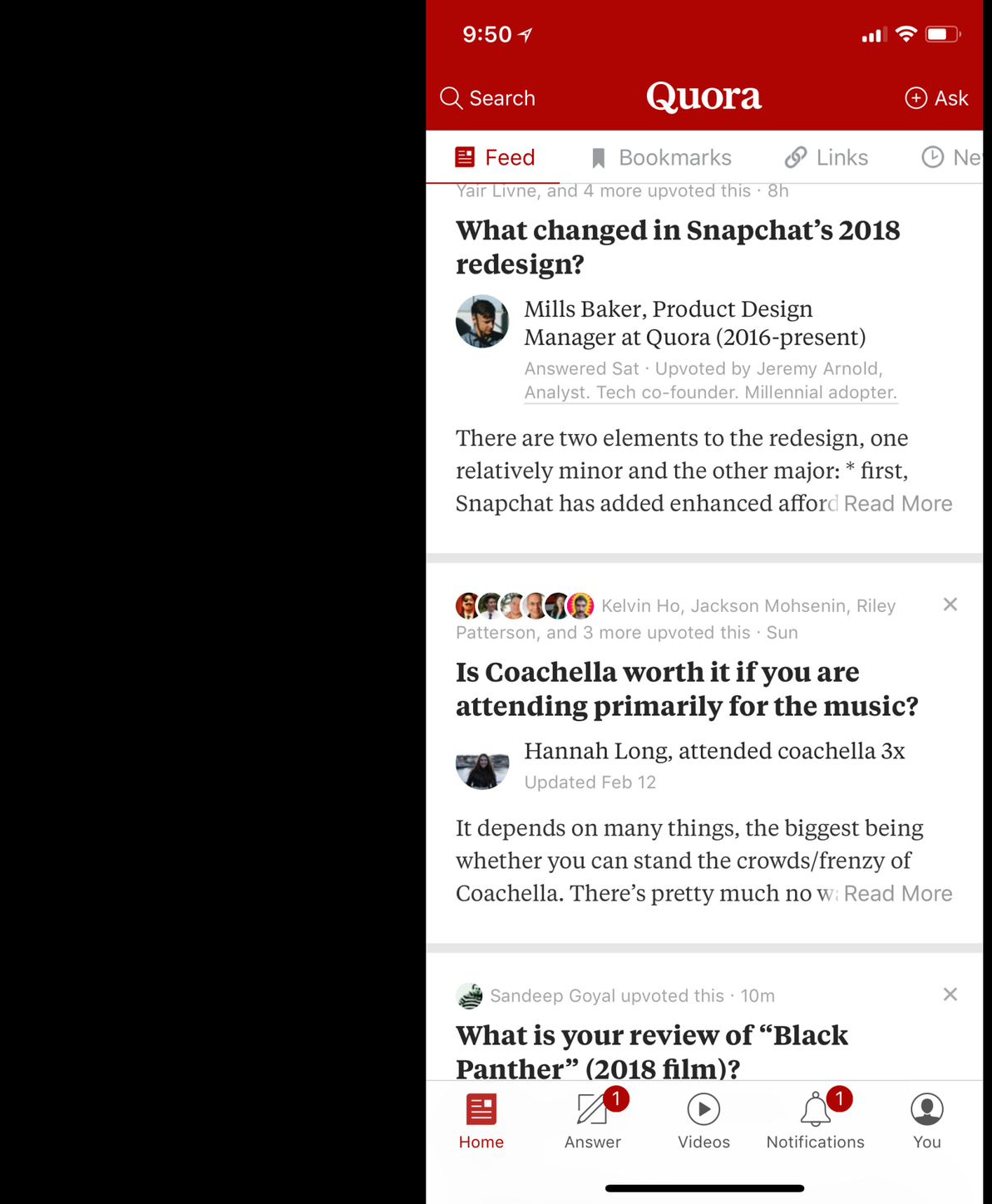
Hybrid Apps

+ fast iteration speed
+ write code mostly once
+ reasonable performance

- rely on frameworks + webviews
- lower performance than native
- some limits on API access

Understand Your Use Case

Quora


9:50
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Yair Livne, and 4 more upvoted this · 8h
What changed in Snapchat's 2018 redesign?
Mills Baker, Product Design Manager at Quora (2016-present)
Answered Sat · Upvoted by Jeremy Arnold, Analyst. Tech co-founder. Millennial adopter.
There are two elements to the redesign, one relatively minor and the other major: * first, Snapchat has added enhanced afford Read More
Kelvin Ho, Jackson Mohsenin, Riley Patterson, and 3 more upvoted this · Sun
Is Coachella worth it if you are attending primarily for the music?
Hannah Long, attended coachella 3x
Updated Feb 12
It depends on many things, the biggest being whether you can stand the crowds/frenzy of Coachella. There's pretty much no w Read More
Sandeep Goyal upvoted this · 10m
What is your review of "Black Panther" (2018 film)?
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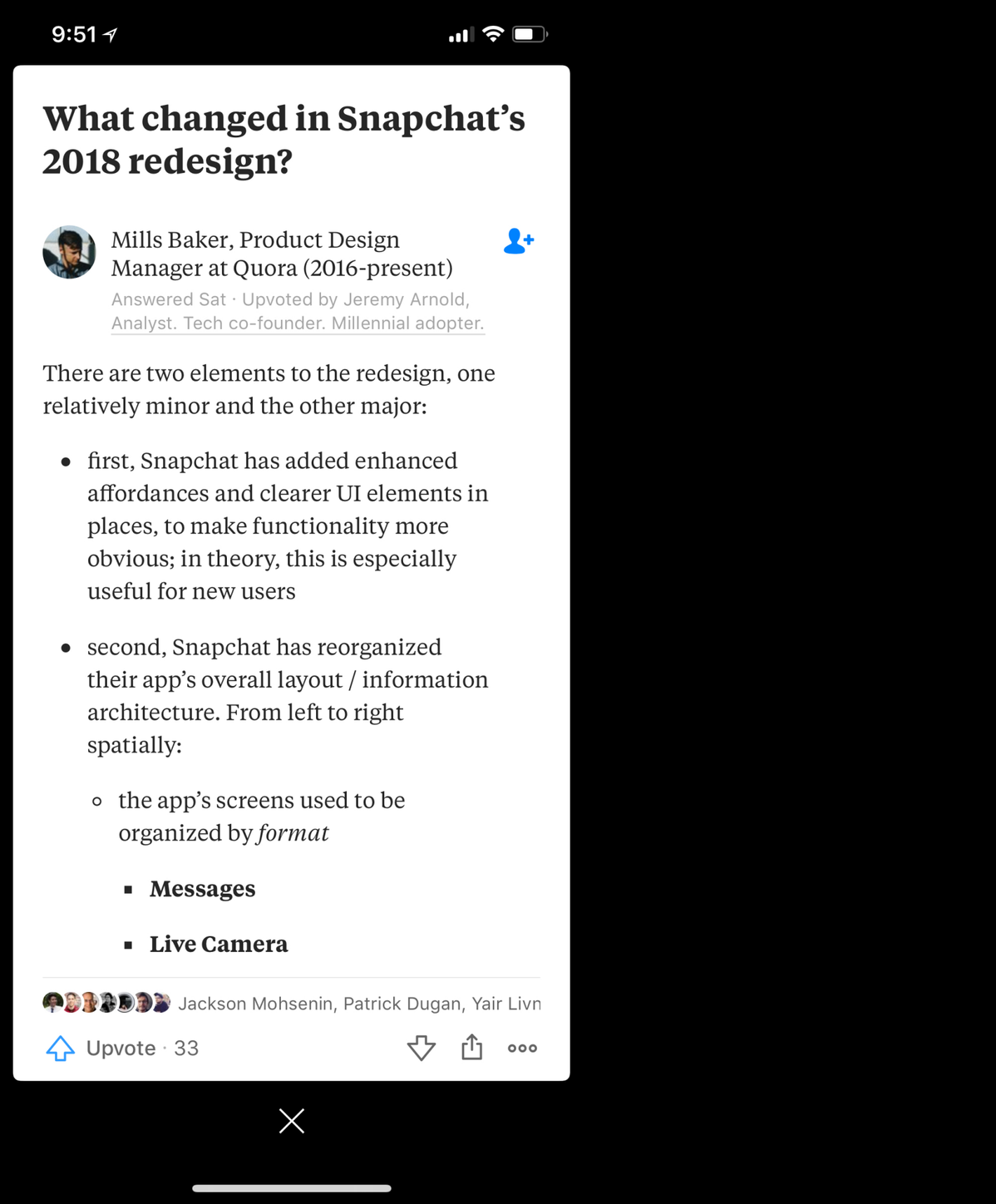
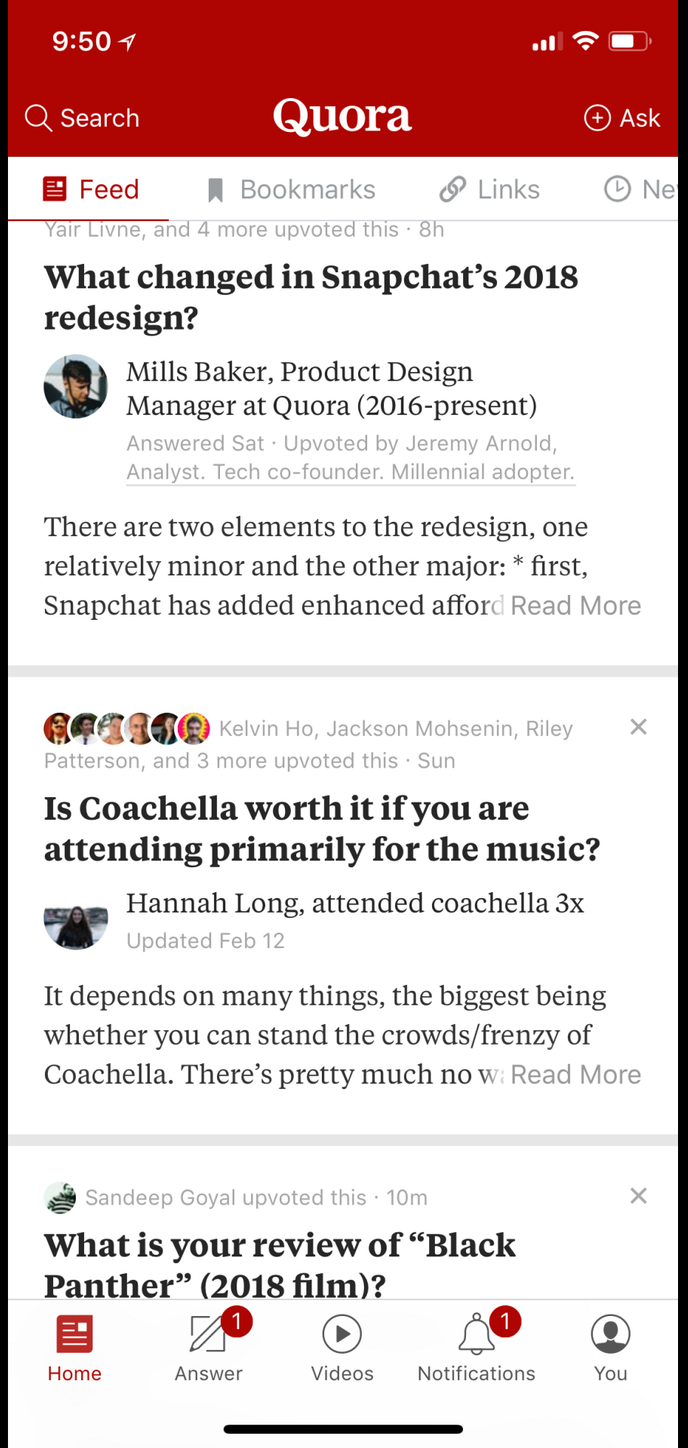

9:51
What changed in Snapchat's 2018 redesign?
Mills Baker, Product Design Manager at Quora (2016-present)
Answered Sat · Upvoted by Jeremy Arnold, Analyst. Tech co-founder. Millennial adopter.
There are two elements to the redesign, one relatively minor and the other major:
first, Snapchat has added enhanced affordances and clearer UI elements in places, to make functionality more obvious; in theory, this is especially useful for new users
second, Snapchat has reorganized their app's overall layout / information architecture. From left to right spatially:
the app's screens used to be organized by format
Messages
Live Camera
Jackson Mohsenin, Patrick Dugan, Yair Livn
Upvote · 33

Hybrid

Native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Updated Feb 12
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Sandeep Goyal upvoted this · 10m
What is your review of "Black Panther" (2018 film)?
Home
Answer
Videos
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You

Web

Team Structure

- Every engineer writes for mobile
- Development happens mobile-first
- Small core team writes native features
- Focus on generalizable APIs

Tradeoffs

- Development velocity is top priority
- Don’t need high performance
- Need APIs like push notifications, home screen

Web-Native Bridge

Message Passing

window.webkit.messageHandlers

```
window
    .webkit
    .messageHandlers
    .SomeMessageName
    .postMessage()
```

WKWebView.evaluateJavaScript()

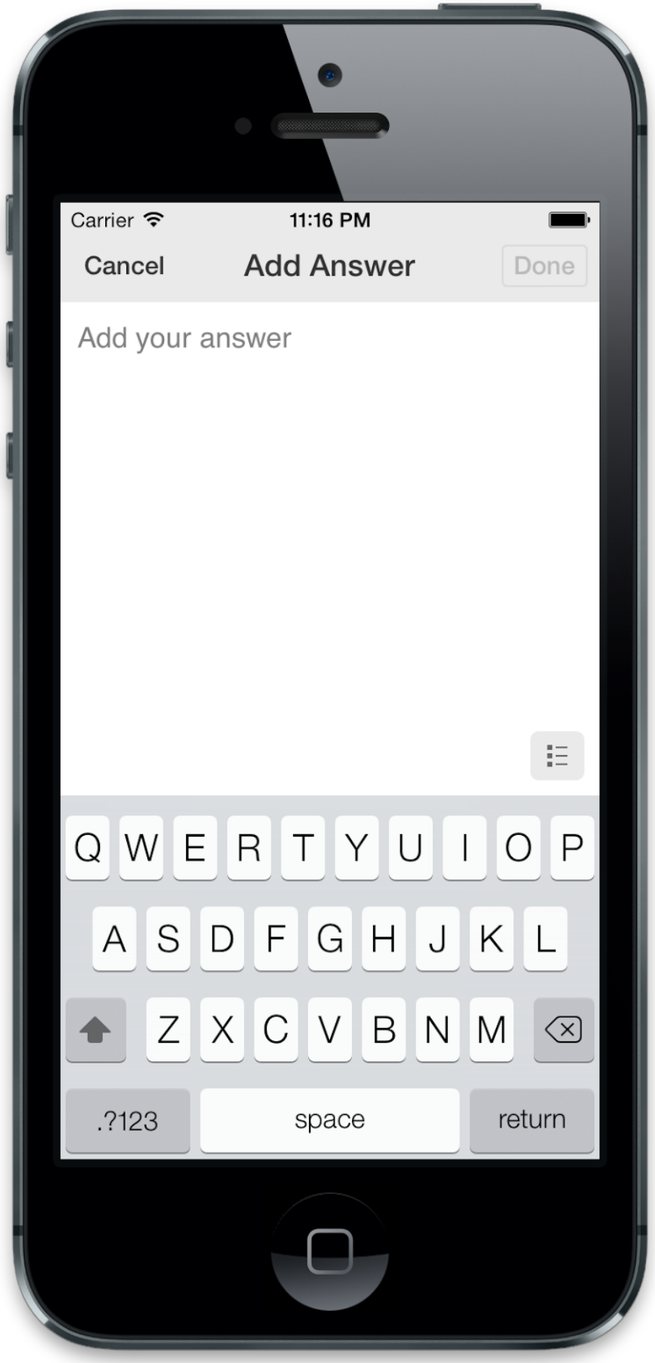
Interface

```
'invokeEditor'
'openURL'
'showActionSheet'
'showAlert'
```

Implementation

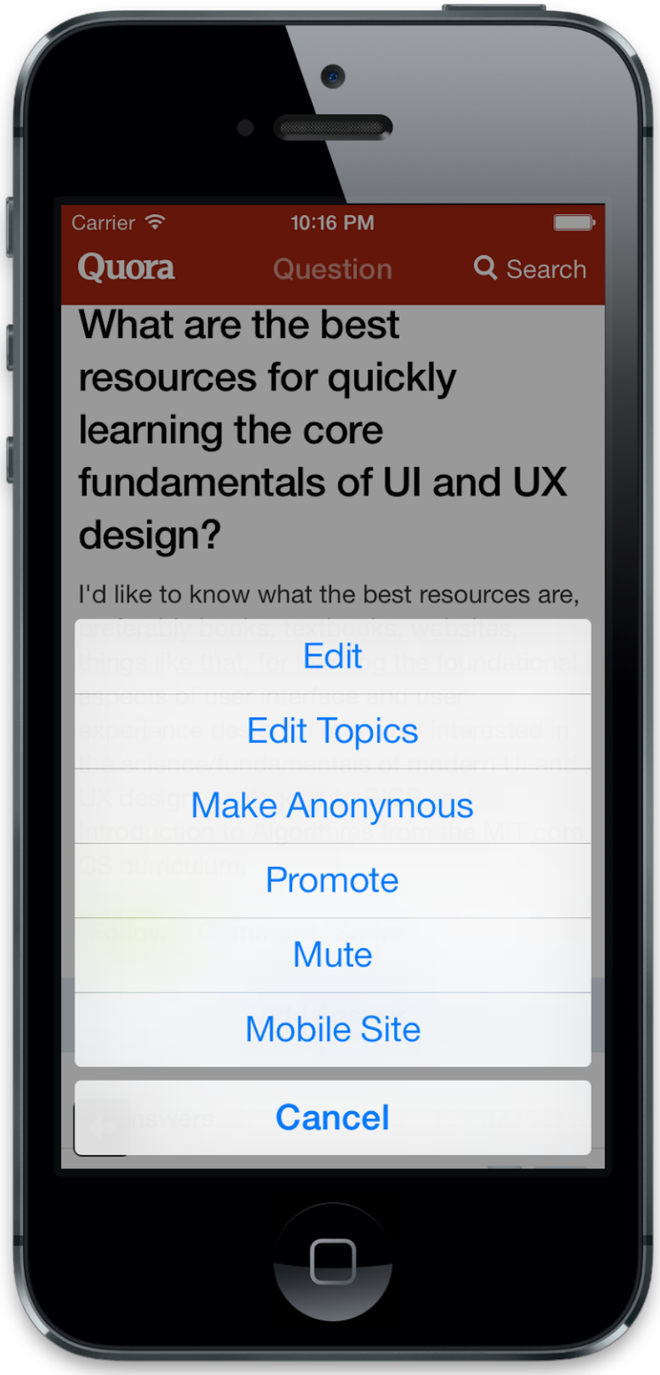
```
public void openURL(Object data) {
    // Java
}
```

```
func openURL(data: Object) {
    // Swift
}
```


Carrier
11:16 PM
Cancel
Add Answer
Done
Add your answer
Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
.?123
space
return

```
var options = {
  title: 'Add Answer',
  type: 'text',
  placeholder: 'Add your answer',
};

client.sendMessageToClient(
  'invokeEditor', options
);
```


Carrier
10:16 PM
Quora
Question
Search
What are the best resources for quickly learning the core fundamentals of UI and UX design?
I'd like to know what the best resources are,
Edit
Edit Topics
Make Anonymous
Promote
Mute
Mobile Site
Cancel

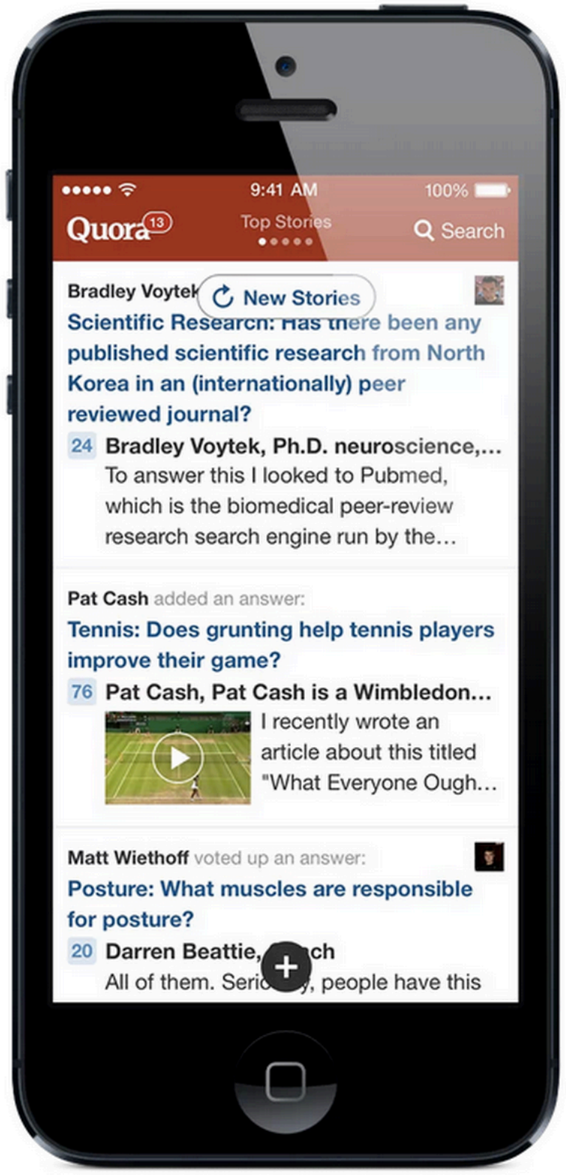
```
var options = {
  buttonTitles: [
    'Edit',
    'Edit Topics',
     ...
  ],
  callback: function(data) {
    if (data.index == 0)
      ...
  }
};

client.sendMessageToClient(
  'showActionSheet', options
);
```

A/B Testing

- Generate a hypothesis
- Implement the experiment
- Measure impact

- **Generate a hypothesis**
- Implement the experiment
- Measure impact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To answer this I looked to Pubmed, which is the biomedical peer-review research search engine run by the...
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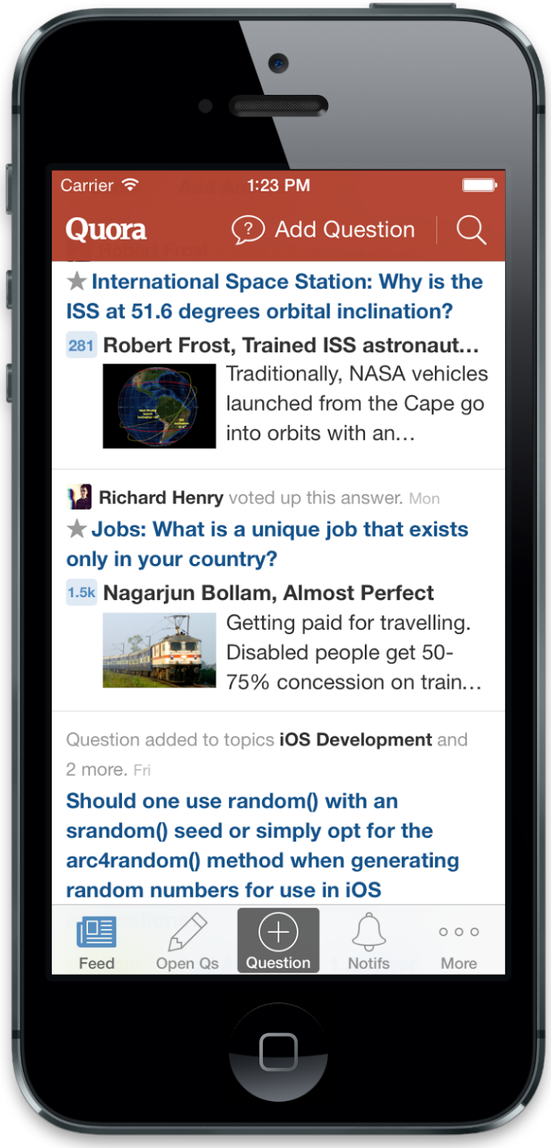
Tennis: Does grunting help tennis players improve their game?
76 Pat Cash, Pat Cash is a Wimbledon...
I recently wrote an article about this titled "What Everyone Ough...
Matt Wiethoff voted up an answer:
Posture: What muscles are responsible for posture?
20 Darren Beattie,
All of them. Seri , people have this

A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Richard Henry voted up this answer. Mon
Jobs: What is a unique job that exists only in your country?
1.5k Nagarjun Bollam, Almost Perfect
Getting paid for travelling. Disabled people get 50-75% concession on train...
Question added to topics iOS Development and 2 more. Fri
Should one use random() with an srandom() seed or simply opt for the arc4random() method when generating random numbers for use in iOS
Feed
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More

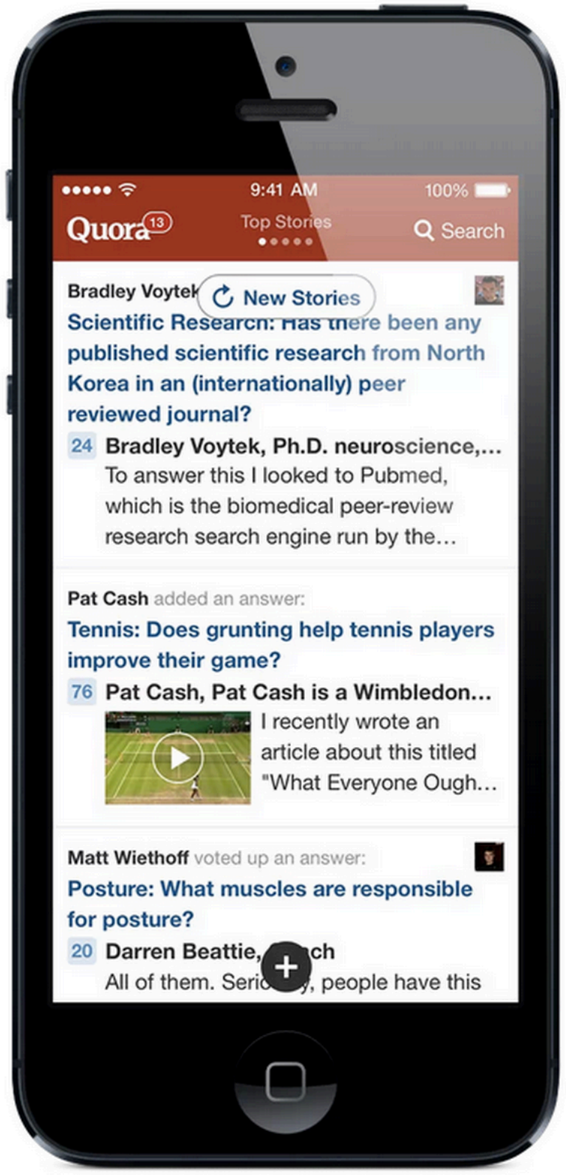
B

“It’s easier to add a question”

“There’s more UI in the way of content”

“Swipe gestures are trendy right now”

- Generate a hypothesis
- **Implement the experiment**
- Measure impact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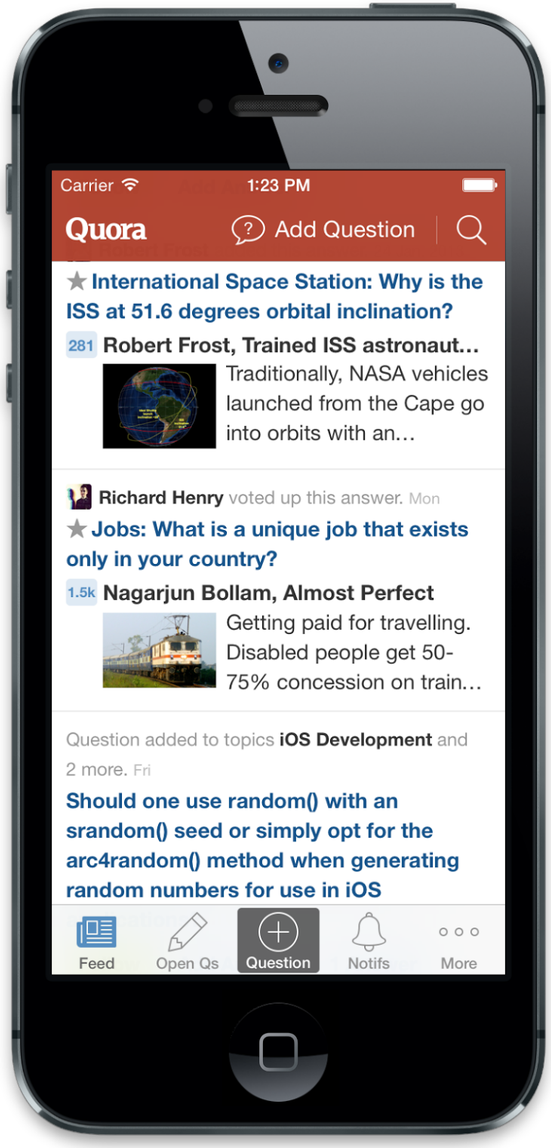
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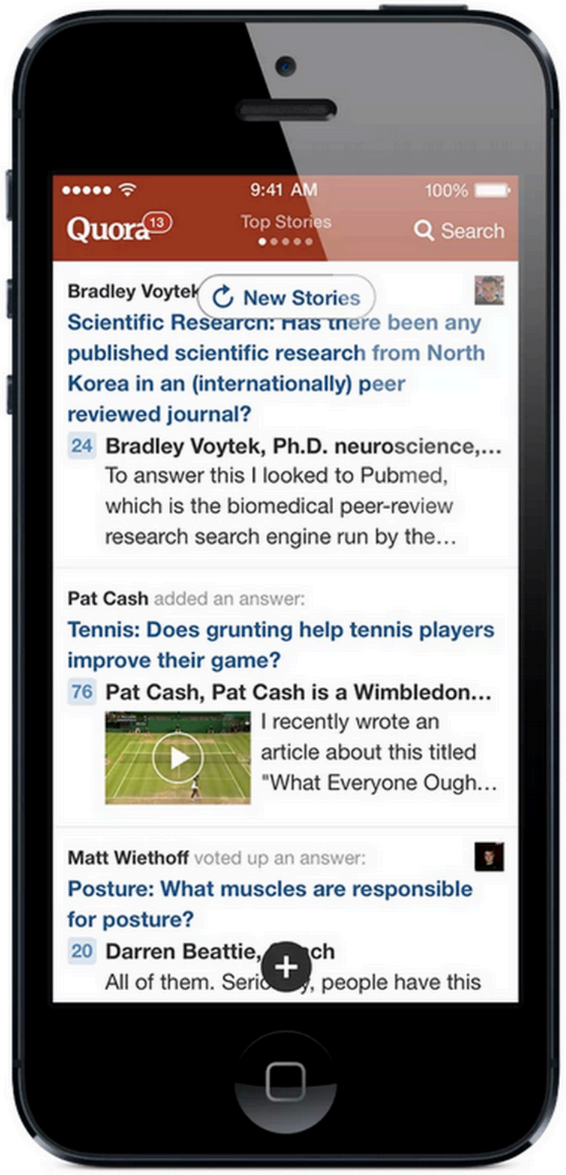
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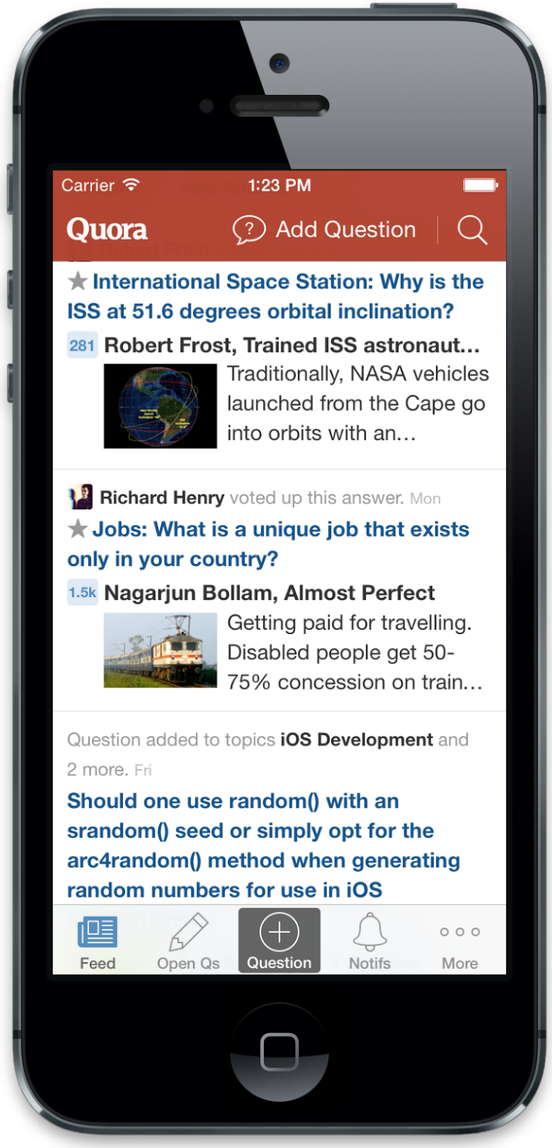
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30%

```
define_experiment('tab_bar',
  buckets=[
    (range(0, 30), True),
    (range(30, 100), False)
  ]
)
```

```
def render():
  if experiment.get('tab_bar'):
    return render_with_bar()
  else:
    return render_without_bar()
```

- Generate a hypothesis
- Implement the experiment
- **Measure impact**

- Engagement?
- Performance?
- Cost?
- Complexity?

- Fabric
- Mixpanel
- Optimizely
- …

Tradeoffs

Q&A

CS50 for MBAs

Mobile Strategies