



# lexical

From `ContentEditable` to `TextKit`

Amy Worrall

Demo

**UITextView**

**NSLayoutManager**

**NSTextContainer**

**NSTextStorage**

UITextView

NSLayoutManager

NSTextContainer

NSTextStorage

Attributed String

UITextView

NSLayoutManager

NSTextContainer

NSTextStorage

Rect

UITextView

NSLayoutManager

Layout, cache, and drawing

NSTextContainer

NSTextStorage

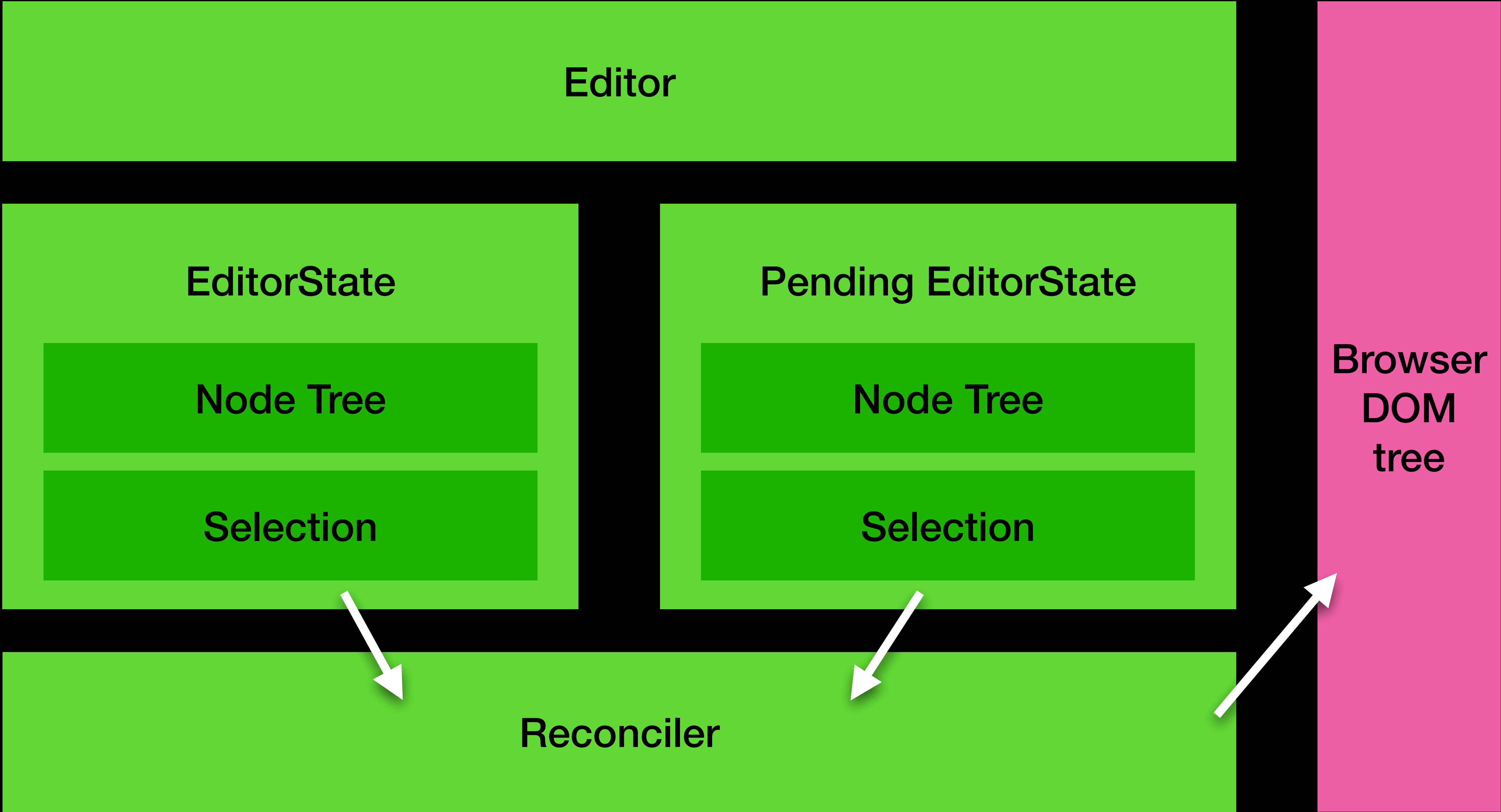
**UITextView**

Event handling and selection

**NSLayoutManager**

**NSTextContainer**

**NSTextStorage**



Editor

EditorState

Pending EditorState

Node Tree

Node Tree

Selection

Selection

Reconciler

Browser  
DOM  
tree



Editor

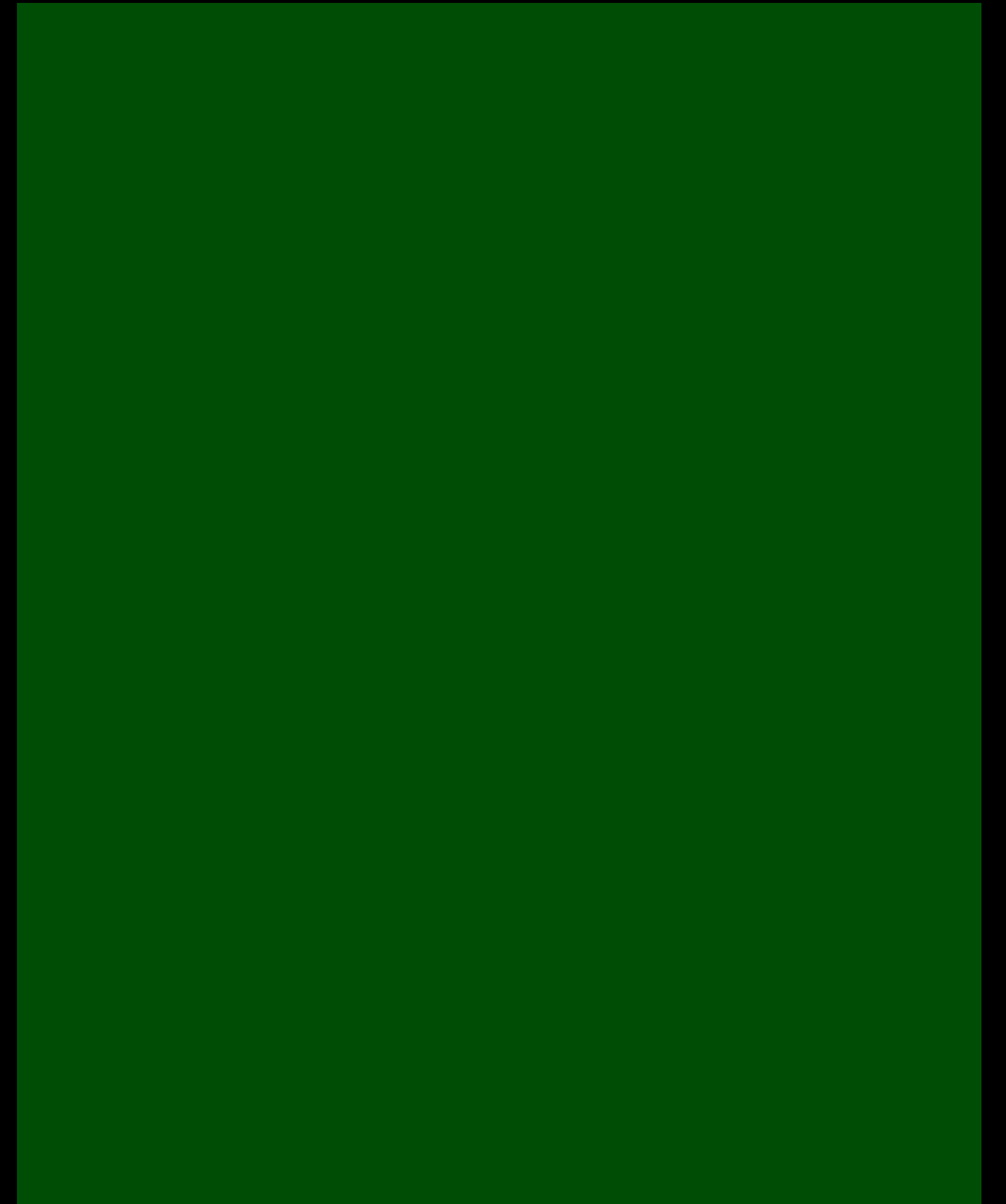
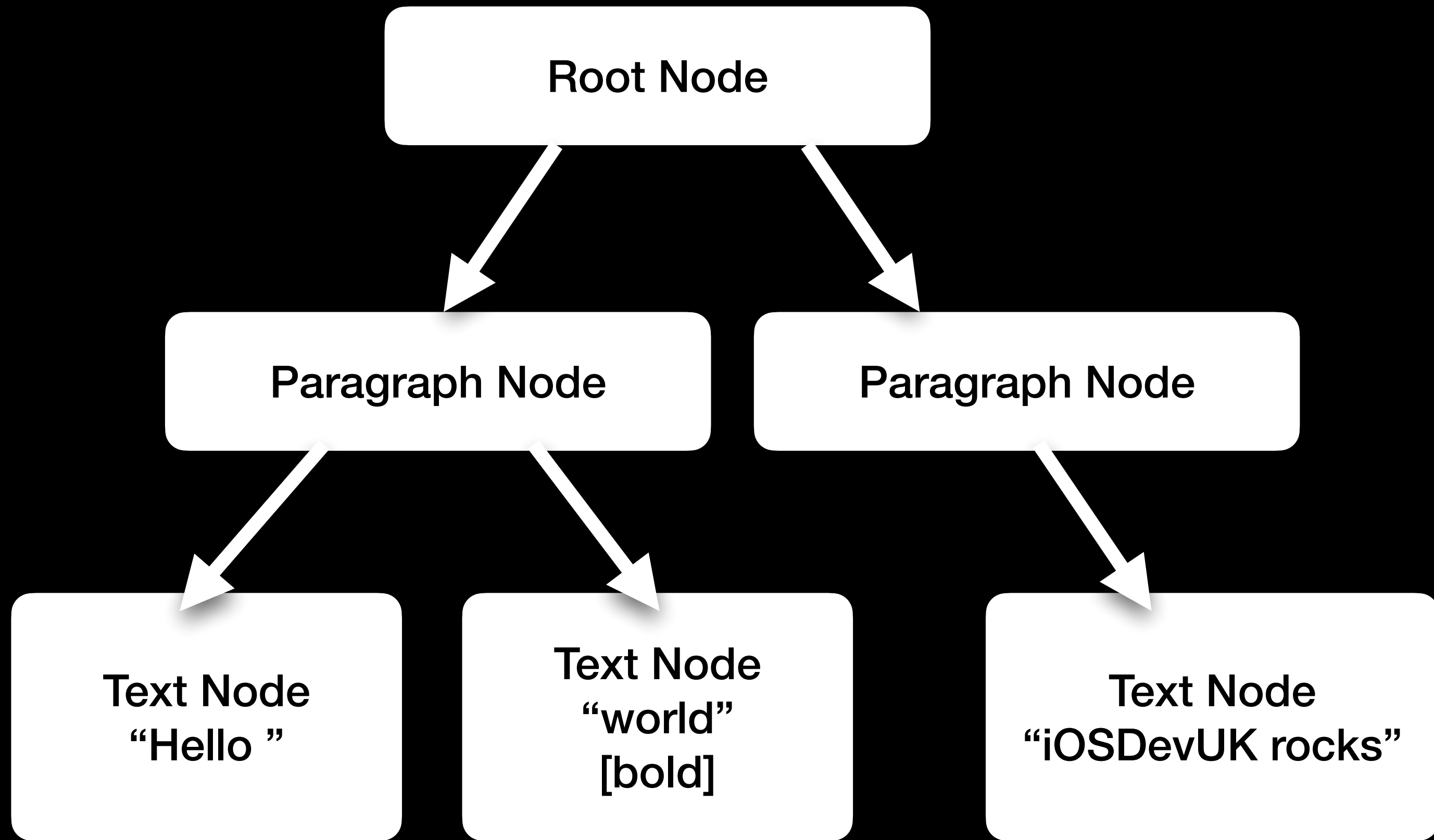
EditorState

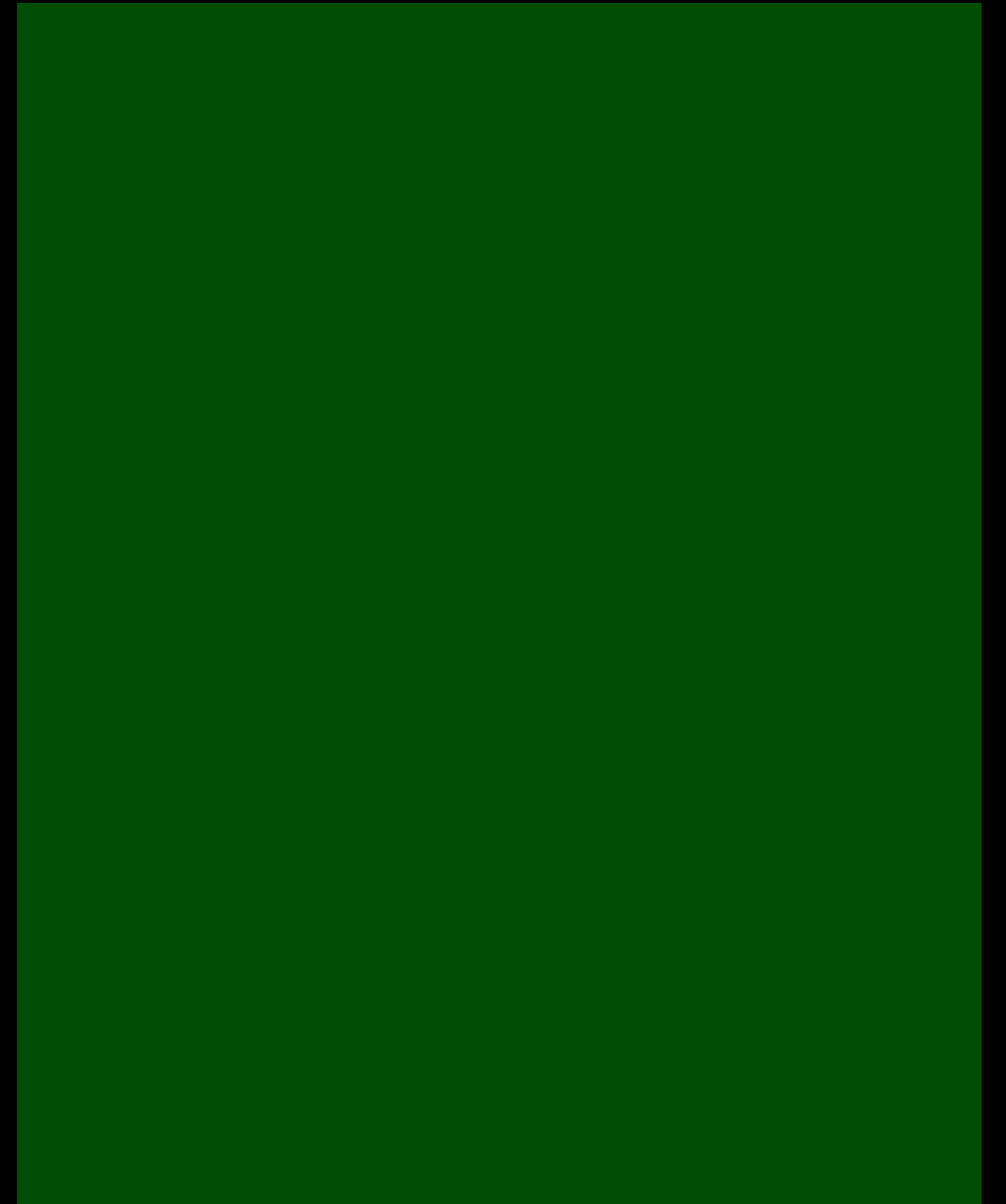
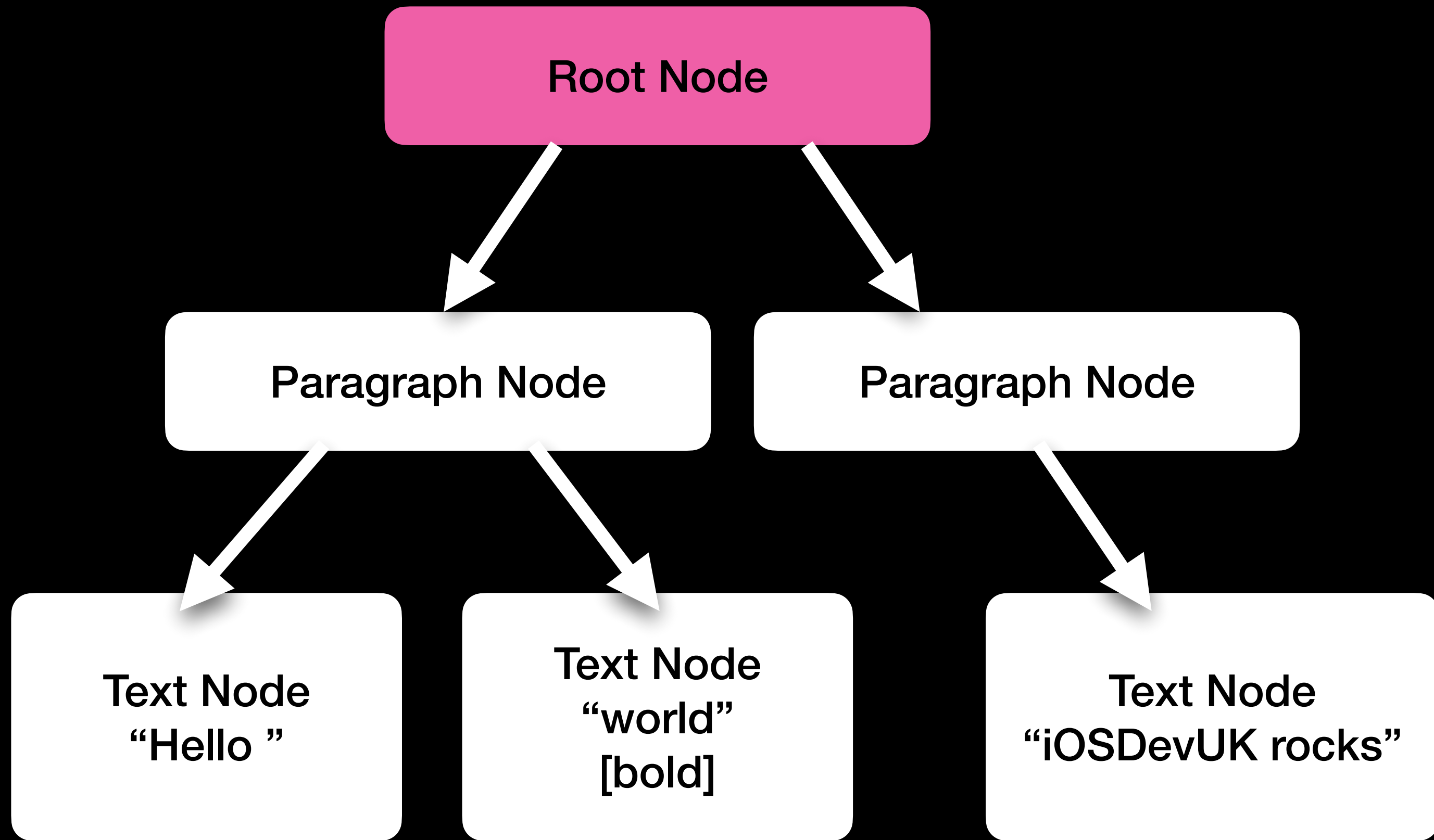
Node Tree

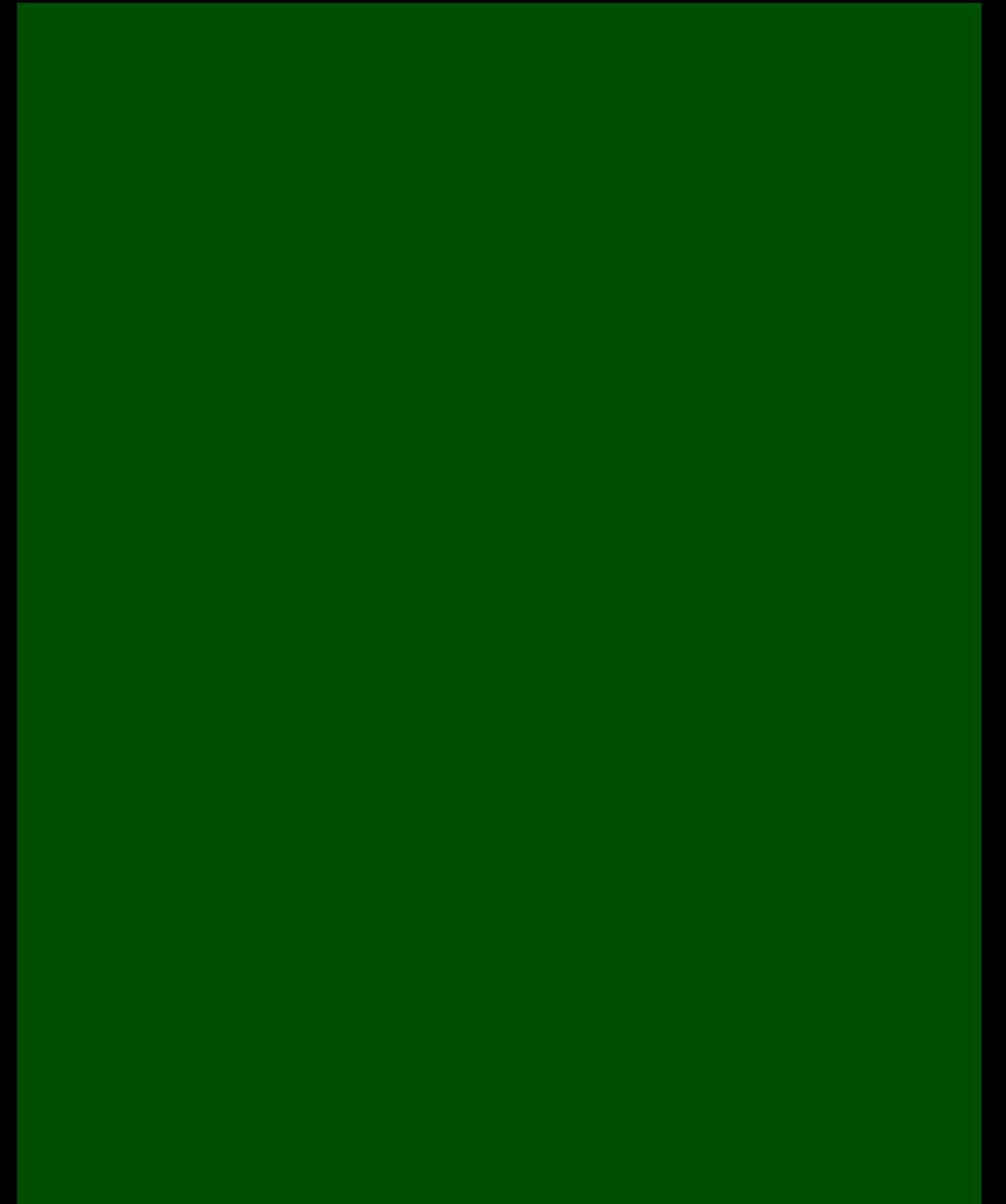
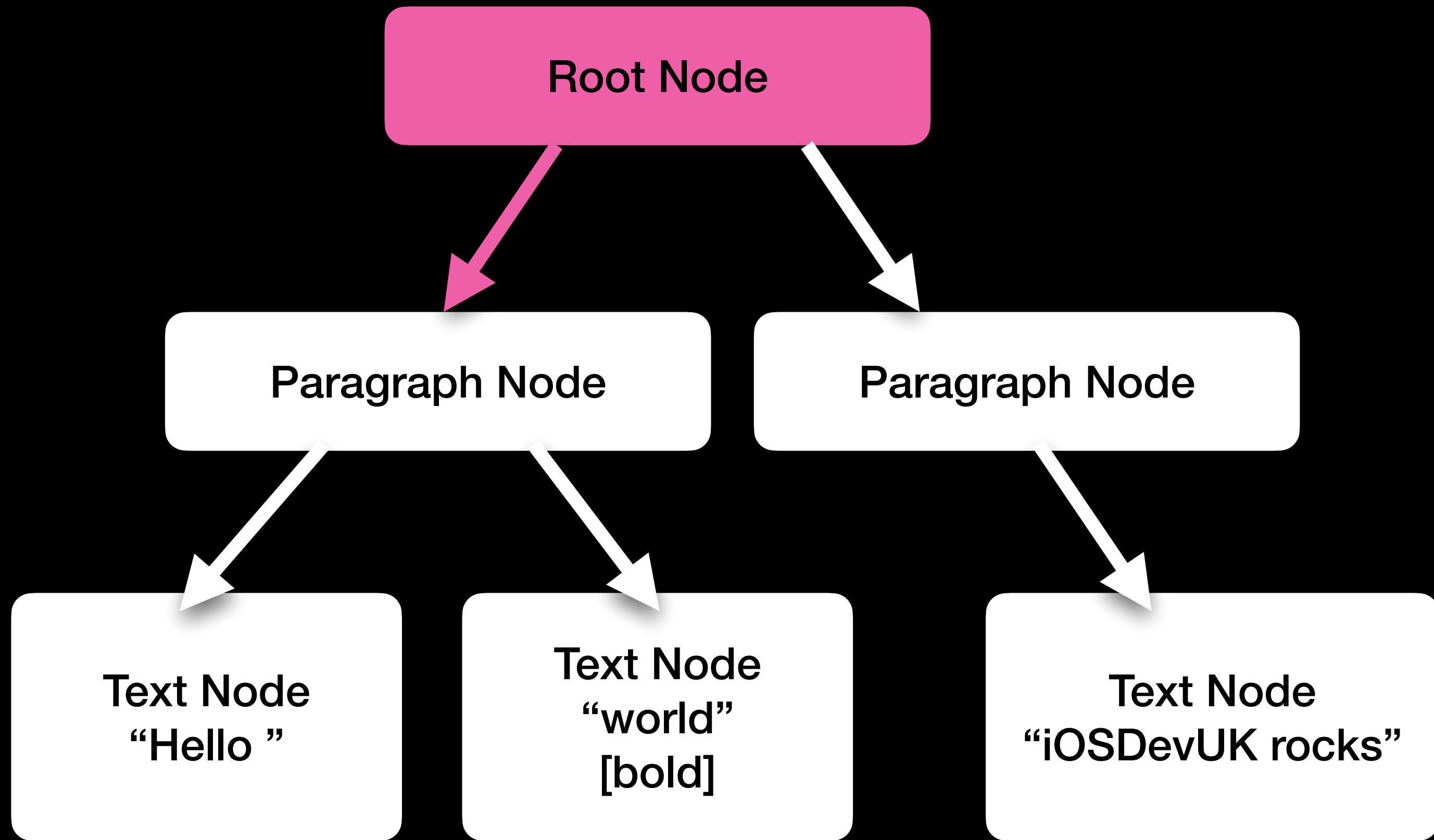
Selection

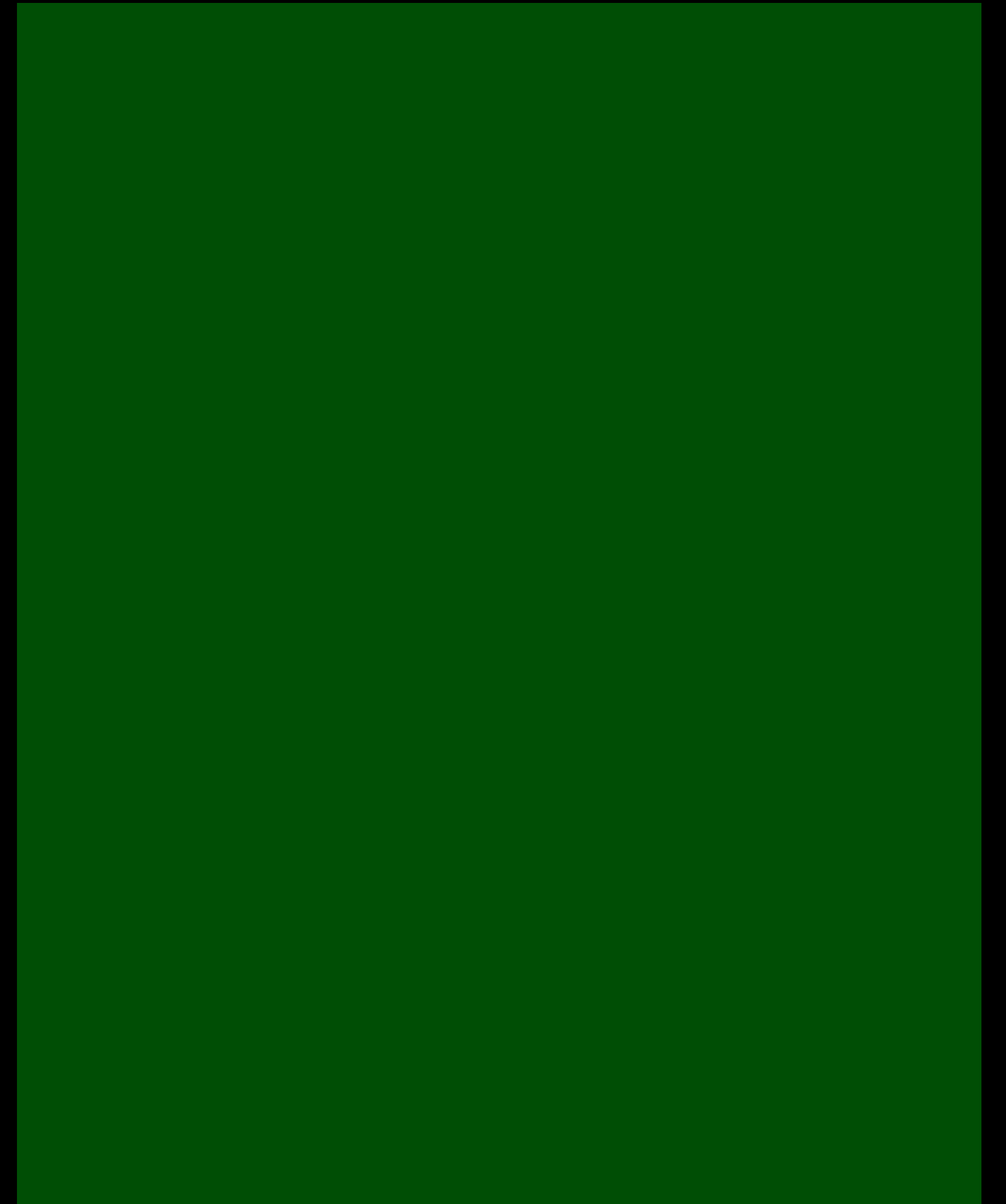
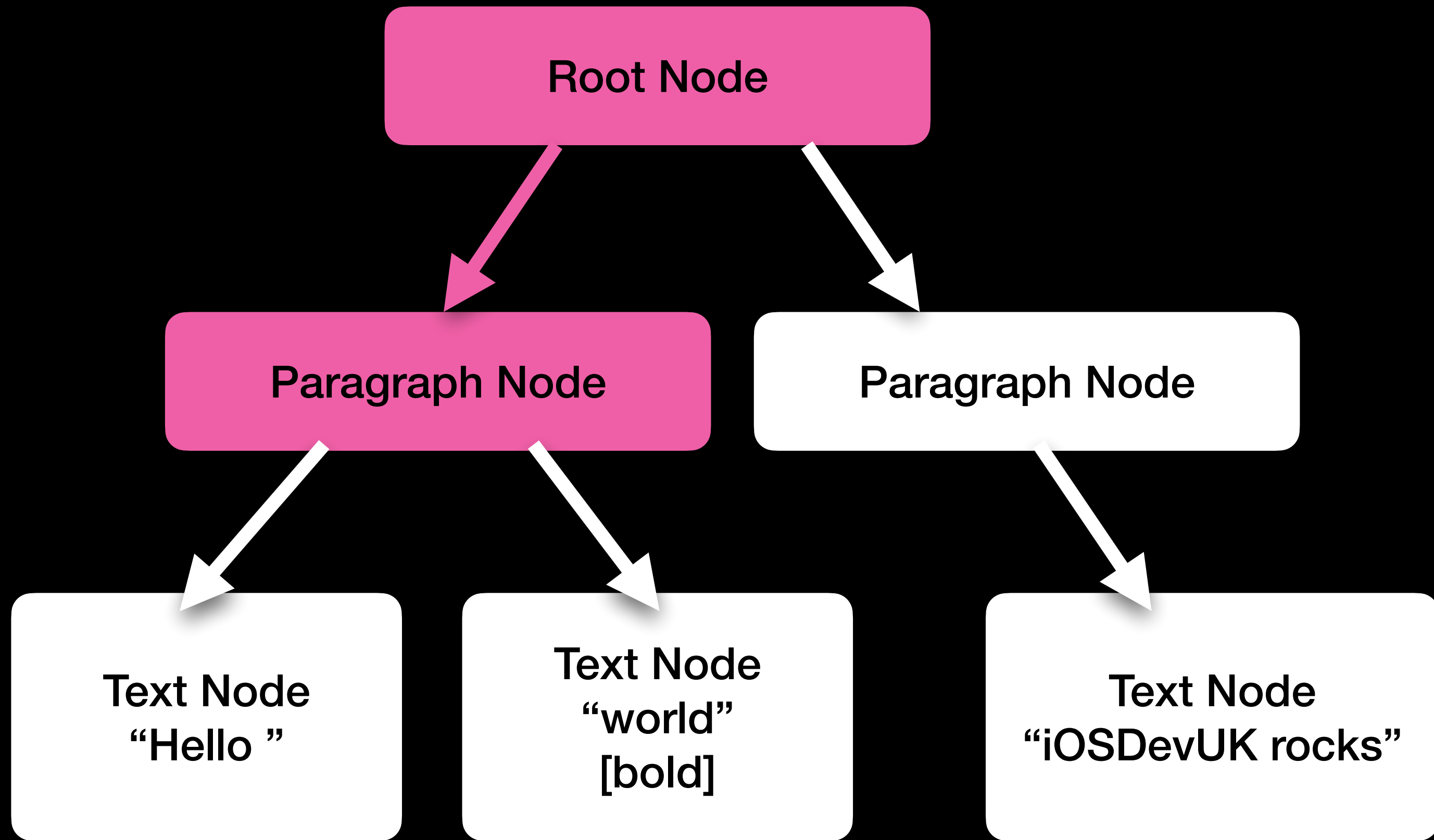
Reconciler

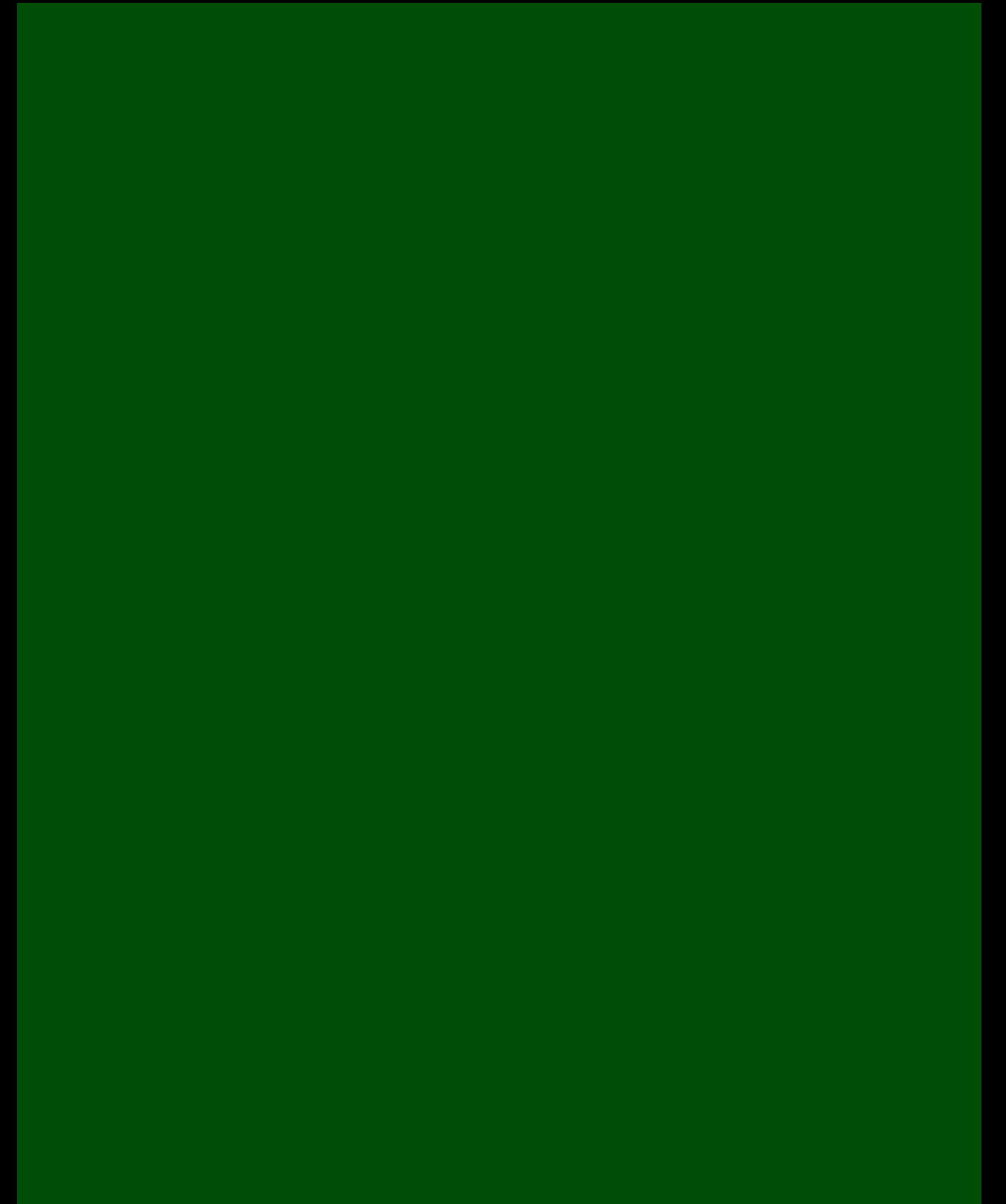
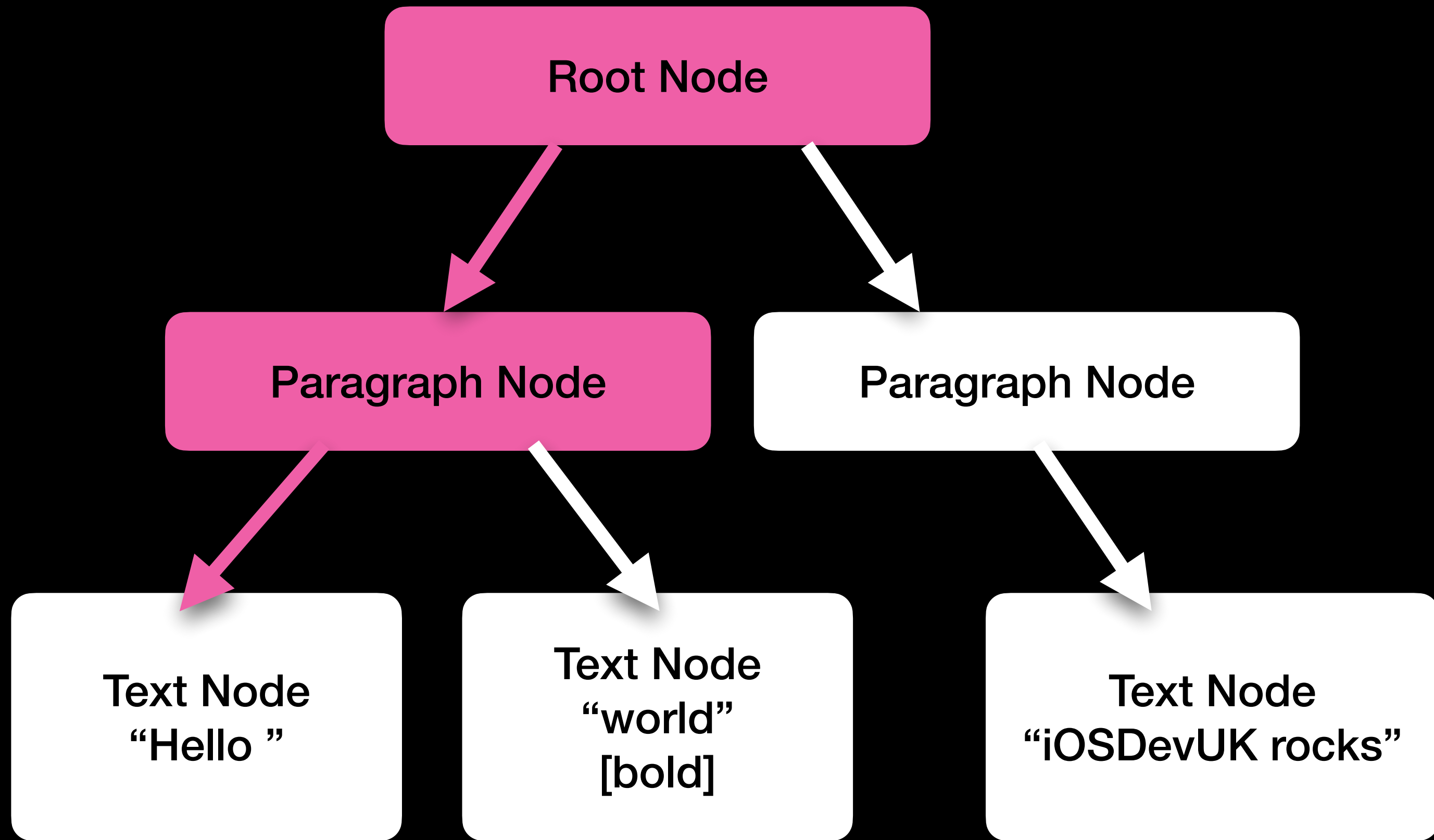
Browser  
DOM  
tree

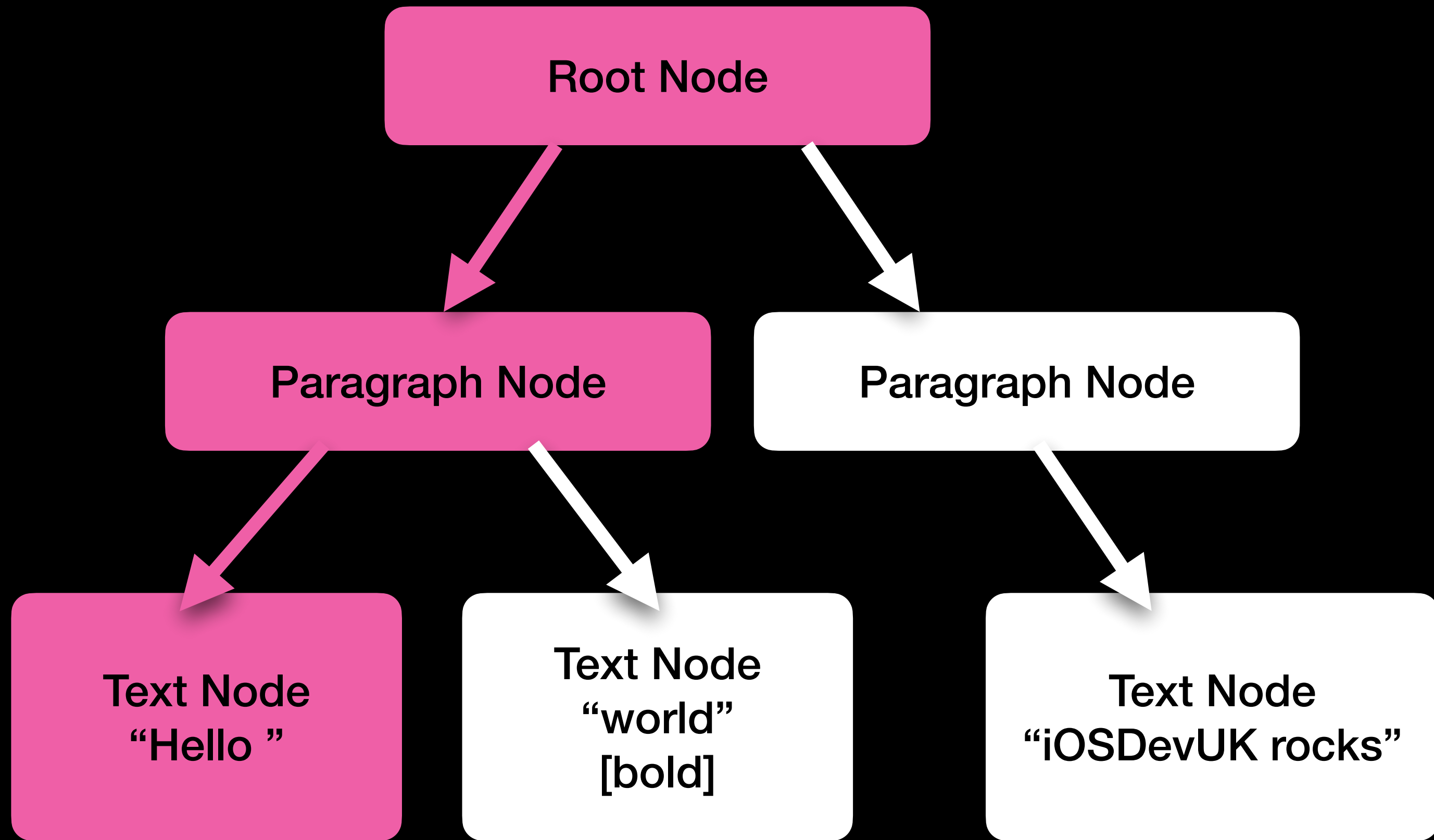




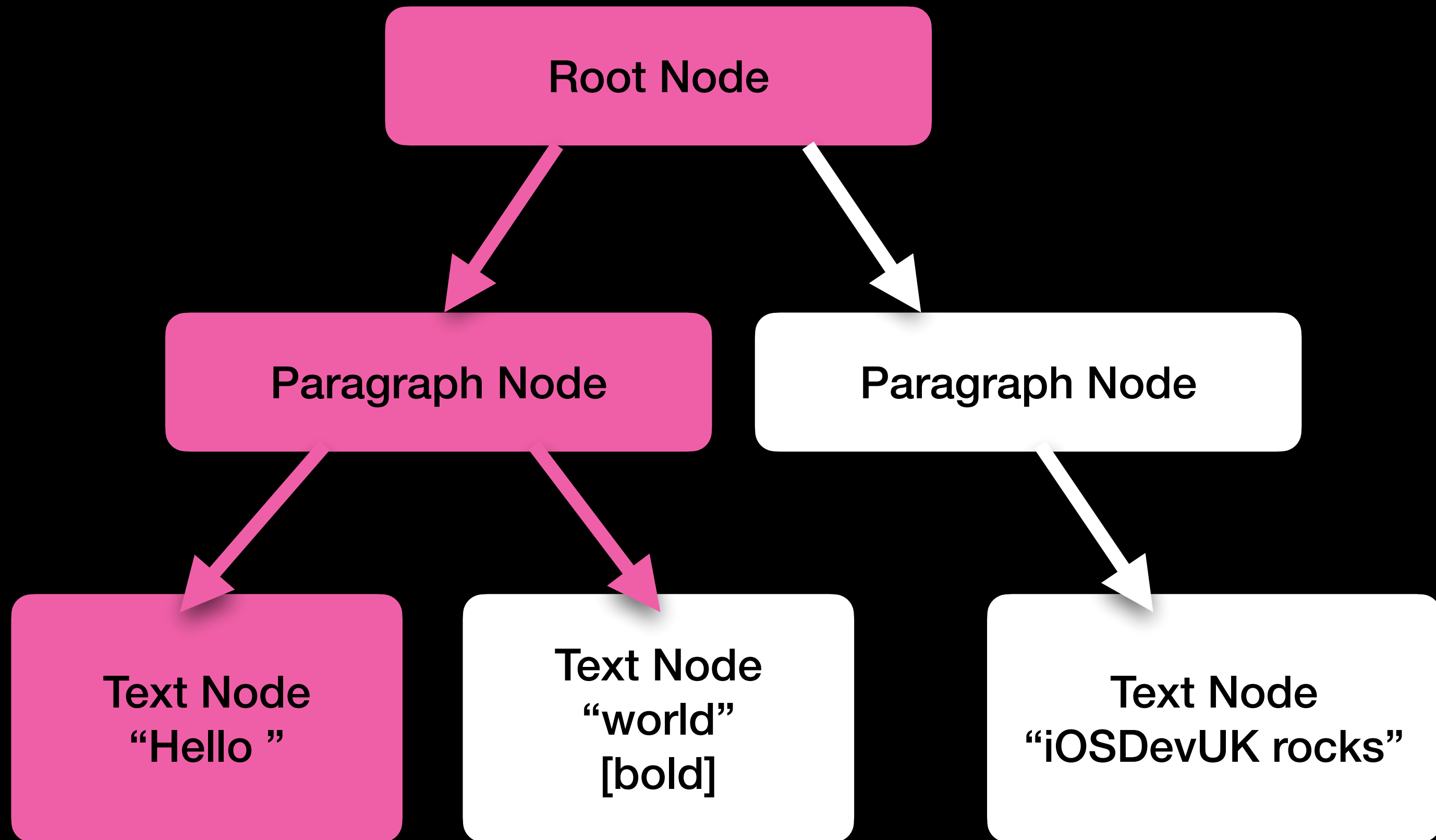






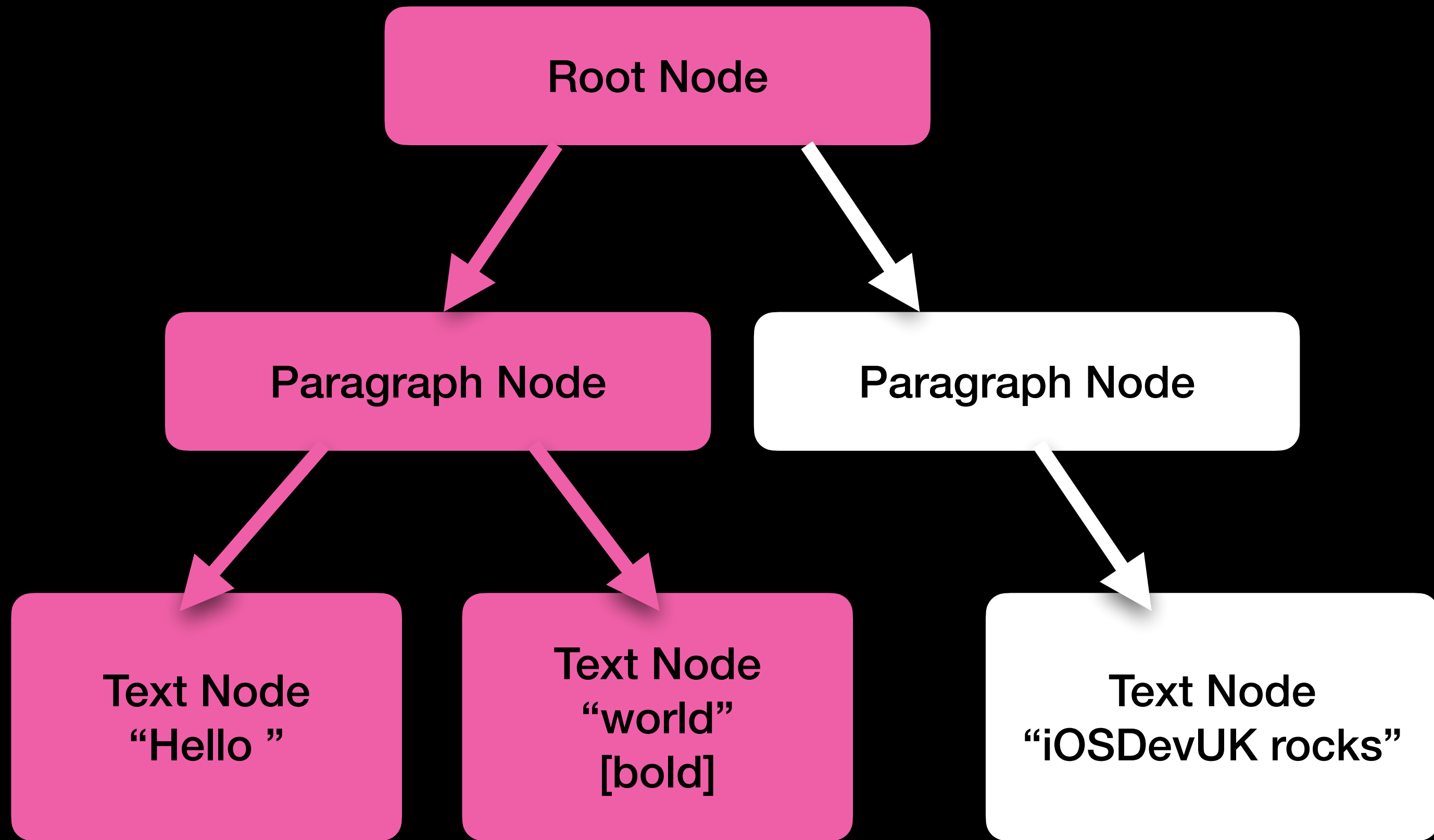


Hello

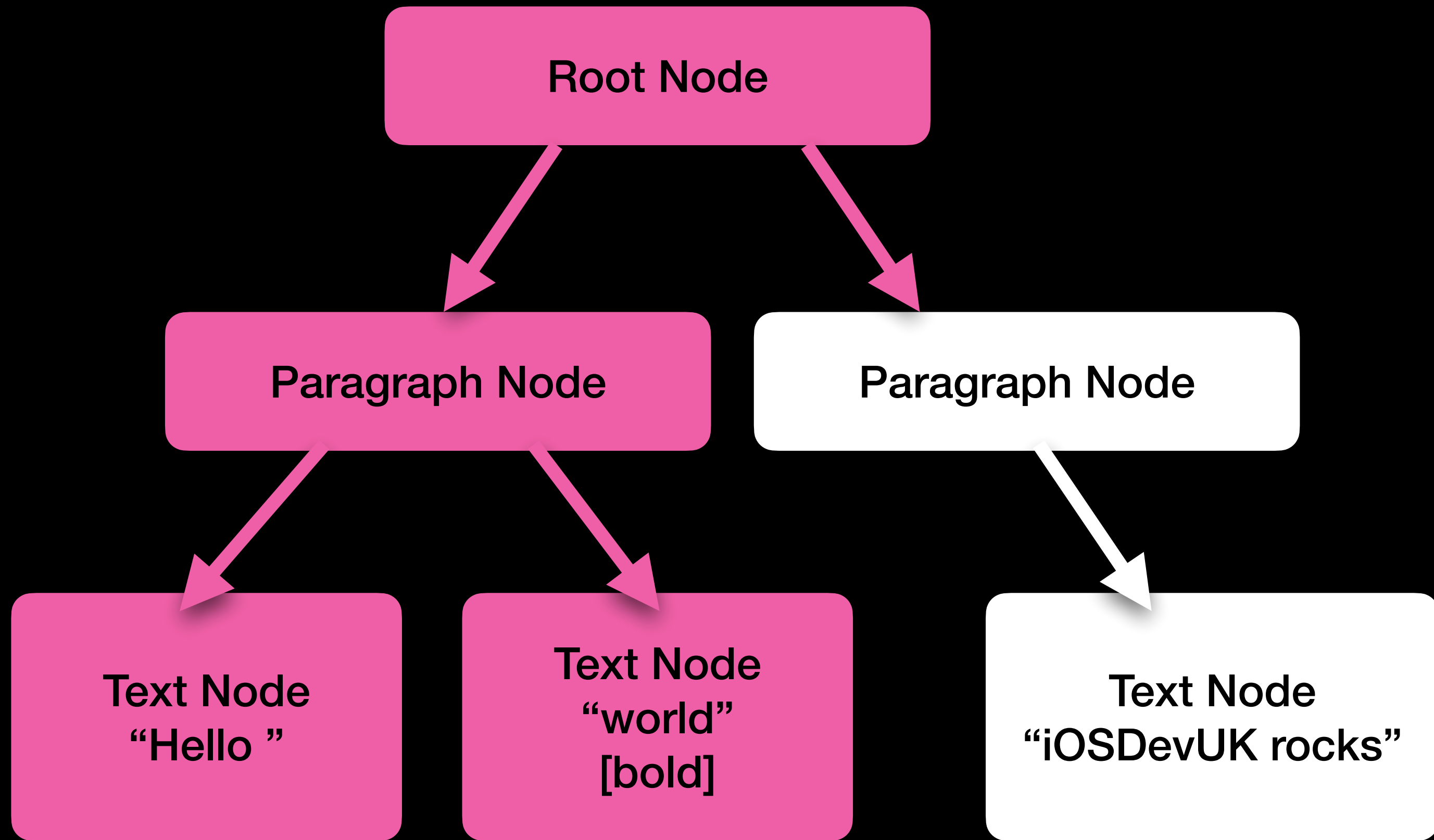


Hello

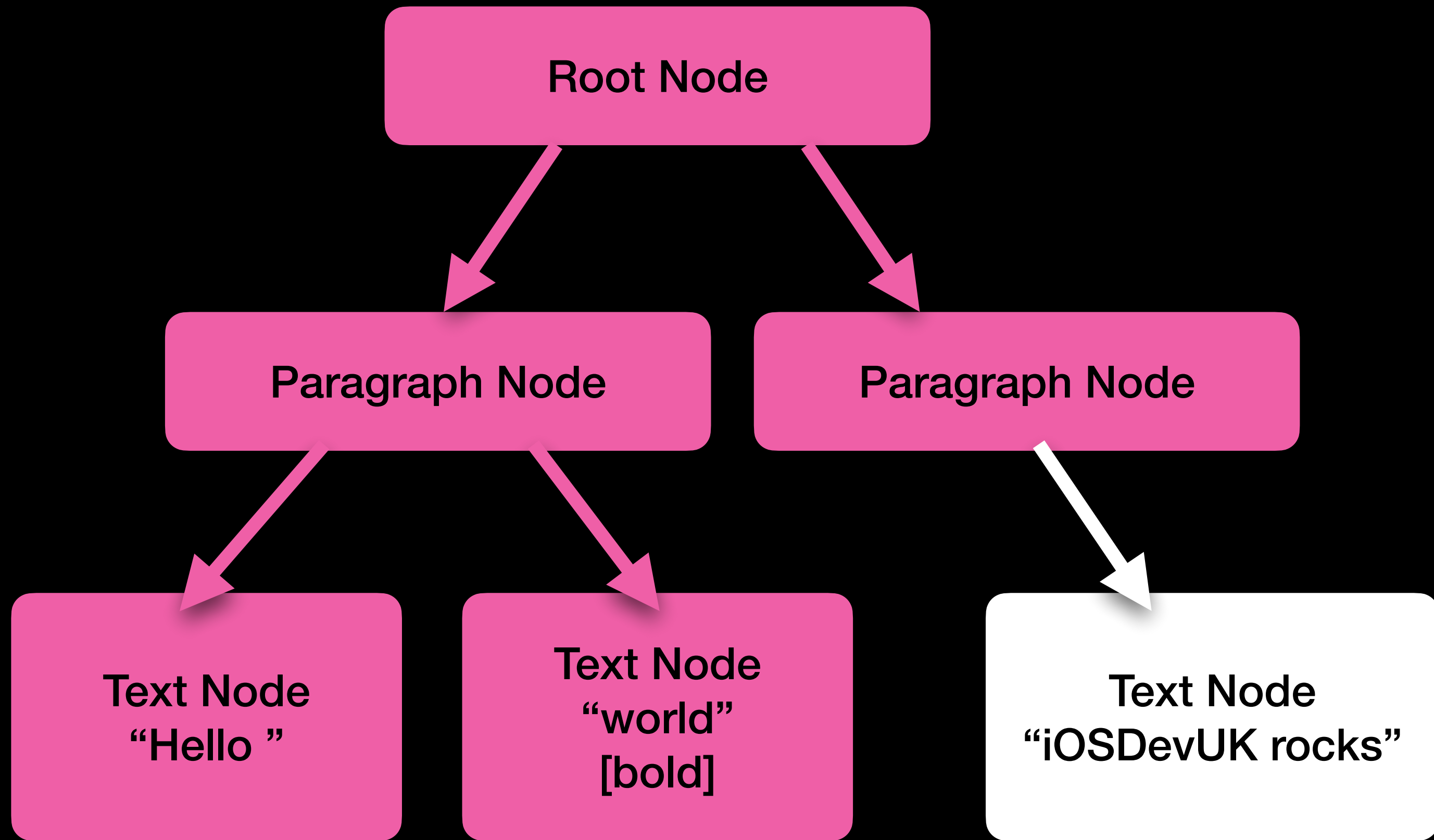




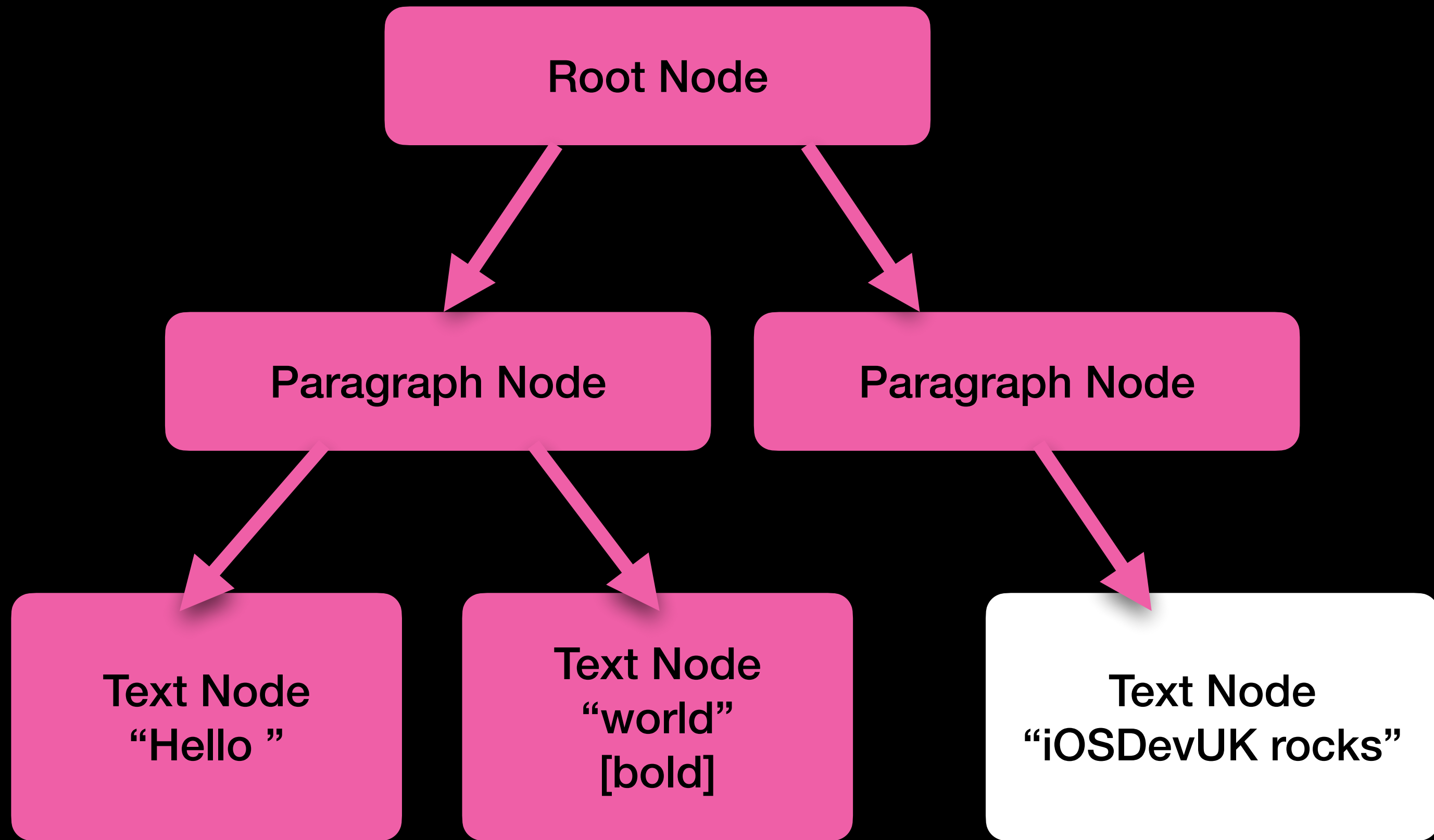
Hello world



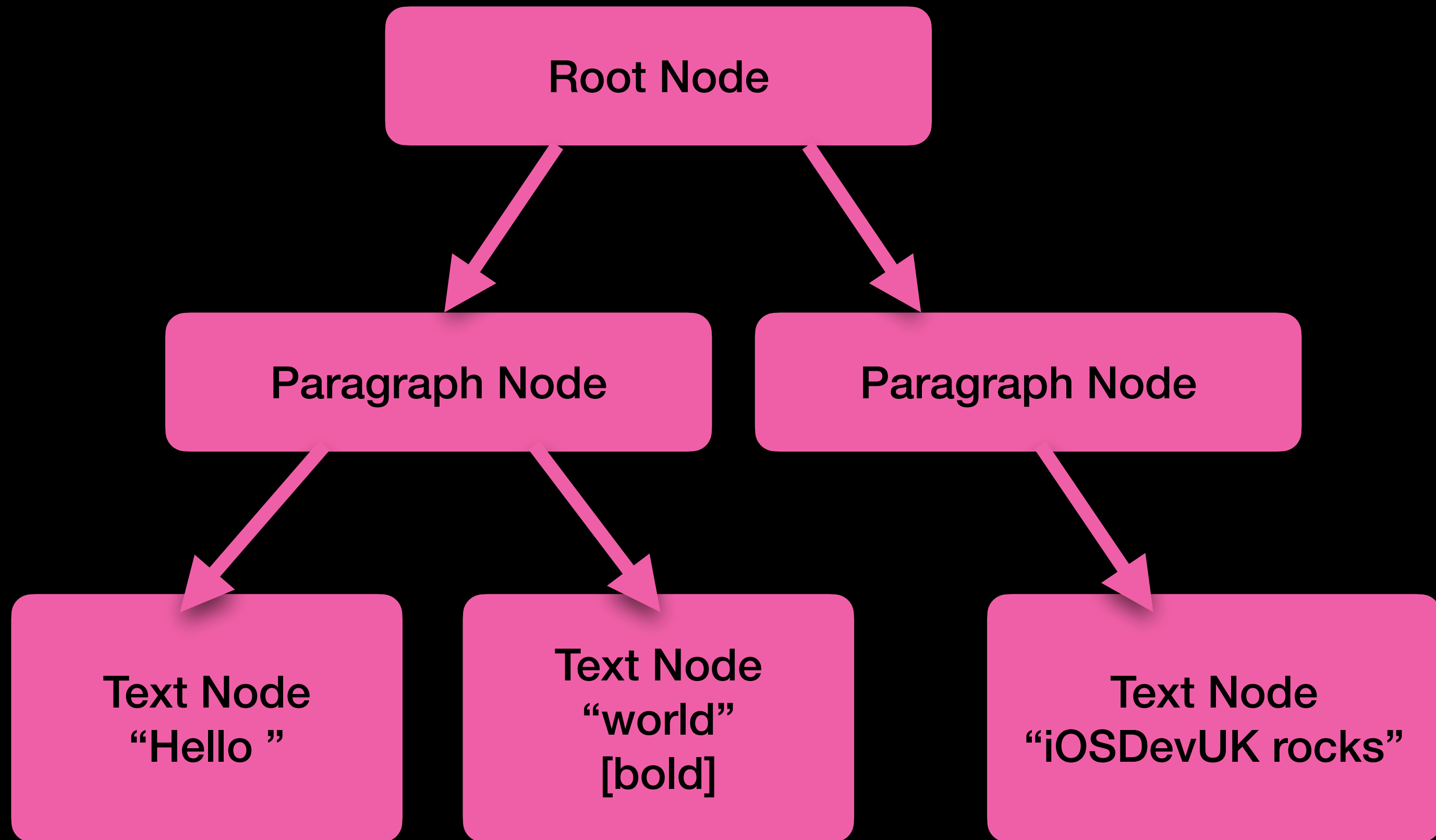
Hello world



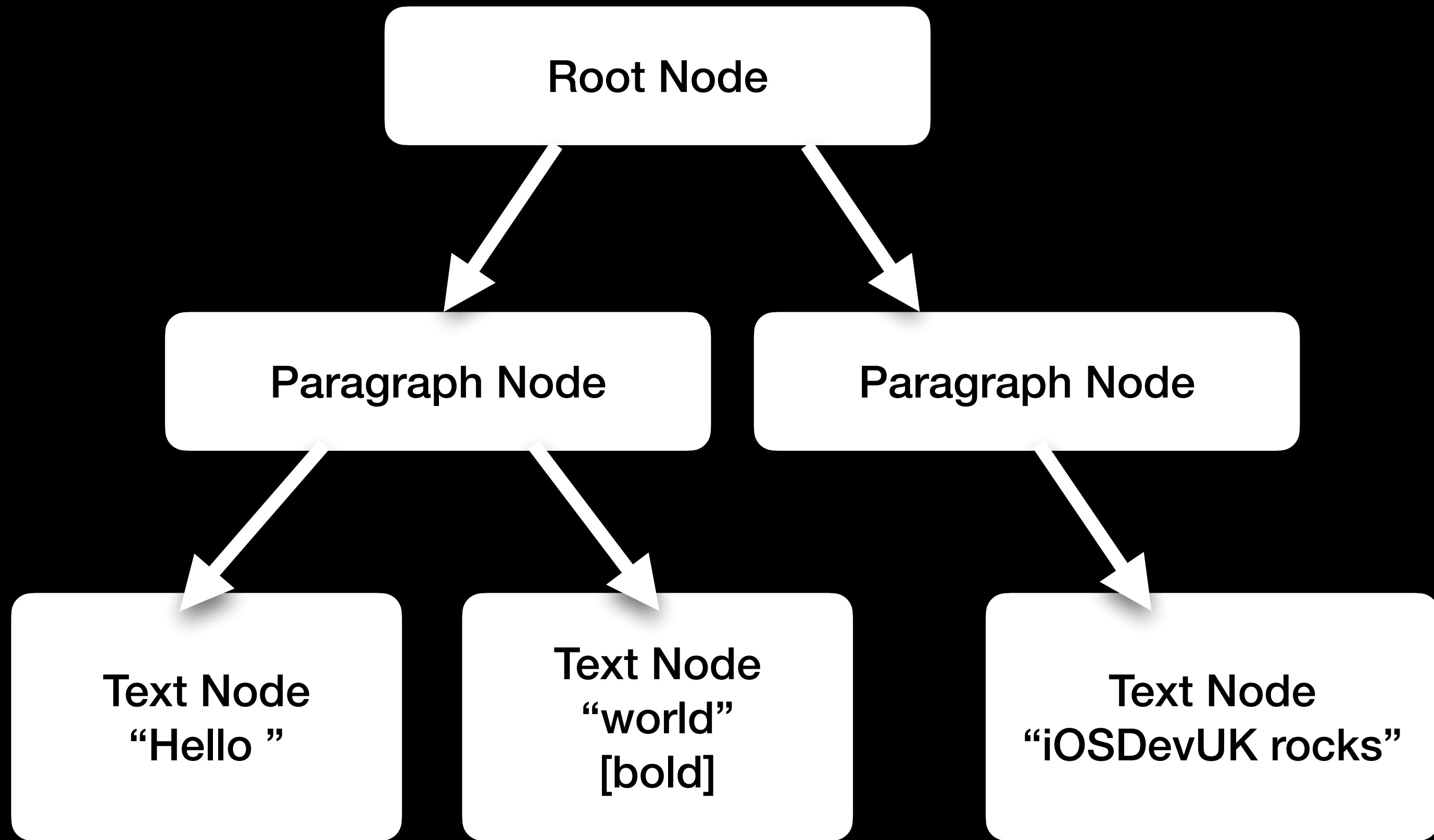
Hello world



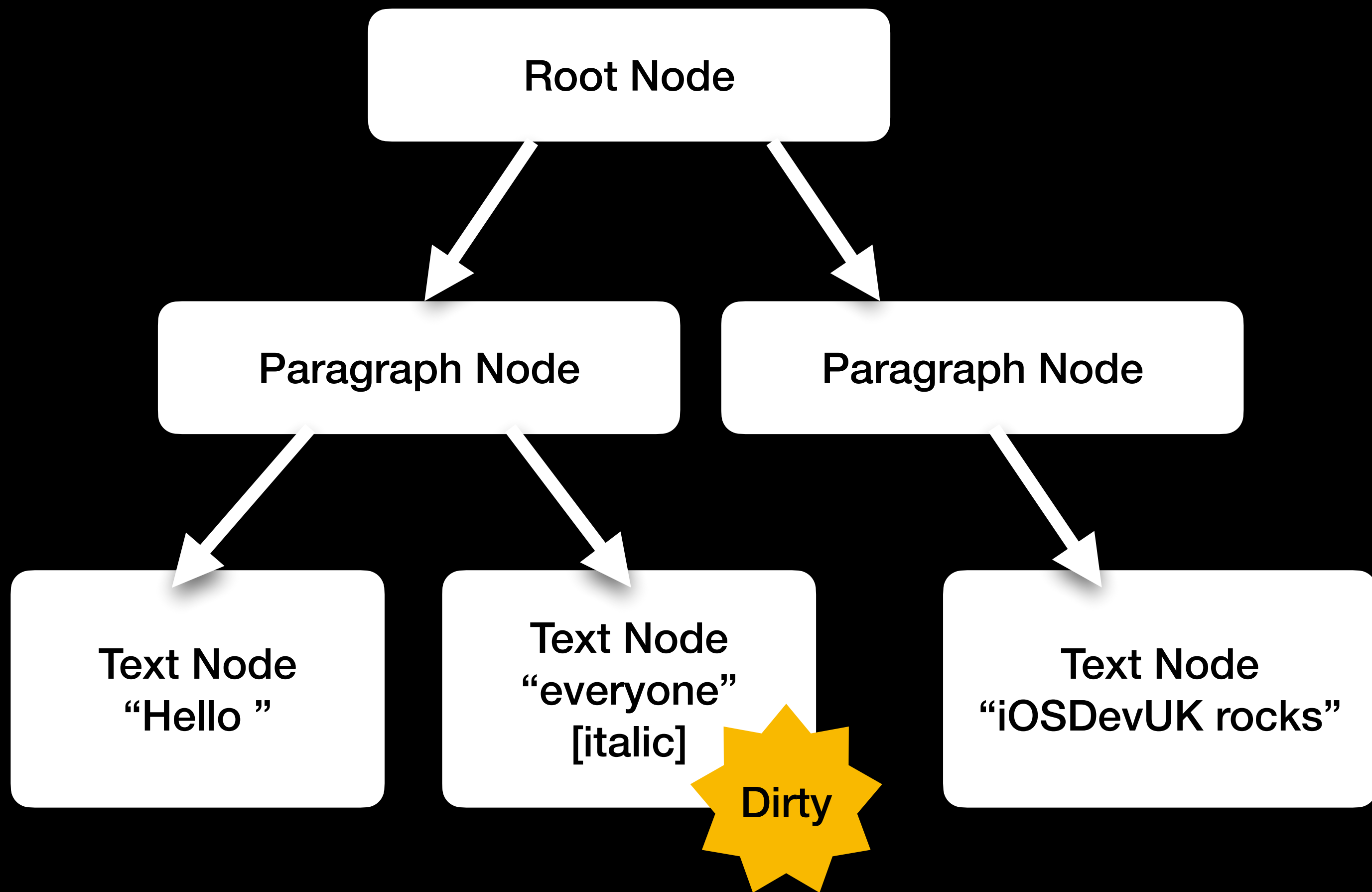
Hello world



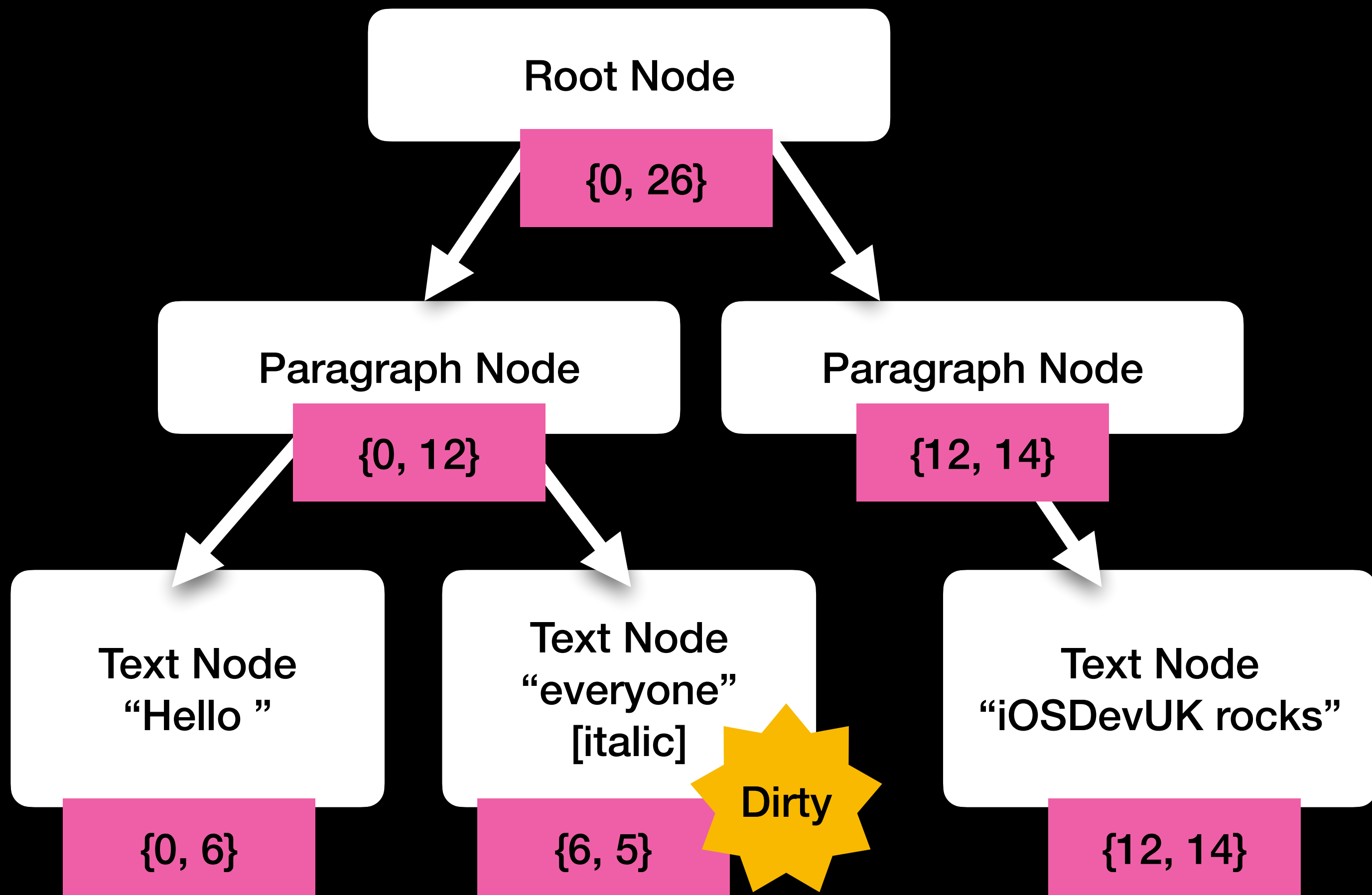
Hello world  
iOSDevUK rocks



Hello world  
iOSDevUK rocks

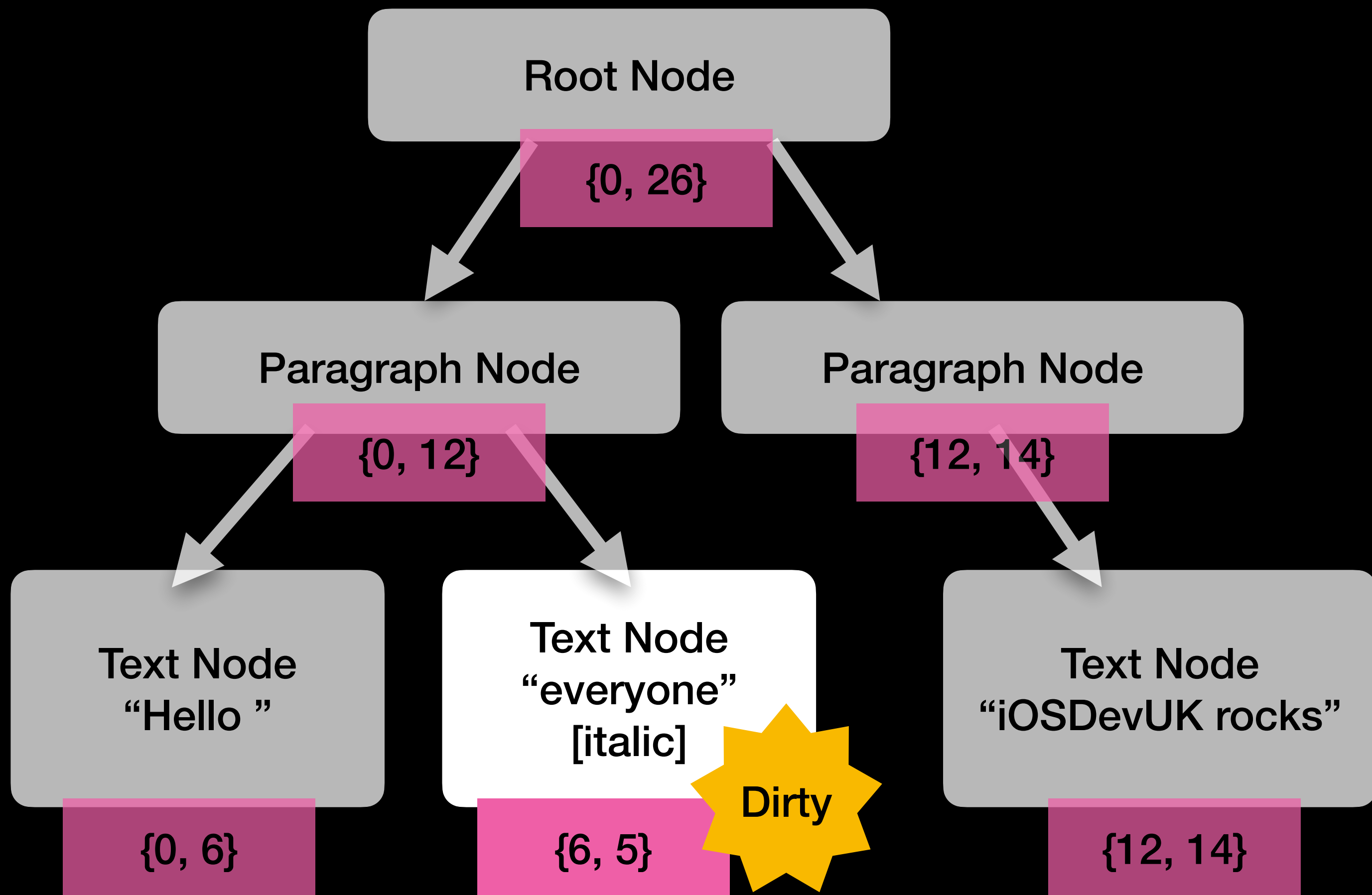


Hello world  
iOSDevUK rocks

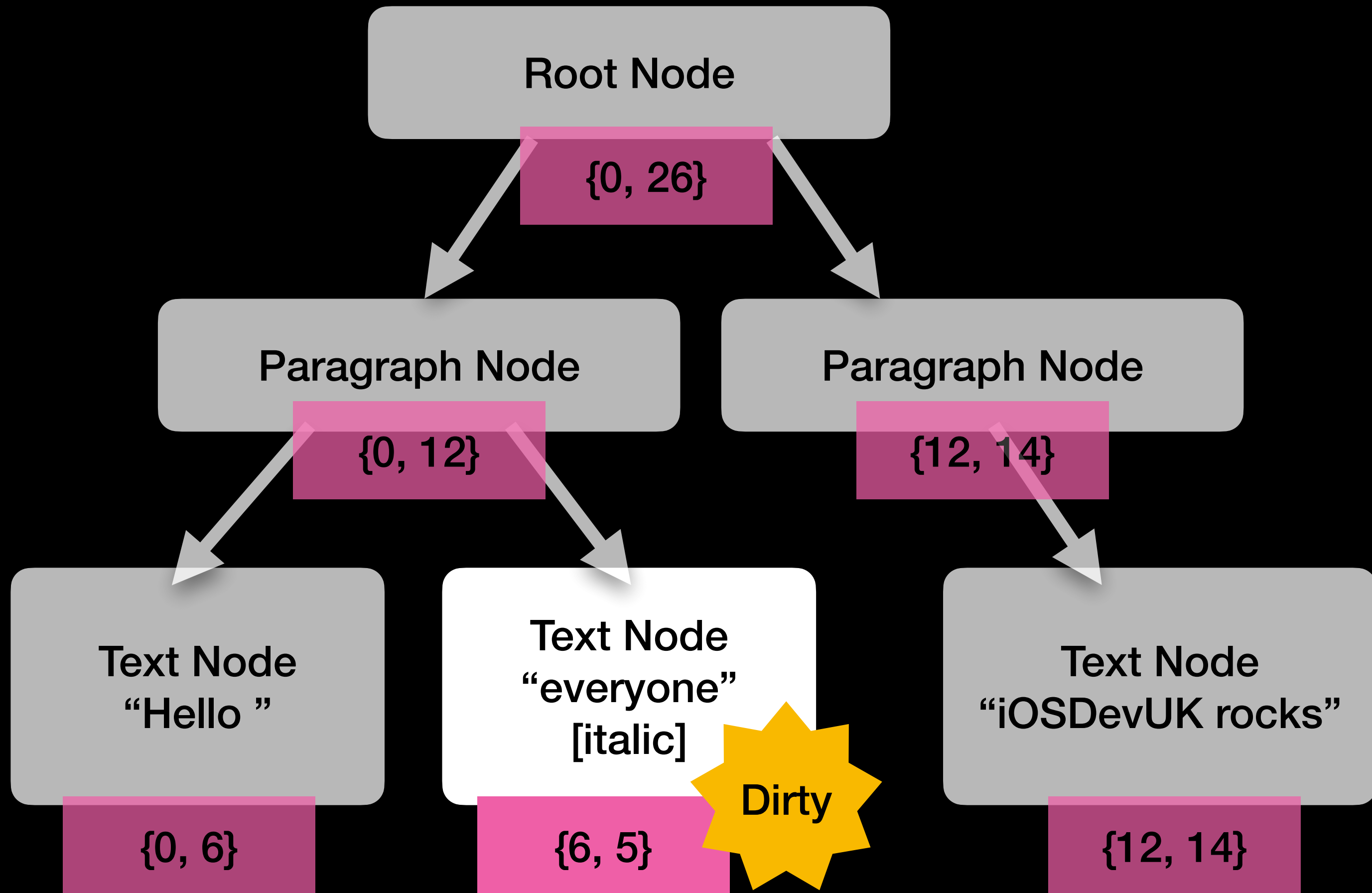


Hello world  
iOSDevUK rocks

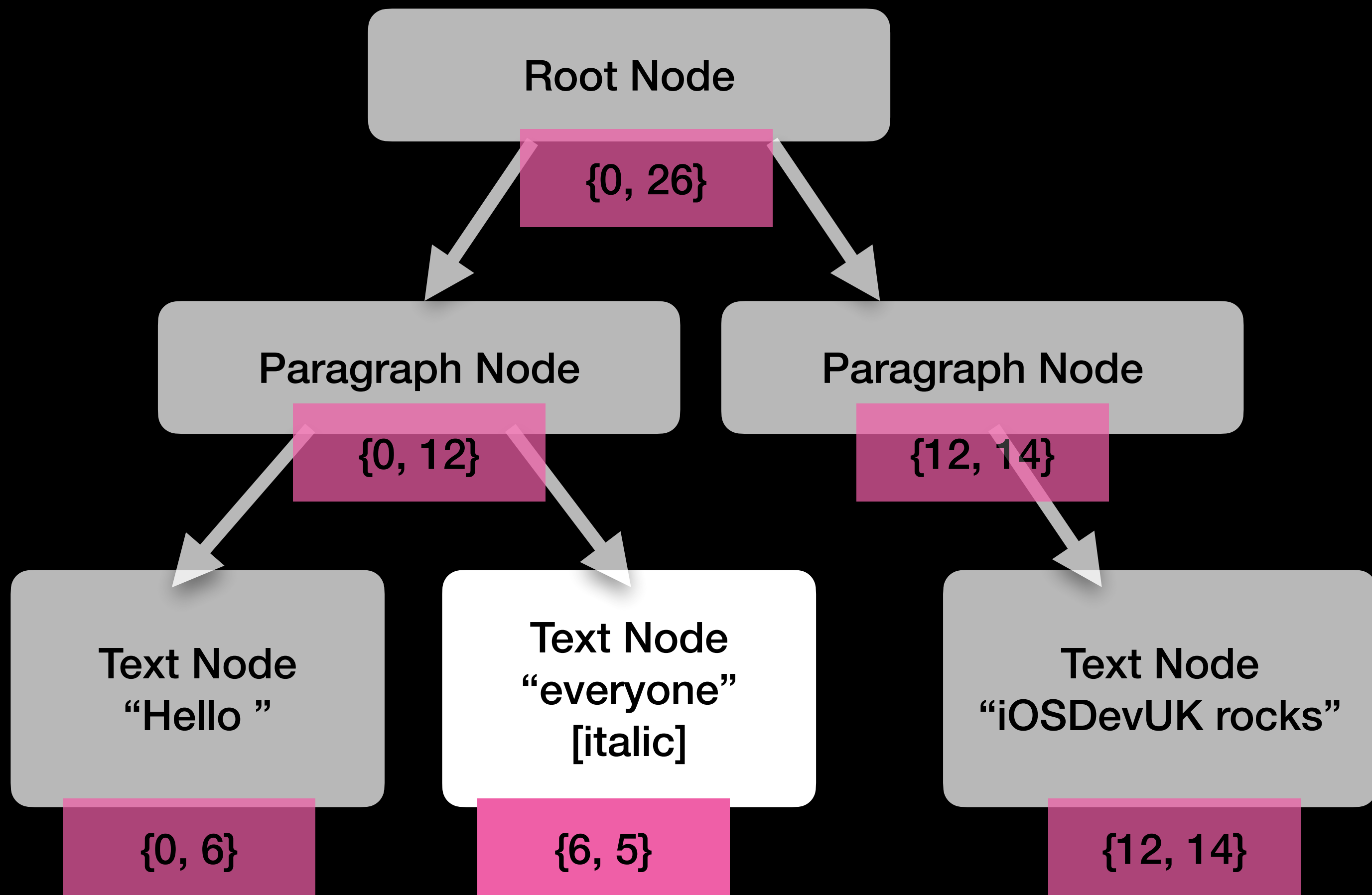




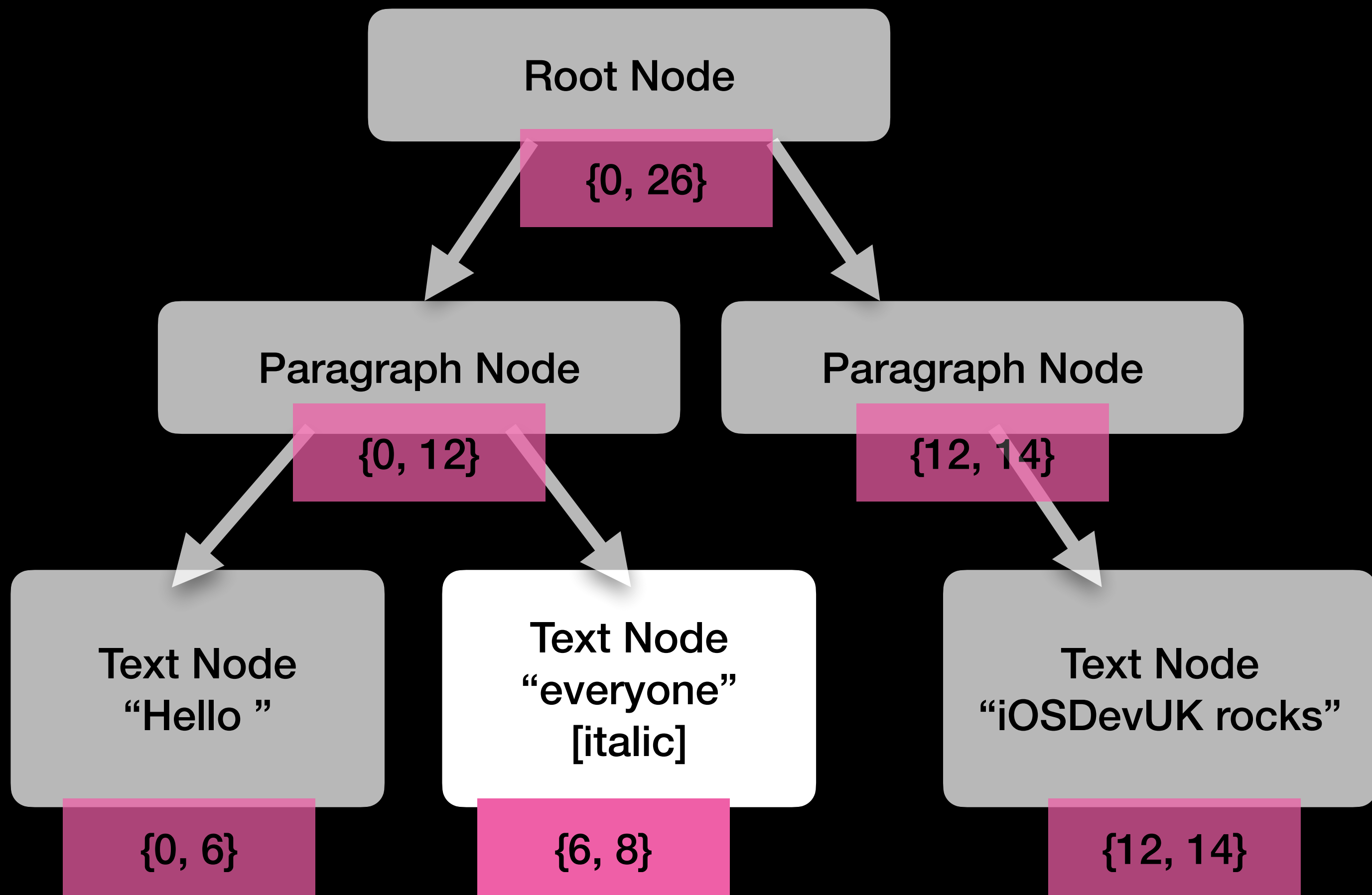
Hello world  
iOSDevUK rocks



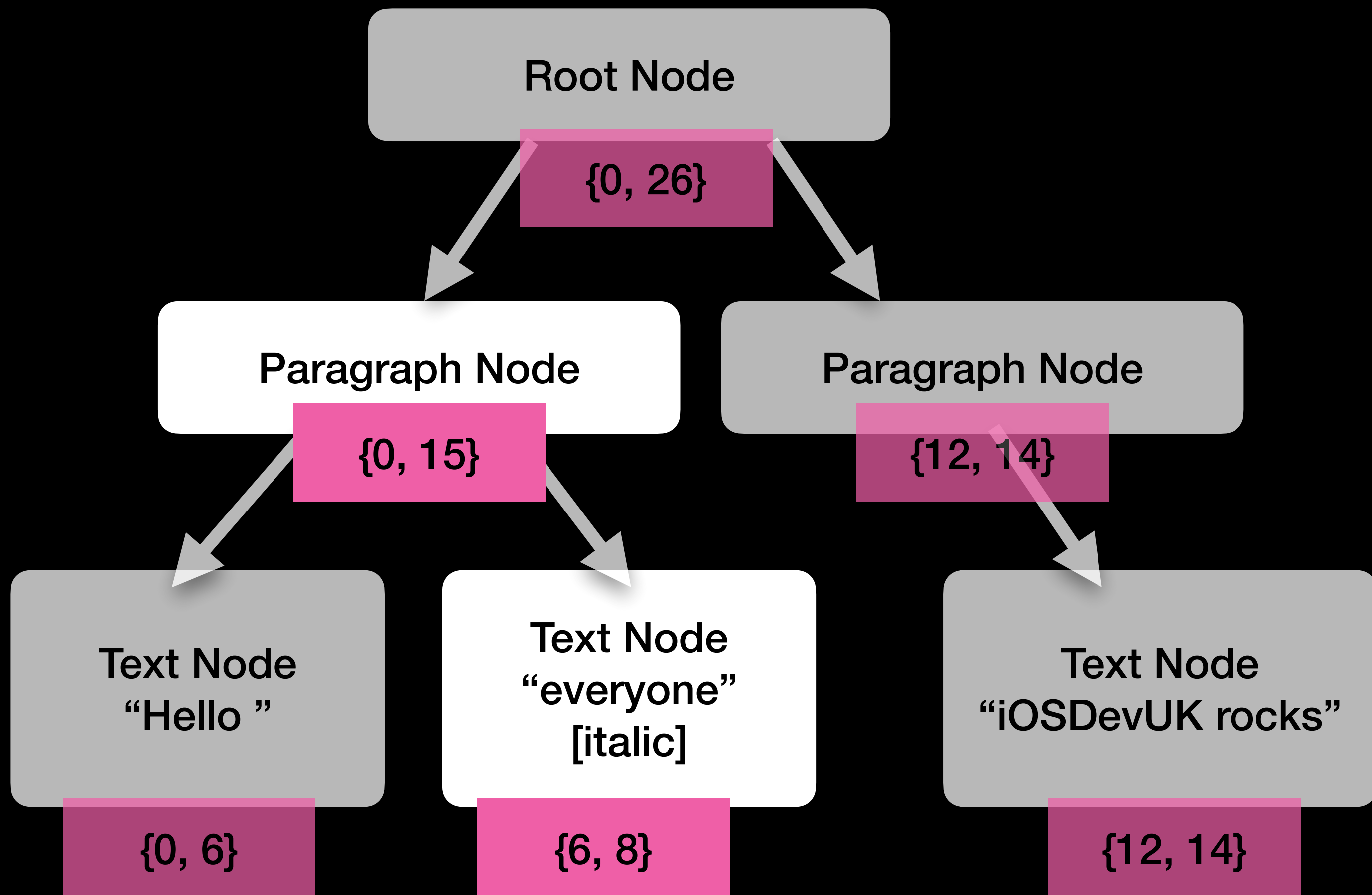
Hello ~~world~~  
iOSDevUK rocks



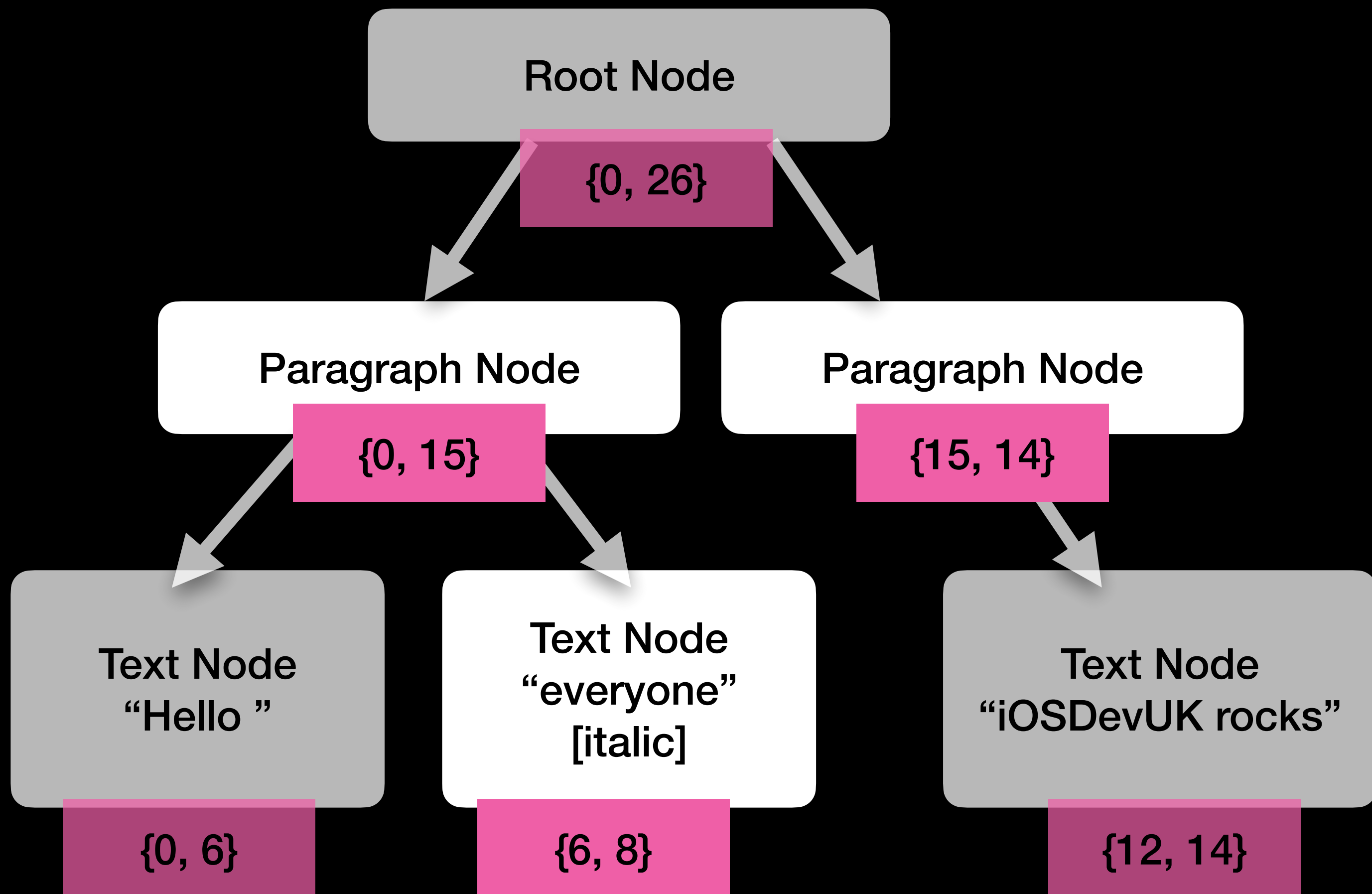
Hello everyone  
iOSDevUK rocks



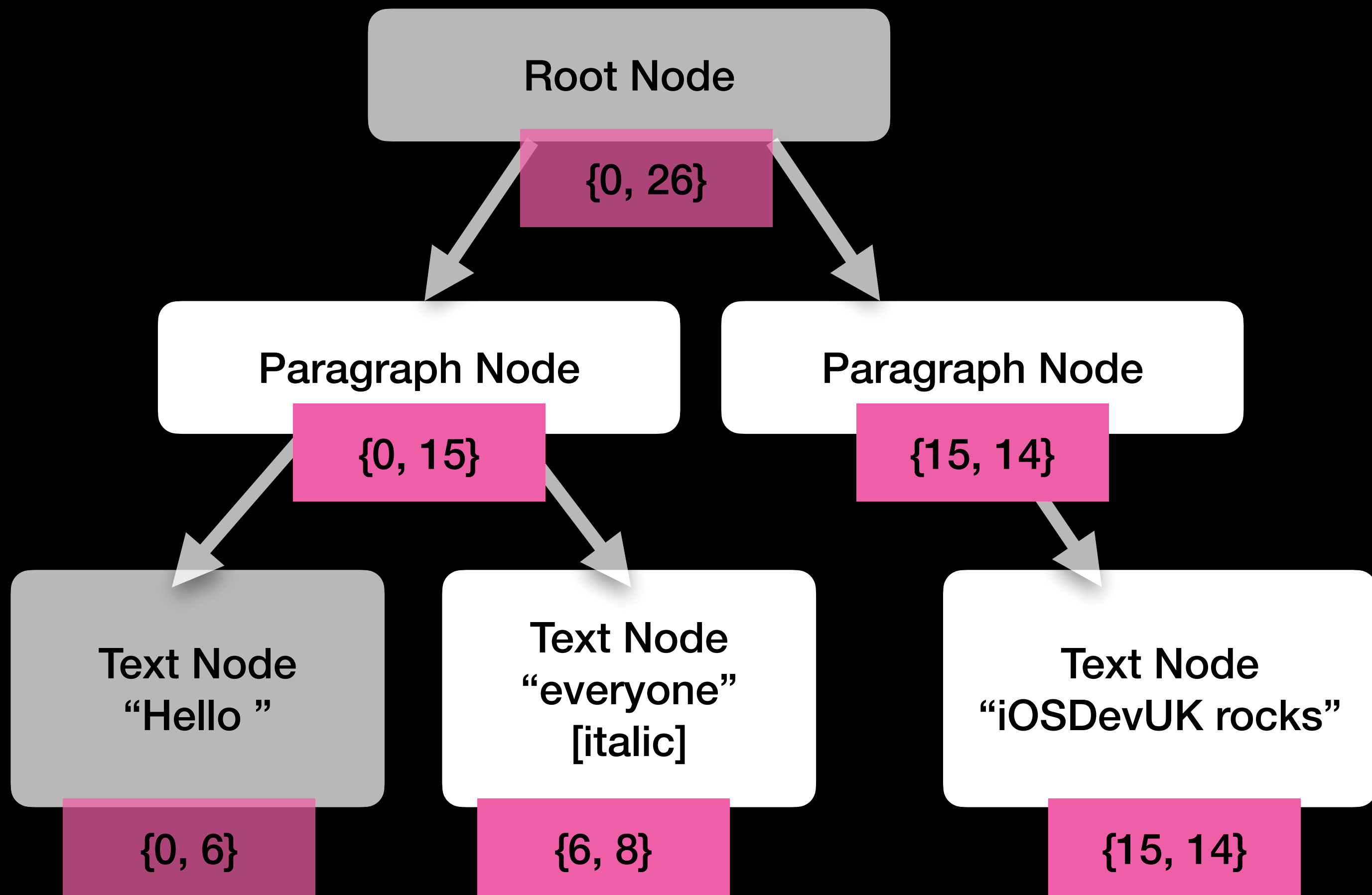
Hello everyone  
iOSDevUK rocks



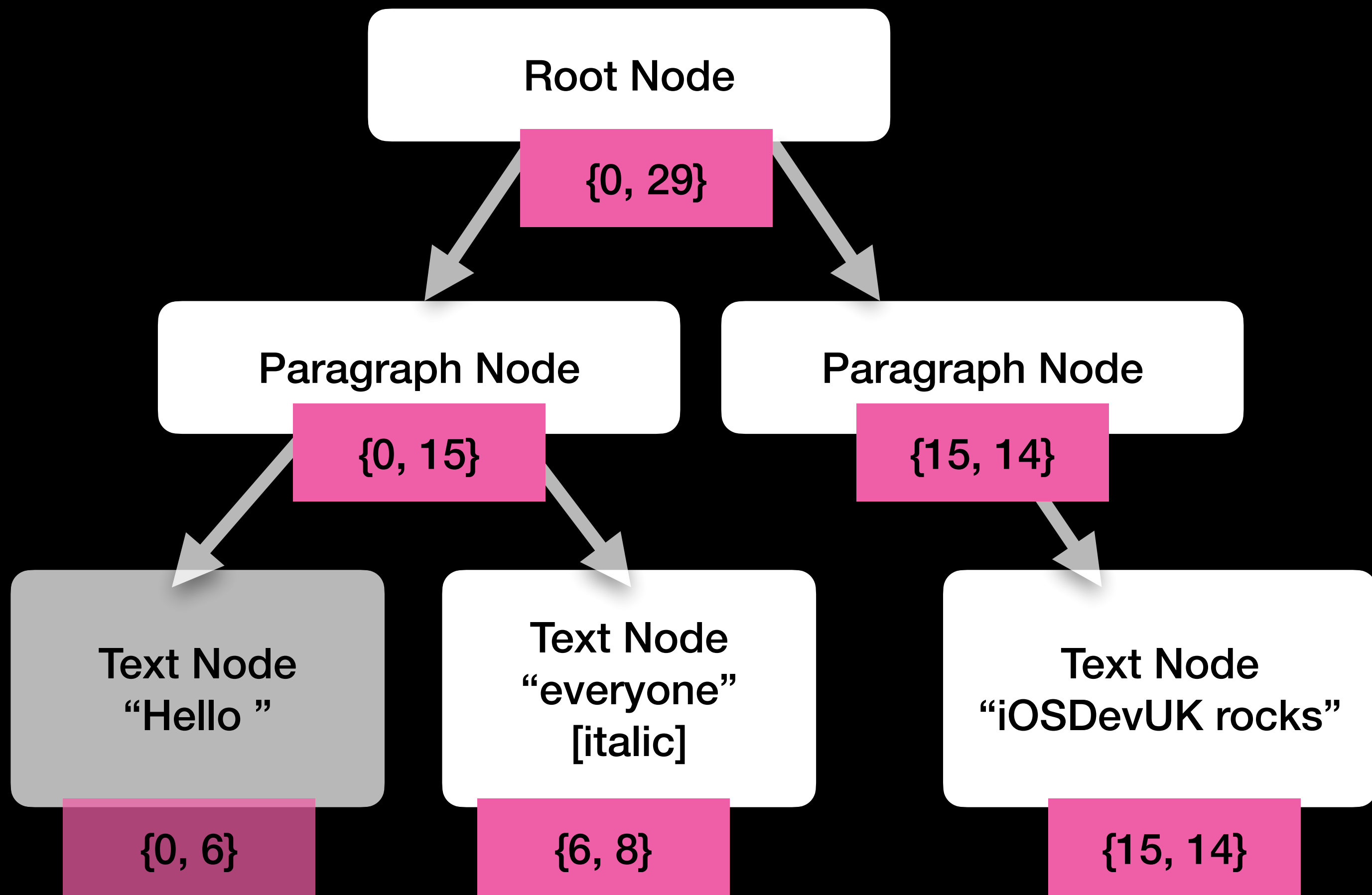
Hello everyone  
iOSDevUK rocks



Hello everyone  
iOSDevUK rocks

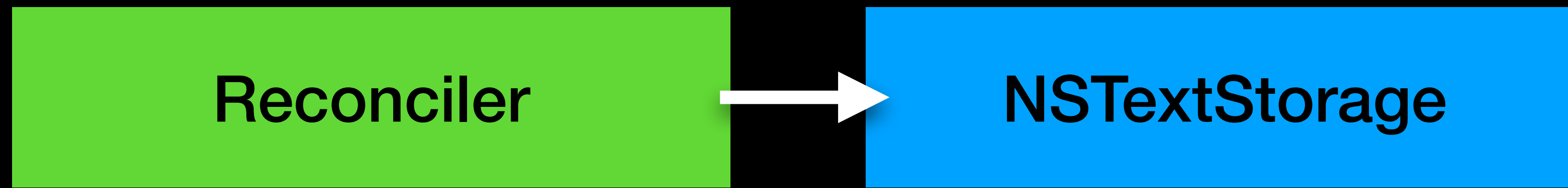


Hello everyone  
iOSDevUK rocks



Hello everyone  
iOSDevUK rocks





```
func replaceCharacters(in: NSRange, with: String)
```

```
func beginEditing()
```

```
func endEditing()
```

**UITextView**

**Business Logic**

**Reconciler**

**NSTextStorage**

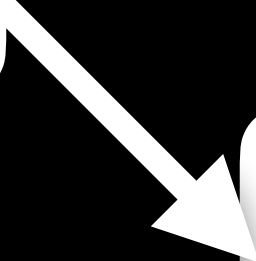
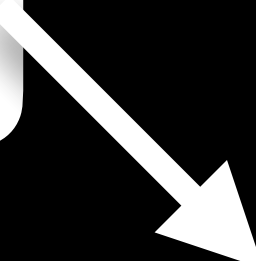
insertText()

get selection

update data model

reconcile dirty nodes

replaceCharacters()



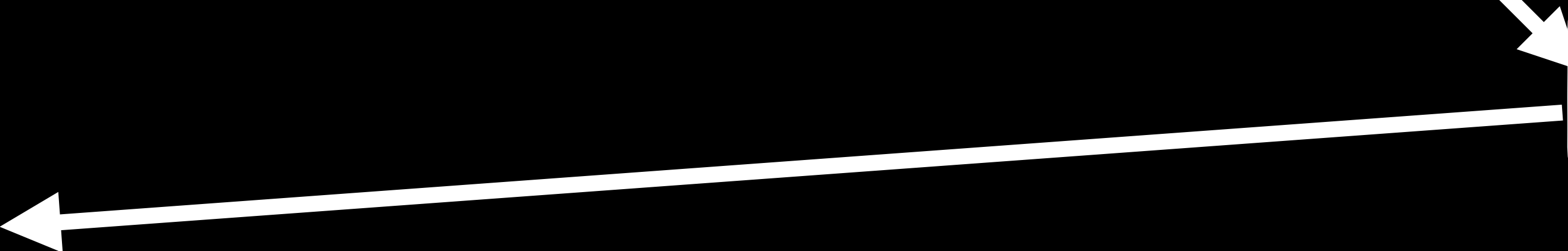
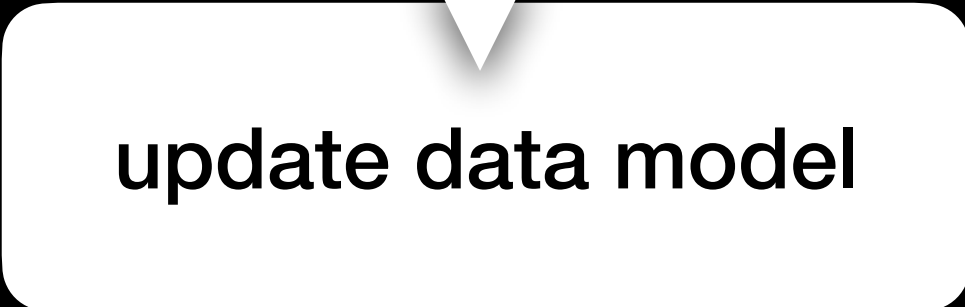
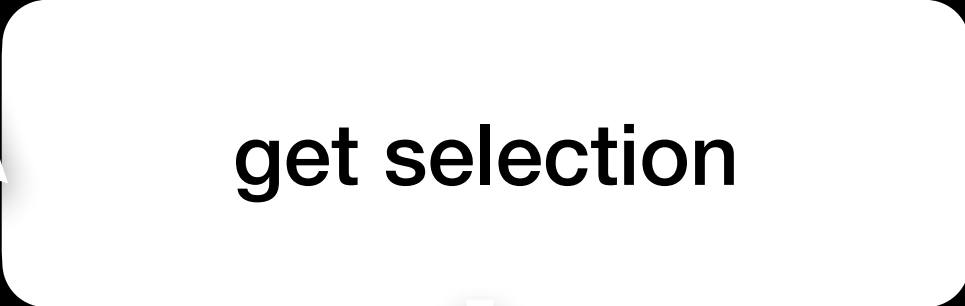
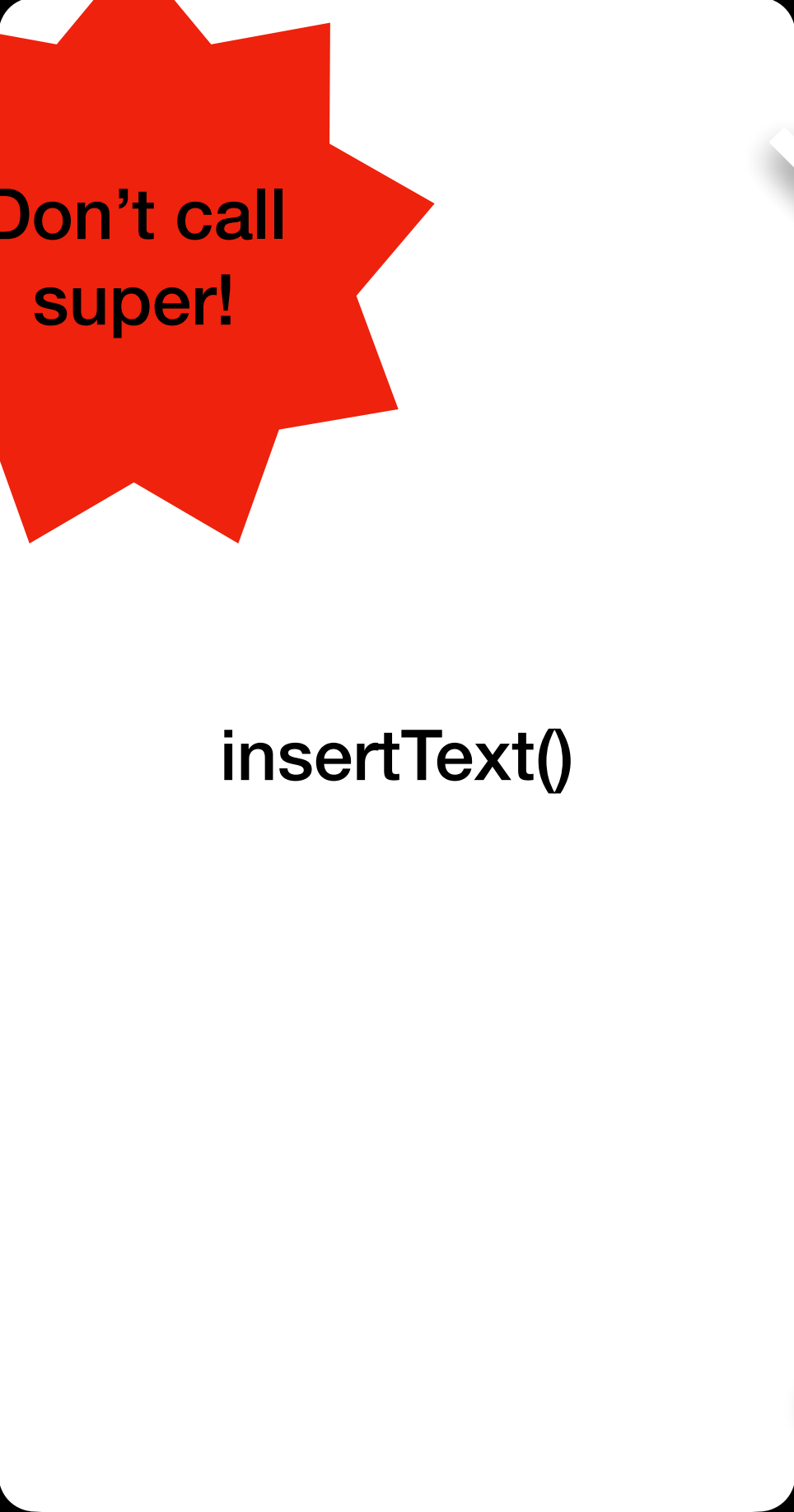
UITextView

Business Logic

Reconciler

NSTextStorage

Don't call super!



# Lexical Selection

Node key:

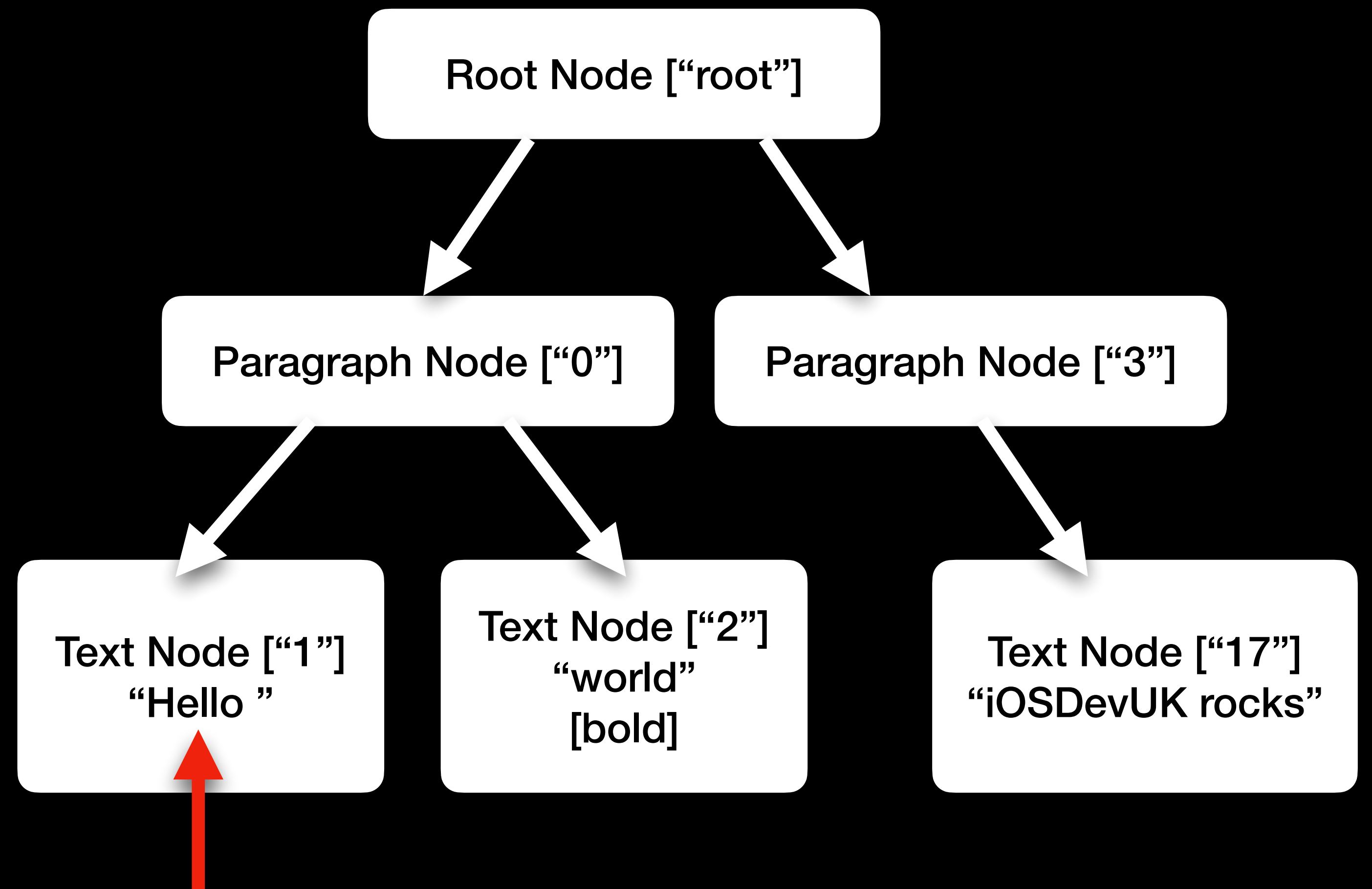
1

Offset:

2 characters

Type:

text



# Lexical Selection

Node key:

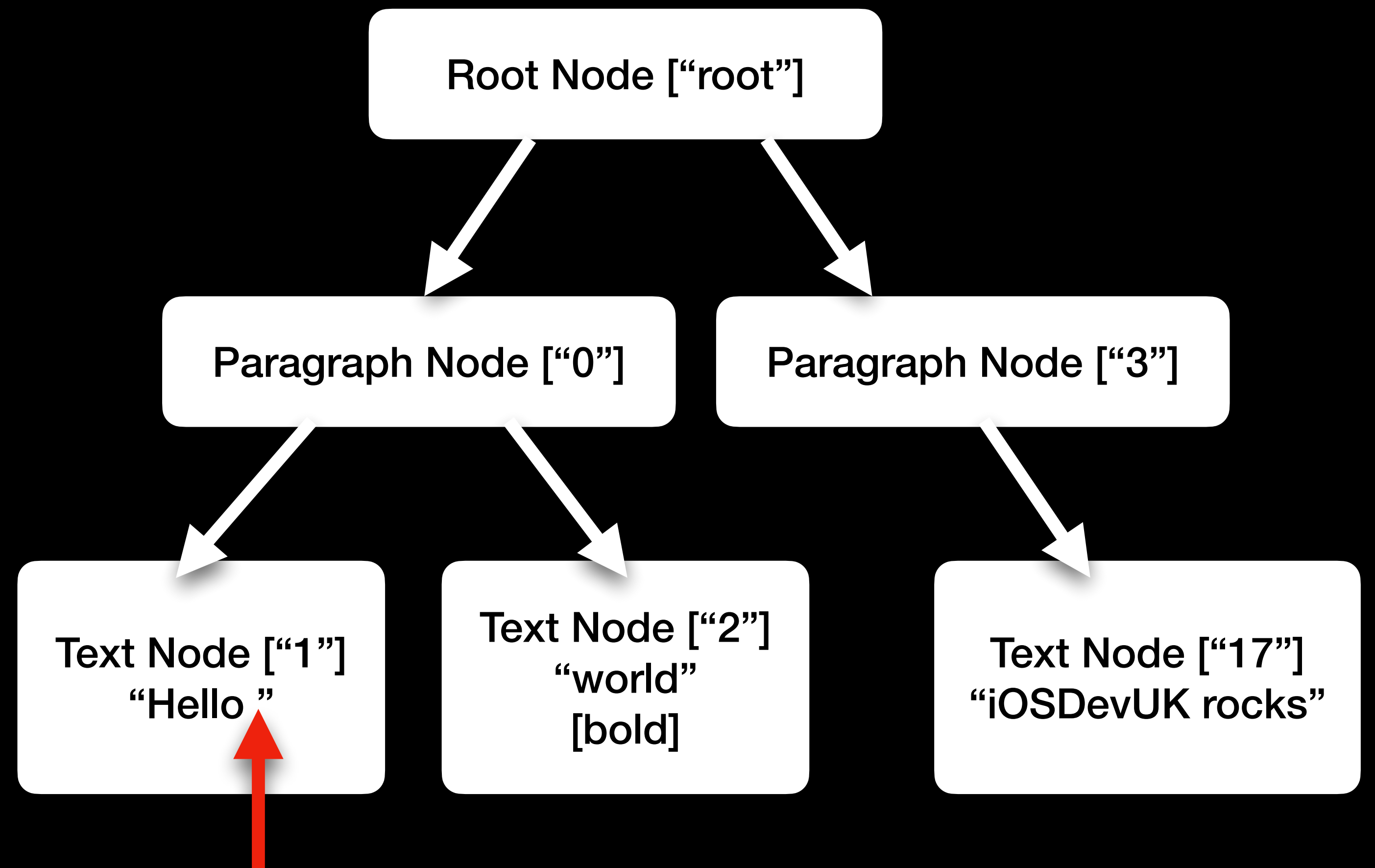
1

Offset:

6 characters

Type:

text



# Lexical Selection

Node key:

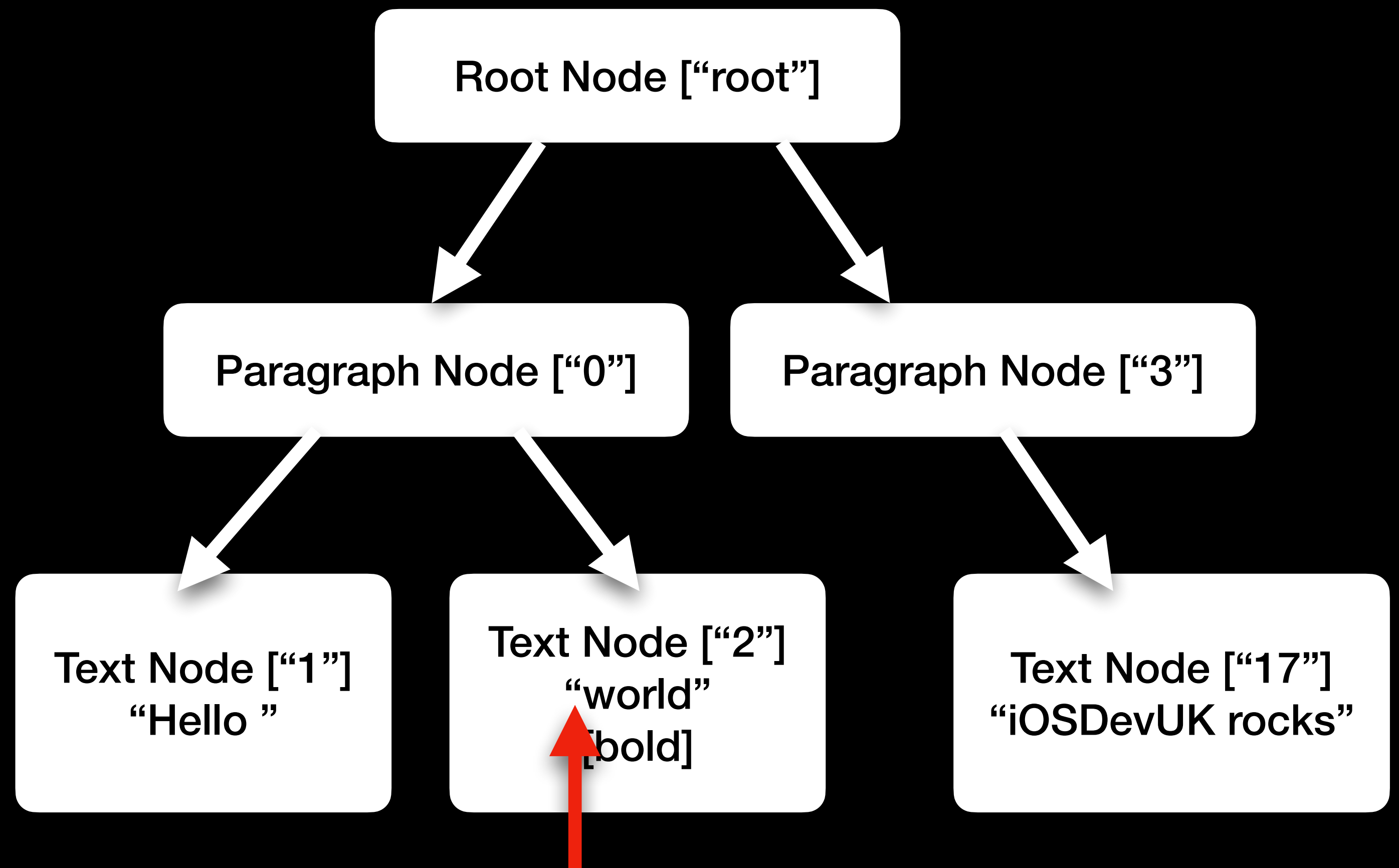
2

Offset:

0 characters

Type:

text



## Lexical Selection

Node key:

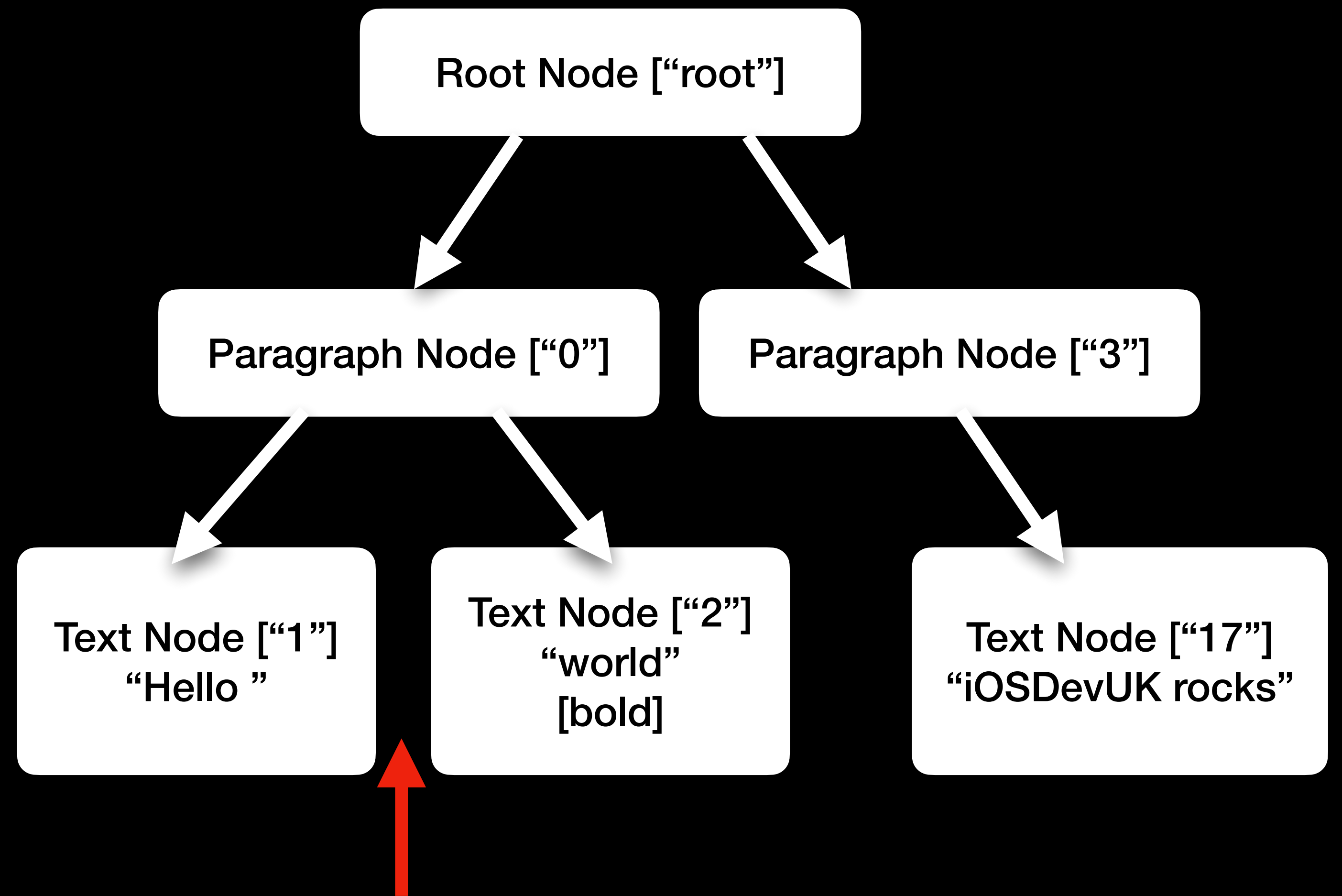
0

Offset:

1 child

Type:

element



**UITextView**

**Business Logic**

**Reconciler**

**NSTextStorage**

`textViewDidChange  
Selection()`

search range cache

derive Lexical selection

save in data model

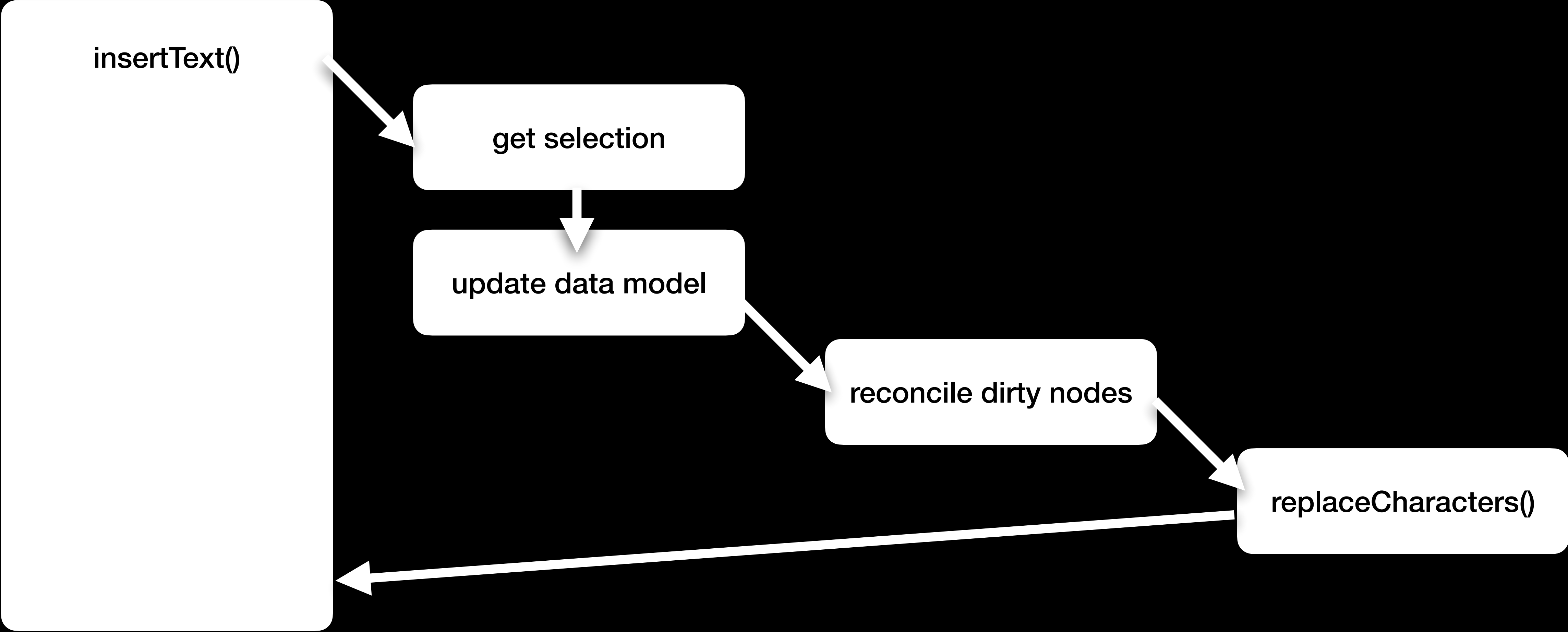


**UITextView**

**Business Logic**

**Reconciler**

**NSTextStorage**

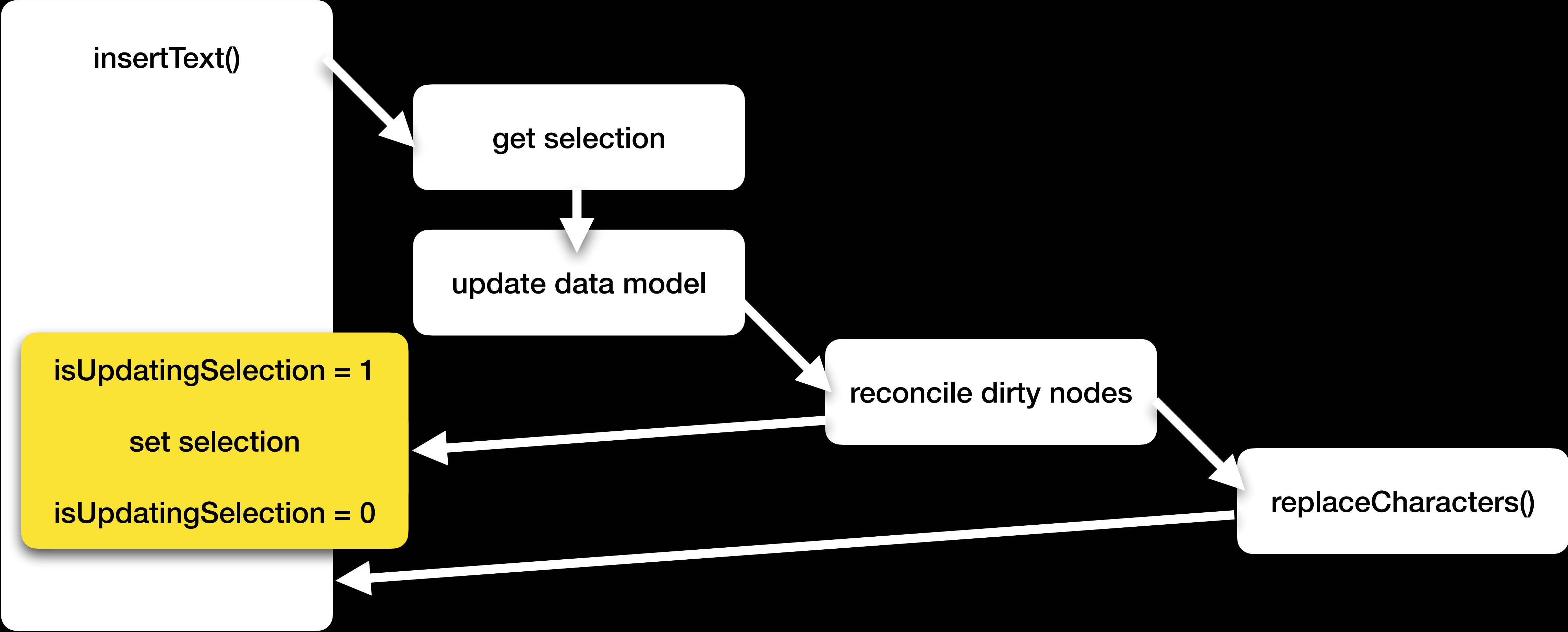


**UITextView**

**Business Logic**

**Reconciler**

**NSTextStorage**



UITextView

Business Logic

Reconciler

NSTextStorage

textViewDidChange  
Selection()

isUpdatingSelection  
== true?

search range cache

derive Lexical selection

save in data model

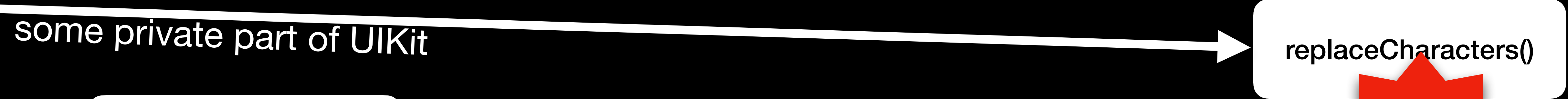
**Autocorrect**

UITextView

Business Logic

Reconciler

NSTextStorage



insertText()

get selection **wrong**

update data model

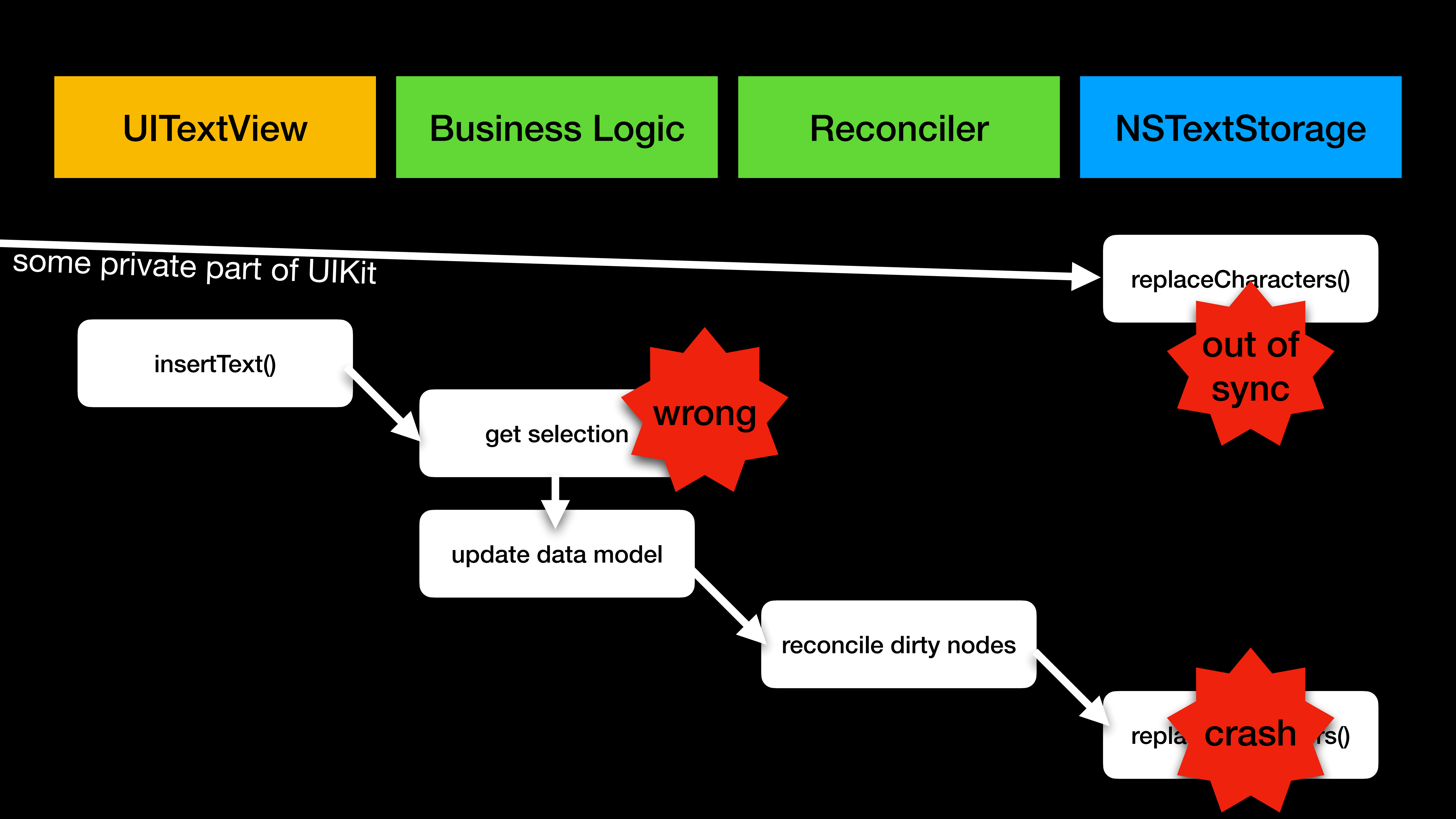
reconcile dirty nodes

replaceCharacters()

**out of sync**

replaceCharacters()

**crash**

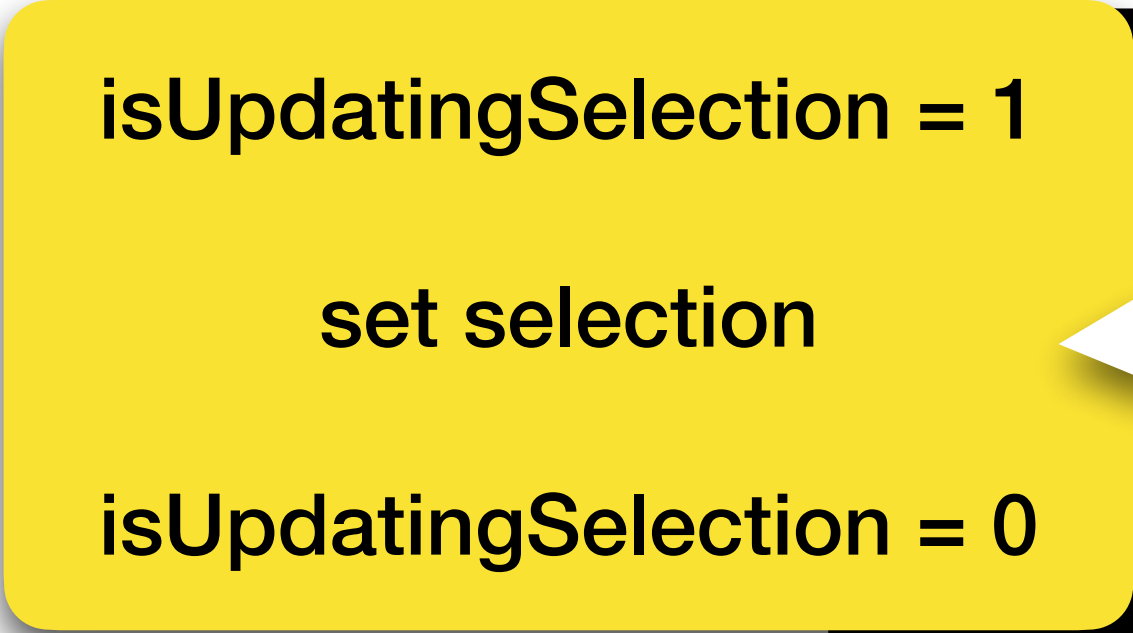
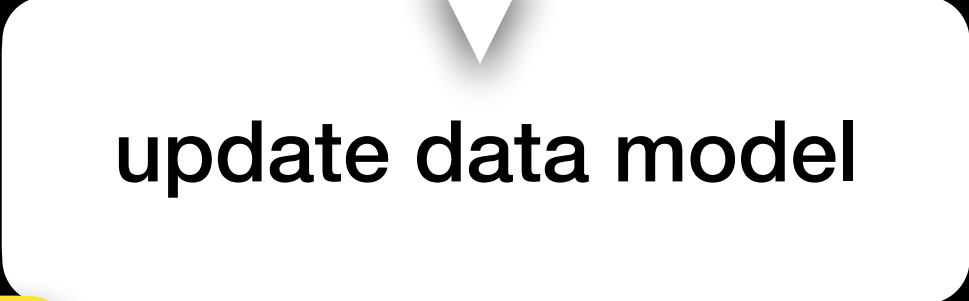
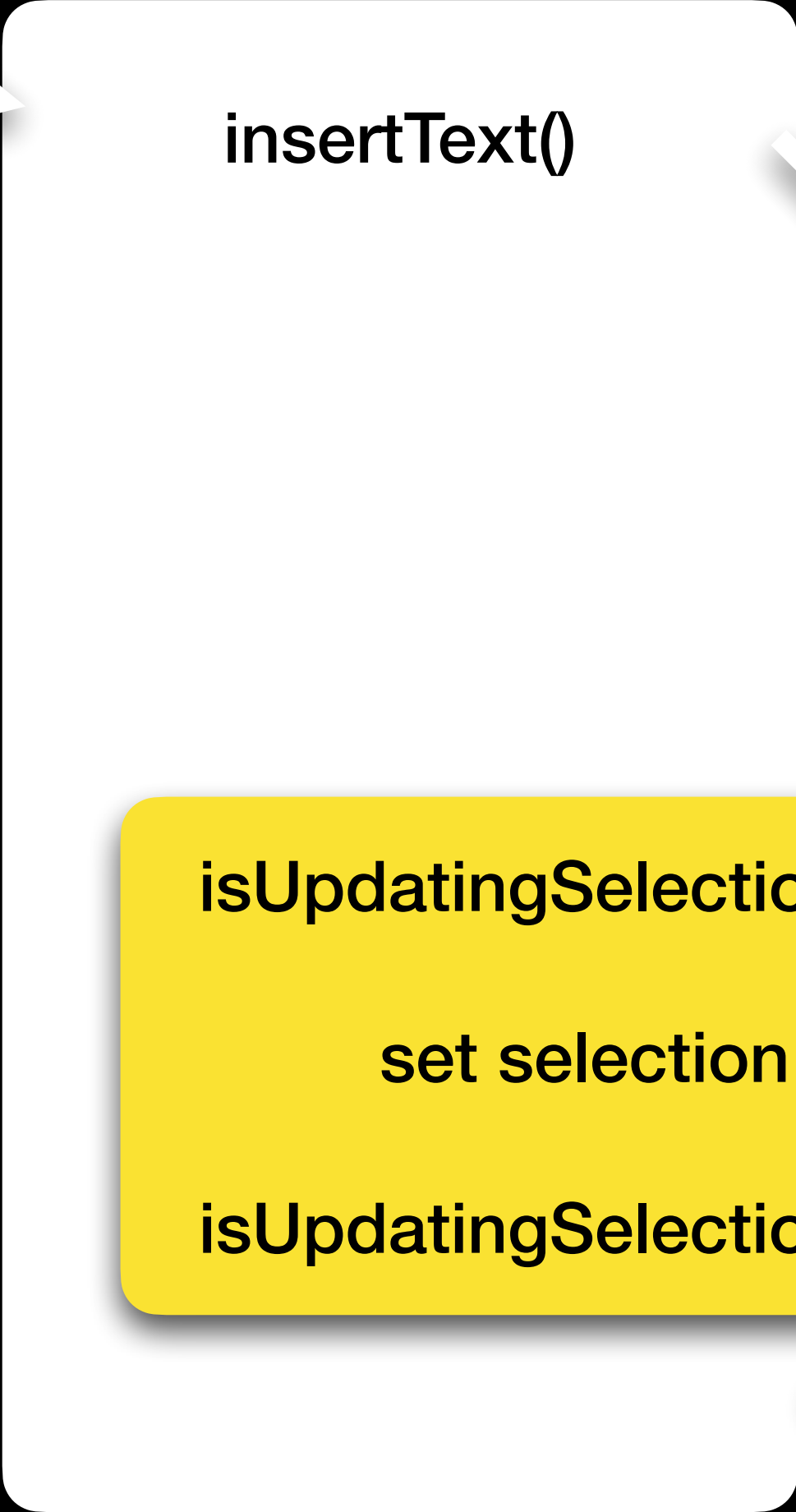


**UITextView**

**Business Logic**

**Reconciler**

**NSTextStorage**



**UITextView**

**Business Logic**

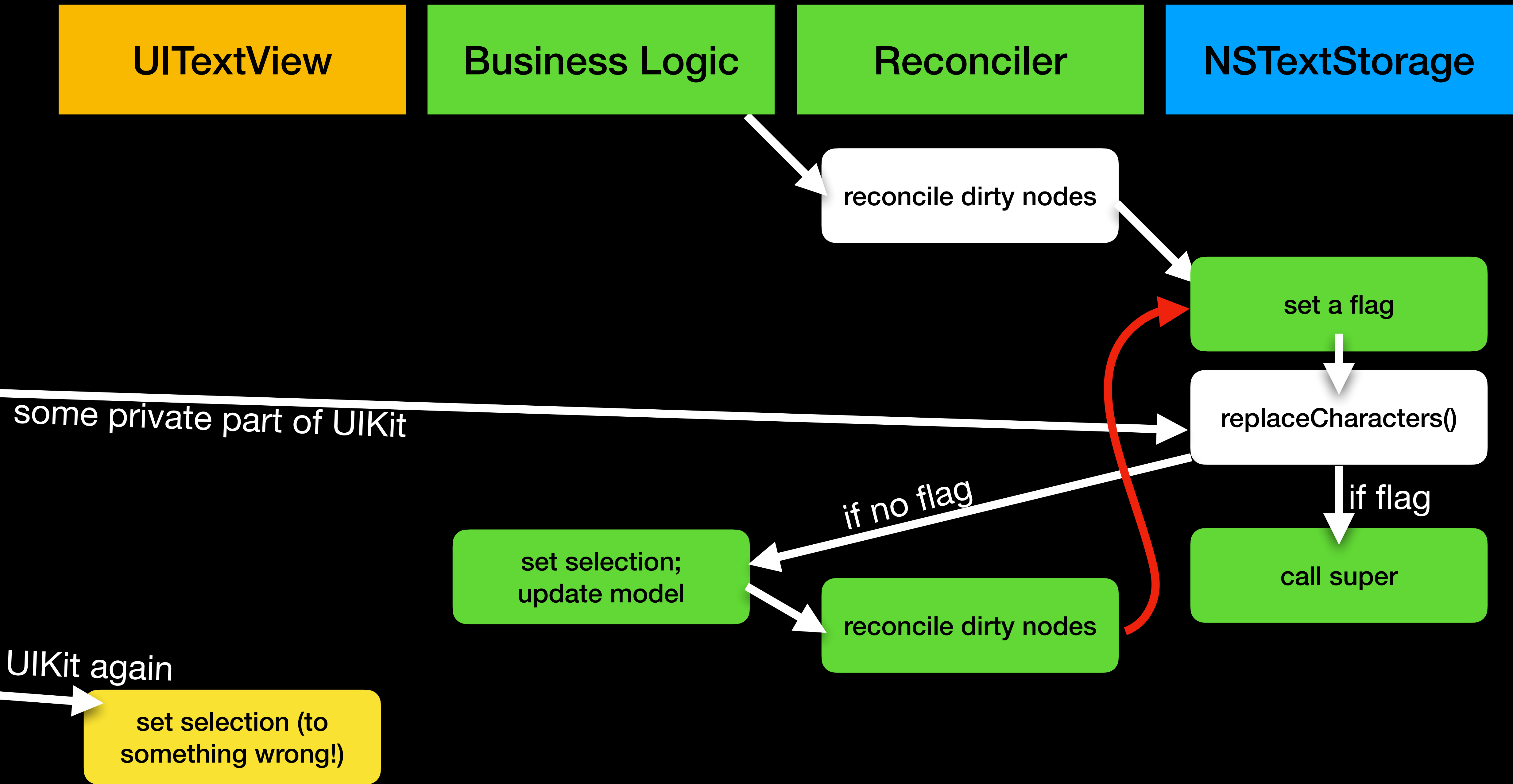
**Reconciler**

**NSTextStorage**

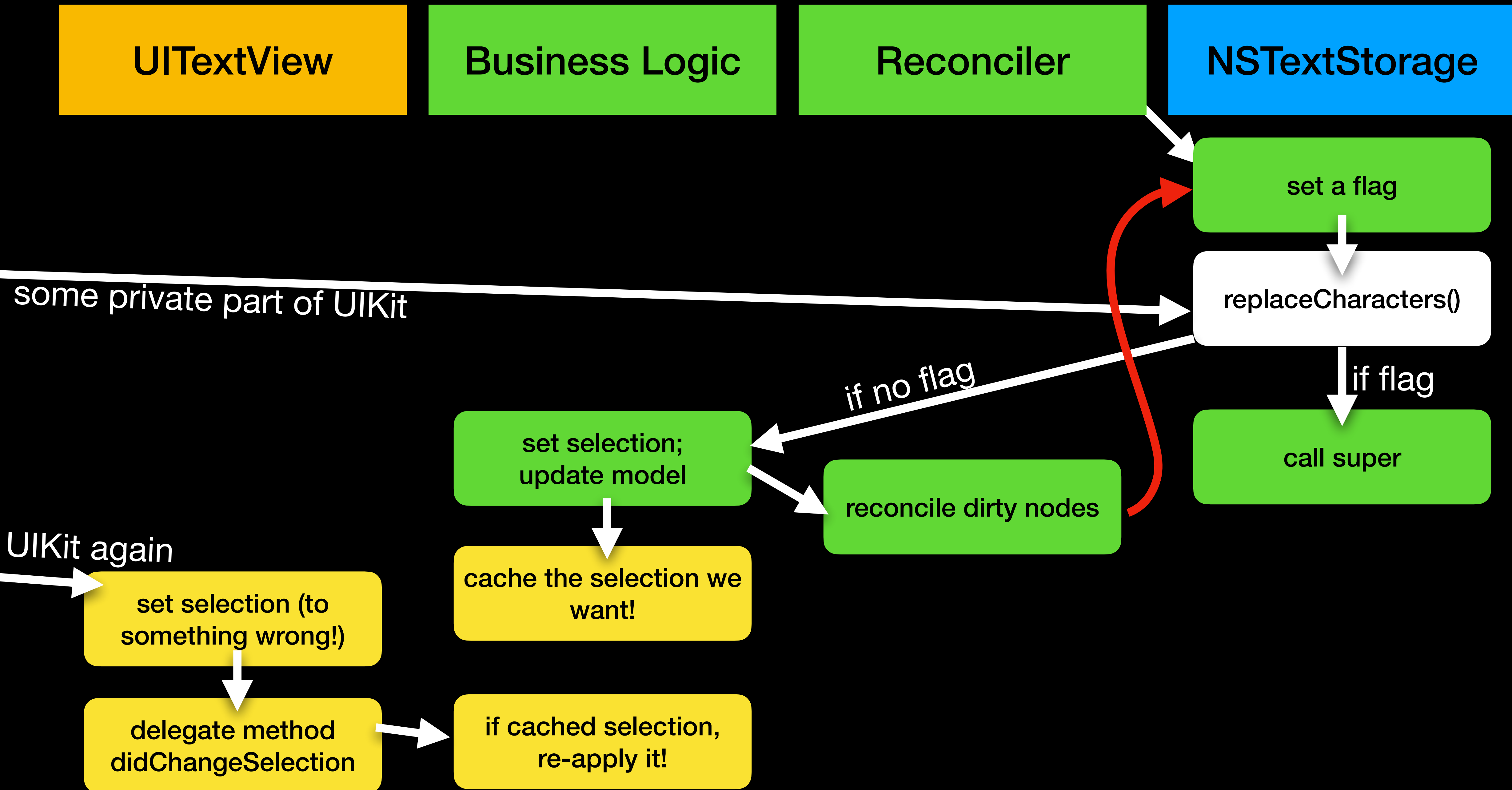
reconcile dirty nodes

replaceCharacters()

some private part of UIKit







**Marked Text**

**UITextView**

**Business Logic**

**Reconciler**

**NSTextStorage**

setMarkedText()

get selection OR  
current marked range

update data model

reconcile dirty nodes

sanity check our  
replacement range

call super  
setMarkedText()

UIKit changes our  
text storage.

**Thankyou**