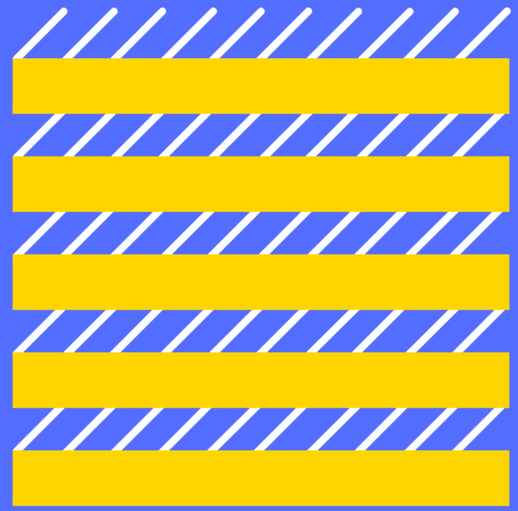
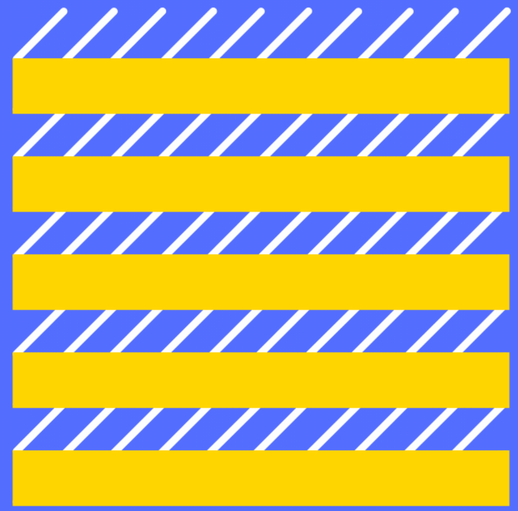
Android KTX



Jake Wharton

Android KTX



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```kotlin
val userLayout: ViewGroup = findViewById(R.id.users)
for (index in 0 until userLayout.childCount) {
    val view = userLayout.getChildAt(index)
    // Do something with index and view…
}
```

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fun ViewGroup.forEachIndexed(action: (Int, View) -> Unit) {
    for (index in 0 until childCount) {
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```
// In an Activity, on API 23+…
val notifications = getSystemService(NotificationManager::class.java)
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```kotlin
// In an Activity, on API 23+…
val notifications = getSystemService(NotificationManager::class.java)

// or all API levels…
val notifications = ContextCompat.getSystemService(this,
    NotificationManager::class.java)
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```
inline fun <reified T> Context.systemService() =
    ContextCompat.getSystemService(this, T::class.java)


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// In an Activity…
val notifications = systemService<NotificationManager>()
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avatarView.setPadding(
    10, avatarView.paddingTop, 10, avatarView.paddingBottom)
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inline fun View.updatePadding(
    left: Int = paddingLeft,
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avatarView.updatePadding(left = 10, right = 10)
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```
val rect = avatarView.clipBounds
val left = rect.left
val top = rect.top
val right = rect.right
val bottom = rect.bottom
// Use left, top, right, bottom…
```

```
inline operator fun Rect.component1() = left
inline operator fun Rect.component2() = top
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val (left, _, right) = avatarView.clipBounds
// Use left, right…
```

```
var onlyDigits = true
for (c in phoneNumber) {
    if (!c.isDigit()) {
        onlyDigits = false
        break
    }
}
```

```
val onlyDigits = phoneNumber.all { it.isDigit() }
```

```
val onlyDigits = TextUtils.isDigitsOnly(phoneNumber)
```

```
inline fun CharSequence.isDigitsOnly() = TextUtils.isDigitsOnly(this)

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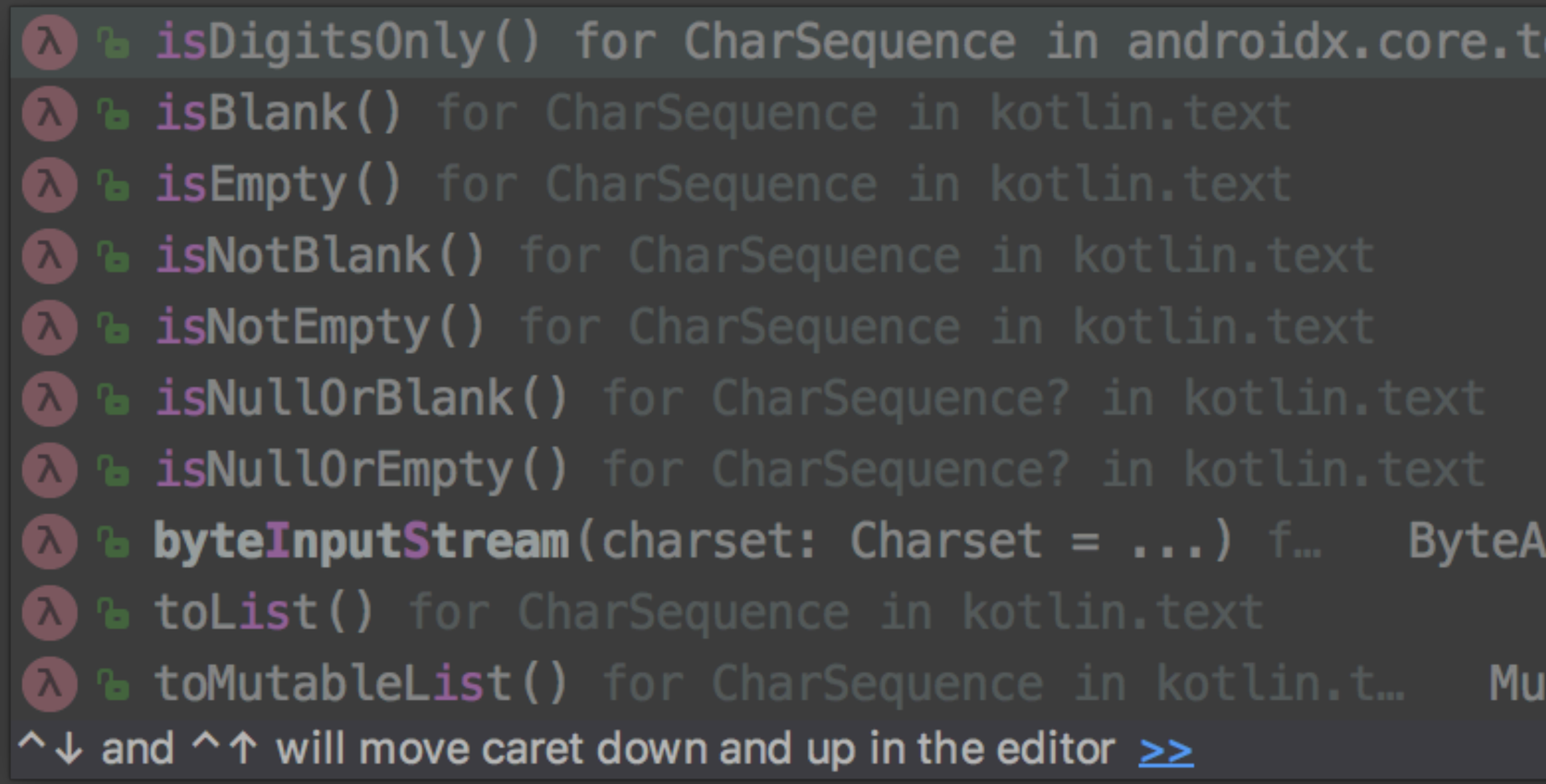

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val onlyDigits = phoneNumber.isDigitsOnly()
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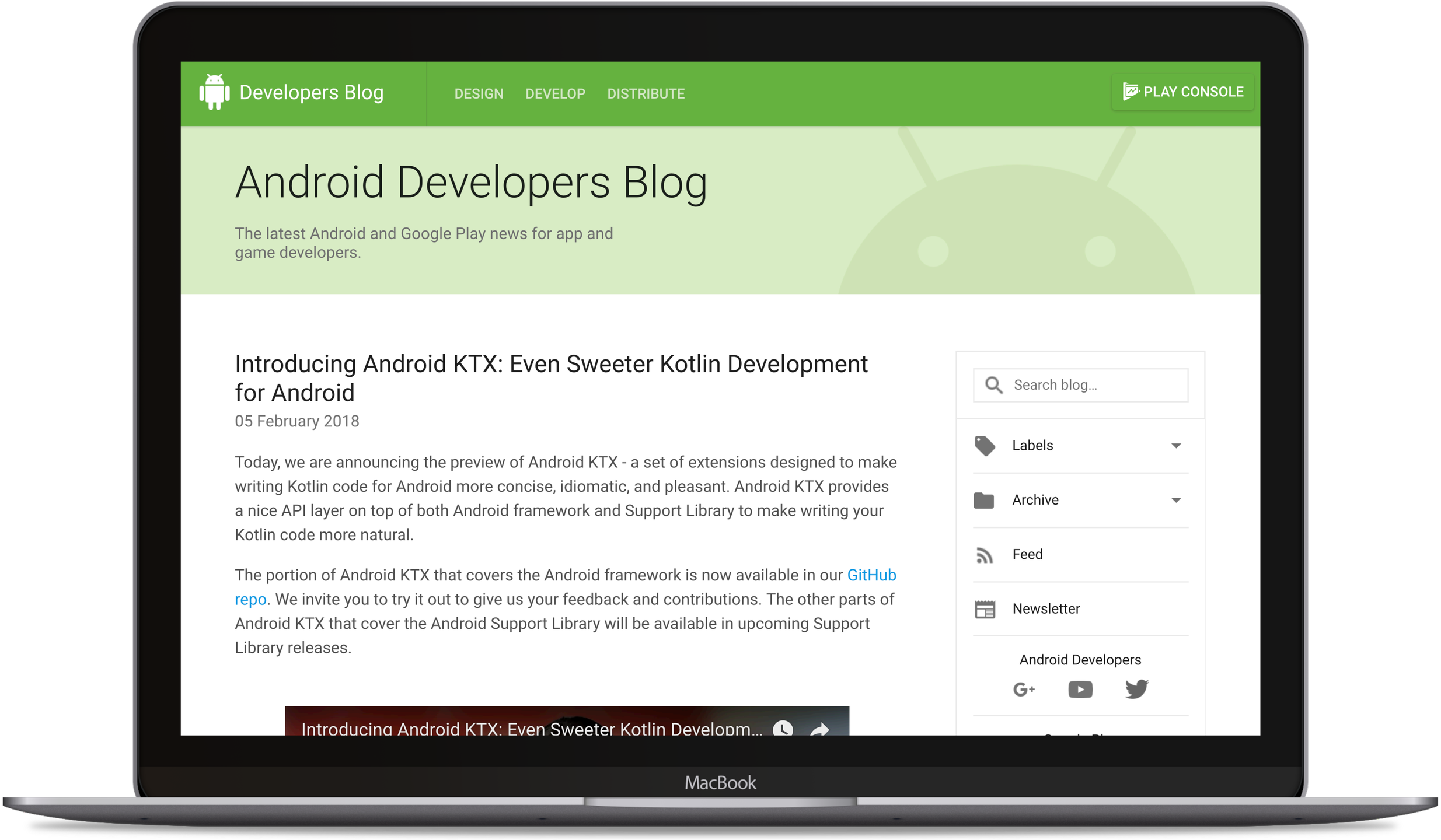
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Introducing Android KTX: Even Sweeter Kotlin Development for Android
05 February 2018
Today, we are announcing the preview of Android KTX - a set of extensions designed to make writing Kotlin code for Android more concise, idiomatic, and pleasant. Android KTX provides a nice API layer on top of both Android framework and Support Library to make writing your Kotlin code more natural.
The portion of Android KTX that covers the Android framework is now available in our GitHub repo. We invite you to try it out to give us your feedback and contributions. The other parts of Android KTX that cover the Android Support Library will be available in upcoming Support Library releases.
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Android KTX

core-ktx

Android KTX

core-ktx → Android framework

Android KTX

core-ktx → support-compat → Android framework

Android KTX

core-ktx → core → Android framework

Android KTX

core-ktx → core → Android framework

fragment-ktx → fragment

palette-ktx → palette

collection-ktx → collection

lifecycle-reactivestreams-ktx → lifecycle-reactivestreams

sqlite-ktx → sqlite

navigation-*-ktx → navigation-*

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Android KTX

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```kotlin
@RequiresApi(26)
operator fun Color.plus(c: Color): Color {
    val s = if (colorSpace != c.colorSpace) c.convert(colorSpace) else c

    val src = s.components
    val dst = components

    var sa = s.alpha()
    // Destination alpha pre-composited
    var da = alpha() * (1.0f - sa)

    // Index of the alpha component
    val ai = componentCount - 1

    // Final alpha: src_alpha + dst_alpha * (1 - src_alpha)
    dst[ai] = sa + da

    // Divide by final alpha to return non pre-multiplied color
    if (dst[ai] > 0) {
        sa /= dst[ai]
        da /= dst[ai]
    }

    // Composite non-alpha components
    for (i in 0 until ai) {
        dst[i] = src[i] * sa + dst[i] * da
    }

    return Color.valueOf(dst, colorSpace)
}
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public final class ColorUtils {
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    @ColorInt
    public static int compositeColors(
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        // …
    }
}
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```kotlin
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KTX Principles

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Adapt existing functionality and redirect features upstream

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```kotlin
operator fun ViewGroup.iterator() = object : MutableIterator<View> {
    private var index = 0
    override fun hasNext() = index < childCount
    override fun next() =
        getChildAt(index++) ?: throw IndexOutOfBoundsException()
    override fun remove() = removeViewAt(--index)
}
```

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}

for (view in userLayout) {
    // Do something with view…
}
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for (view in userLayout) {
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KTX Principles

Adapt existing functionality and redirect features upstream

KTX Principles

- Adapt existing functionality and redirect features upstream
- Default to inline unless code size or allocation is prohibitive

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inline fun ViewGroup.forEachIndexed(action: (Int, View) -> Unit) {
    for (index in 0 until childCount) {
        action(index, getChildAt(index))
    }
}

val userLayout: ViewGroup = findViewById(R.id.users)
userLayout.forEachIndexed { index, view ->
    // Do something with index and view…
}
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```
inline fun <reified T> Context.systemService() =
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// In an Activity…
val notifications = systemService<NotificationManager>()
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    left: Int = paddingLeft,
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avatarView.updatePadding(left = 10, right = 10)
```

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inline operator fun Rect.component1() = left
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val (left, _, right) = avatarView.clipBounds
// Use left, right…
```

```kotlin
inline fun CharSequence.isDigitsOnly() = TextUtils.isDigitsOnly(this)

val onlyDigits = phoneNumber.isDigitsOnly()
```

```
operator fun ViewGroup.iterator() = object : MutableIterator<View> {
    private var index = 0
    override fun hasNext() = index < childCount
    override fun next() =
        getChildAt(index++) ?: throw IndexOutOfBoundsException()
    override fun remove() = removeViewAt(--index)
}

for (view in userLayout) {
    // Do something with view…
}
```

KTX Principles

- Adapt existing functionality and redirect features upstream
- Default to inline unless code size or allocation is prohibitive

KTX Principles

- Adapt existing functionality and redirect features upstream
- Default to inline unless code size or allocation is prohibitive
- Leverage features unique to Kotlin

```
view.setOnClickListener {
    // React to click…
}
```

```
fun View.click(listener: (View) -> Unit) {
    setOnClickListener(listener)
}

view.setOnClickListener {
    // React to click…
}
```

```kotlin
fun View.click(listener: (View) -> Unit) {
    setOnClickListener(listener)
}

view.setOnClickListener {
    // React to click…
}
```

```
fun View.click(listener: (View) -> Unit) {
    setOnClickListener(listener)
}

view.click {
    // React to click…
}
```

```
view.setOnClickListener {
    // React to click…
}

view.click {
    // React to click…
}
```

KTX Principles

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KTX Principles


Adapt existing functionality and redirect features upstream


Default to inline unless code size or allocation is prohibitive


Leverage features unique to Kotlin


Code golf APIs to be as short as possible

```
if (Build.VERSION.SDK_INT >= 19) {
    TransitionManager.beginDelayedTransition(viewGroup)
}
```

```
inline fun onApi(level: Int, body: () -> Unit) {
    if (Build.VERSION.SDK_INT >= level) {
        body()
    }
}

if (Build.VERSION.SDK_INT > 19) {
    TransitionManager.beginDelayedTransition(viewGroup)
}
```

```
inline fun onApi(level: Int, body: () -> Unit) {
    if (Build.VERSION.SDK_INT >= level) {
        body()
    }
}

if (Build.VERSION.SDK_INT > 19) {
    TransitionManager.beginDelayedTransition(viewGroup)
}
```

```
inline fun onApi(level: Int, body: () -> Unit) {
    if (Build.VERSION.SDK_INT >= level) {
        body()
    }
}

onApi(19) {
    TransitionManager.beginDelayedTransition(viewGroup)
}
```

```
onApi(19) {
    TransitionManager.beginDelayedTransition(viewGroup)
}
```

```
if (Build.VERSION.SDK_INT >= 19) {
    TransitionManager.beginDelayedTransition(viewGroup)
}

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```
if (SDK_INT >= 19) {
    TransitionManager.beginDelayedTransition(viewGroup)
}

onApi(19) {
    TransitionManager.beginDelayedTransition(viewGroup)
}
```

```
if (SDK_INT >= 19) {
    TransitionManager.beginDelayedTransition(viewGroup)
} else {
    // Something...
}

onApi(19) {
    TransitionManager.beginDelayedTransition(viewGroup)
}
```

```
if (SDK_INT >= 19) {
    TransitionManager.beginDelayedTransition(viewGroup)
} else {
    // Something...
}

onApi(19) {
    TransitionManager.beginDelayedTransition(viewGroup)
}
```

```
if (SDK_INT >= 19) {
    TransitionManager.beginDelayedTransition(viewGroup)
} else {
    // Something...
}

onApi(19, {
    TransitionManager.beginDelayedTransition(viewGroup)
}, {
    // Something...
})
```

```
if (SDK_INT >= 28) {
    // Fancy new thing...
} else if (SDK_INT >= 19) {
    TransitionManager.beginDelayedTransition(viewGroup)
} else {
    // Something...
}

onApi(19, {
    TransitionManager.beginDelayedTransition(viewGroup)
}, {
    // Something...
})
```

```
if (SDK_INT >= 28) {
    // Fancy new thing...
} else if (SDK_INT >= 19) {
    TransitionManager.beginDelayedTransition(viewGroup)
} else {
    // Something...
}

onApi(19, {
    TransitionManager.beginDelayedTransition(viewGroup)
}, {
    // Something...
})
```

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Code golf APIs to be as short as possible

KTX Principles


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Code golf APIs to be as short as possible


Optimize for a single and/or specific use case

Android KTX

core-ktx → core → Android framework

fragment-ktx → fragment

palette-ktx → palette

collection-ktx → collection

lifecycle-reactivestreams-ktx → lifecycle-reactivestreams

sqlite-ktx → sqlite

navigation-*-ktx → navigation-*

work-runtime-ktx → work-runtime

Android KTX

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collection-ktx → collection

lifecycle-reactivestreams-ktx → lifecycle-reactivestreams

sqlite-ktx → sqlite

navigation-*-ktx → navigation-*

work-runtime-ktx → work-runtime

```
supportFragmentManager.beginTransaction()
    .replace(android.R.id.content, userFragment)
    .commit()
```

```
inline fun FragmentManager.transaction(
    body: FragmentTransaction.() -> Unit
) {
    val transaction = beginTransaction()
    transaction.body()
    transaction.commit()
}

supportFragmentManager.beginTransaction()
    .replace(android.R.id.content, userFragment)
    .commit()
```

```
inline fun FragmentManager.transaction(
    body: FragmentTransaction.() -> Unit
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```
inline fun FragmentManager.transaction(
    body: FragmentTransaction.() -> Unit
) {
    val transaction = beginTransaction()
    transaction.body()
    transaction.commit()
}

supportFragmentManager.transaction {
    replace(android.R.id.content, userFragment)
}
```

```kotlin
inline fun FragmentManager.transaction(
    allowStateLoss: Boolean = false
    body: FragmentTransaction.() -> Unit
) {
    val transaction = beginTransaction()
    transaction.body()
    if (allowStateLoss) transaction.commitAllowingStateLoss()
    else transaction.commit()
}

supportFragmentManager.transaction {
    replace(android.R.id.content, userFragment)
}
```

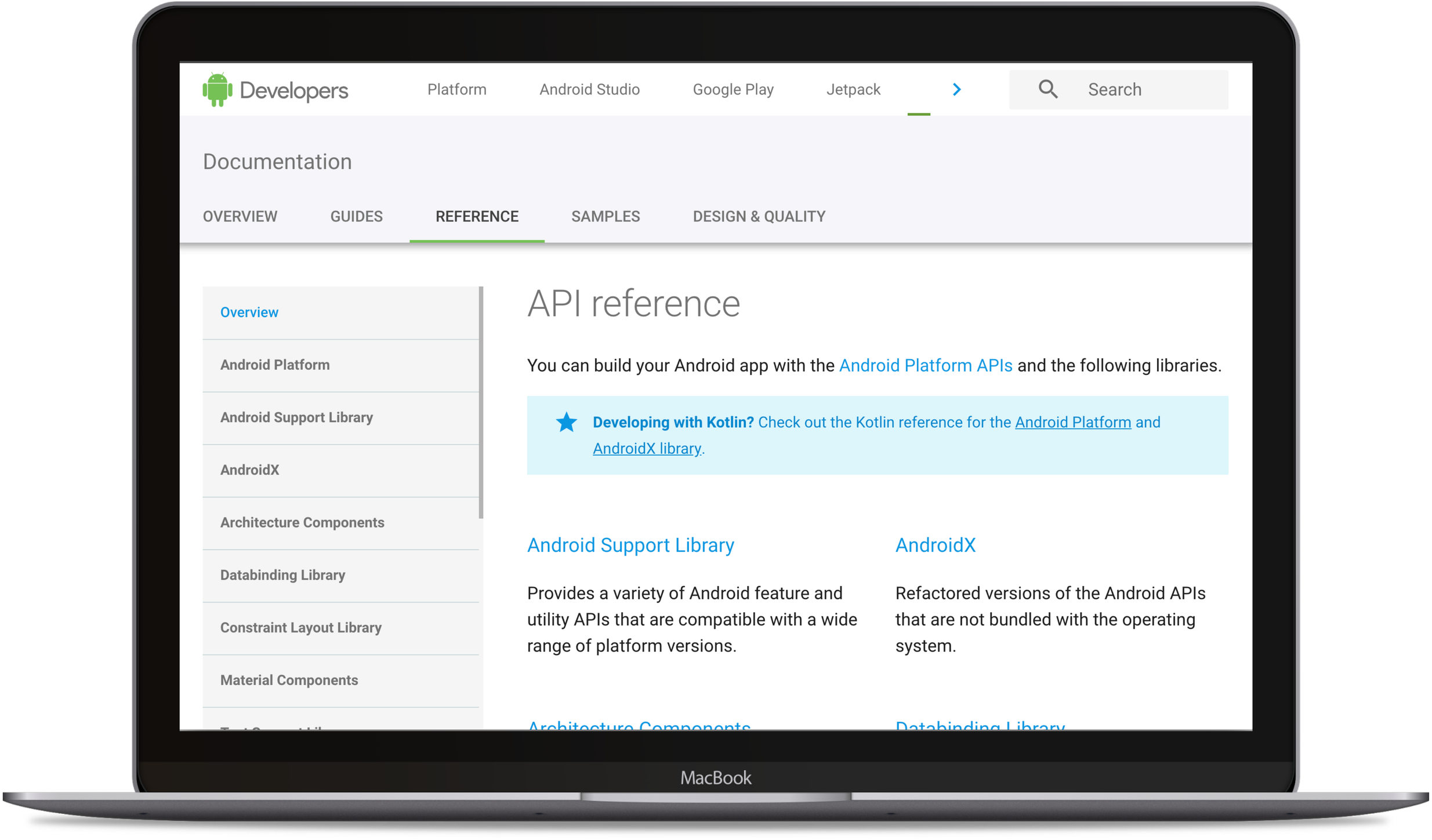
```
inline fun FragmentManager.transaction(
    allowStateLoss: Boolean = false
    body: FragmentTransaction.() -> Unit
) {
    val transaction = beginTransaction()
    transaction.body()
    if (allowStateLoss) transaction.commitAllowingStateLoss()
    else transaction.commit()
}

supportFragmentManager.transaction {
    replace(android.R.id.content, userFragment)
}
```

```
inline fun FragmentManager.transaction(
    allowStateLoss: Boolean = false,
    body: FragmentTransaction.() -> Unit
) {
    val transaction = beginTransaction()
    transaction.body()
    if (allowStateLoss) transaction.commitAllowingStateLoss()
    else transaction.commit()
}

supportFragmentManager.transaction(allowStateLoss = true) {
    replace(android.R.id.content, userFragment)
}
```

```
L7    ALOAD 3
      INVOKEVIRTUAL androidx/fragment/app/FragmentManager
          beginTransaction()
          Landroidx/fragment/app/FragmentTransaction;
      ASTORE 7

L8    ALOAD 7
      LDC 16908290
      ALOAD 2
      INVOKEVIRTUAL androidx/fragment/app/FragmentTransaction
          replace( I Landroidx/fragment/app/Fragment; )
          Landroidx/fragment/app/FragmentTransaction;
      POP

L9    ALOAD 7
      INVOKEVIRTUAL androidx/fragment/app/FragmentTransaction
          commitAllowingStateLoss()
          I
      POP
```

```
inline fun FragmentManager.transaction(
    allowStateLoss: Boolean = false,
    body: FragmentTransaction.() -> Unit
) {
    val transaction = beginTransaction()
    transaction.body()
    if (allowStateLoss) transaction.commitAllowingStateLoss()
    else transaction.commit()
}

supportFragmentManager.transaction(allowStateLoss = true) {
    replace(android.R.id.content, userFragment)
}
```

```
inline fun FragmentManager.transaction(
    now: Boolean = false,
    allowStateLoss: Boolean = false,
    body: FragmentTransaction.() -> Unit
) {
    val transaction = beginTransaction()
    transaction.body()
    if (now) {
        if (allowStateLoss) transaction.commitNowAllowingStateLoss()
        else transaction.commitNow()
    } else {
        if (allowStateLoss) transaction.commitAllowingStateLoss()
        else transaction.commit()
    }
}
```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AndroidX
Architecture Components
Databinding Library
Constraint Layout Library
Material Components
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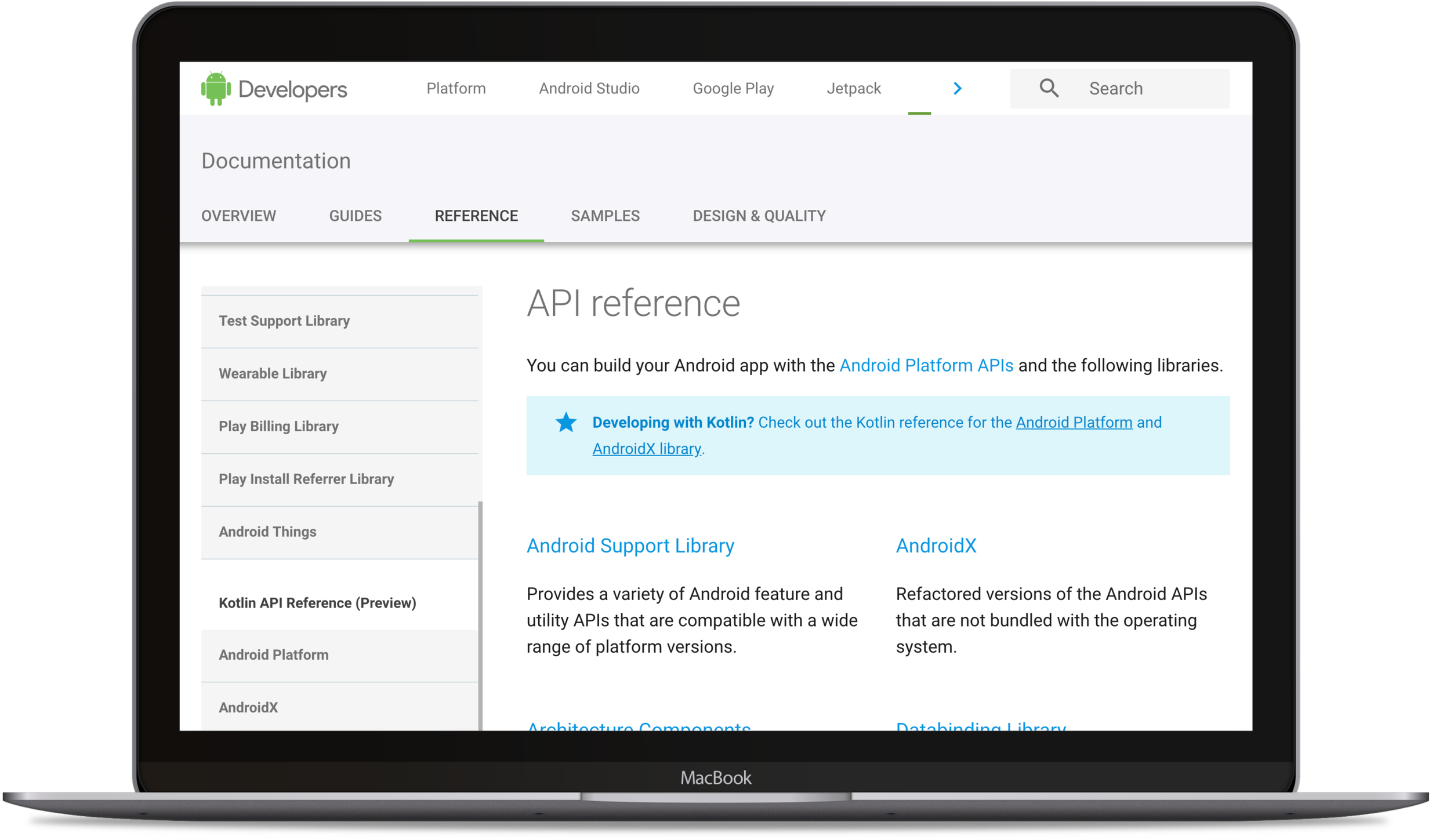
MacBook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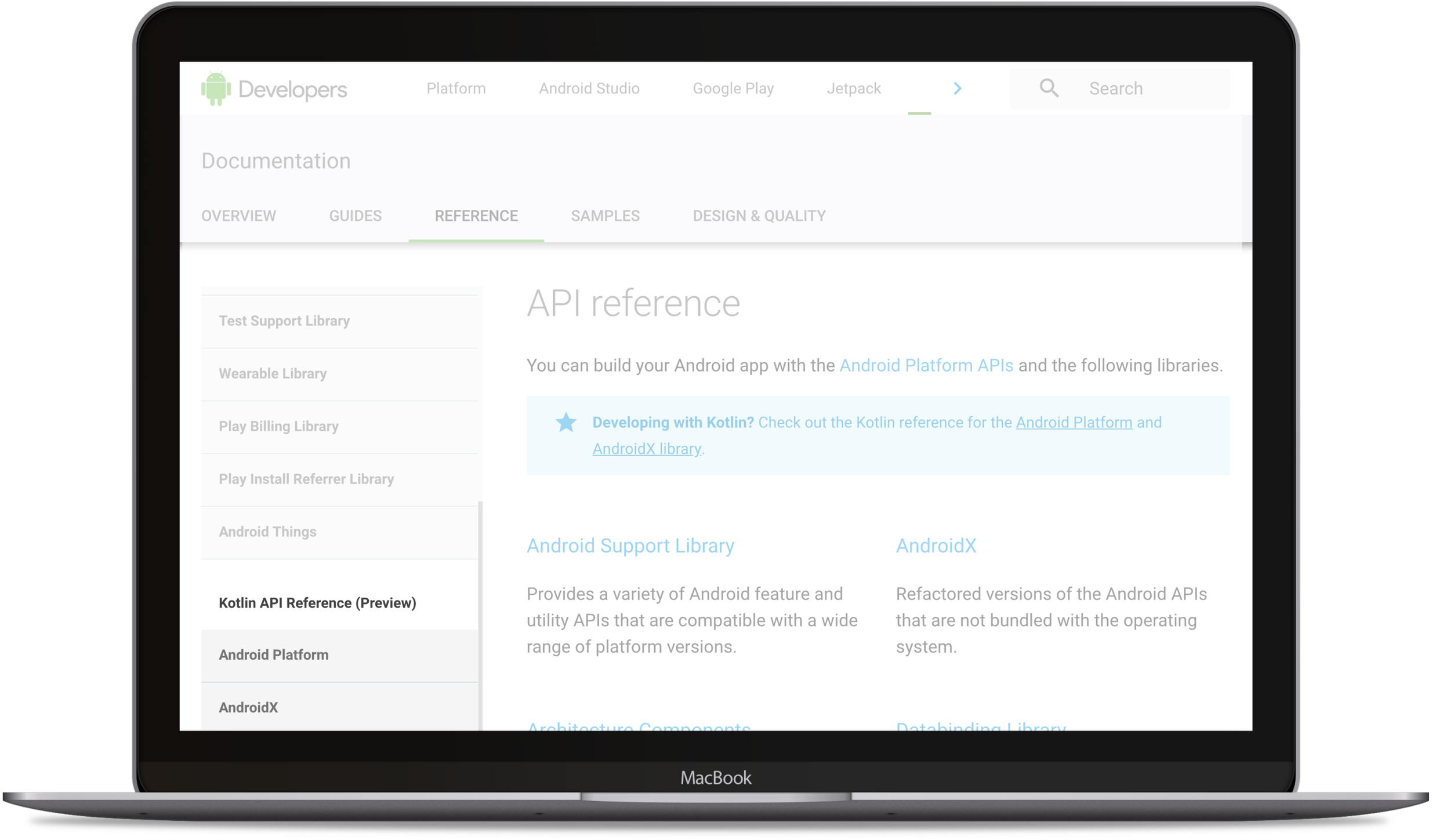
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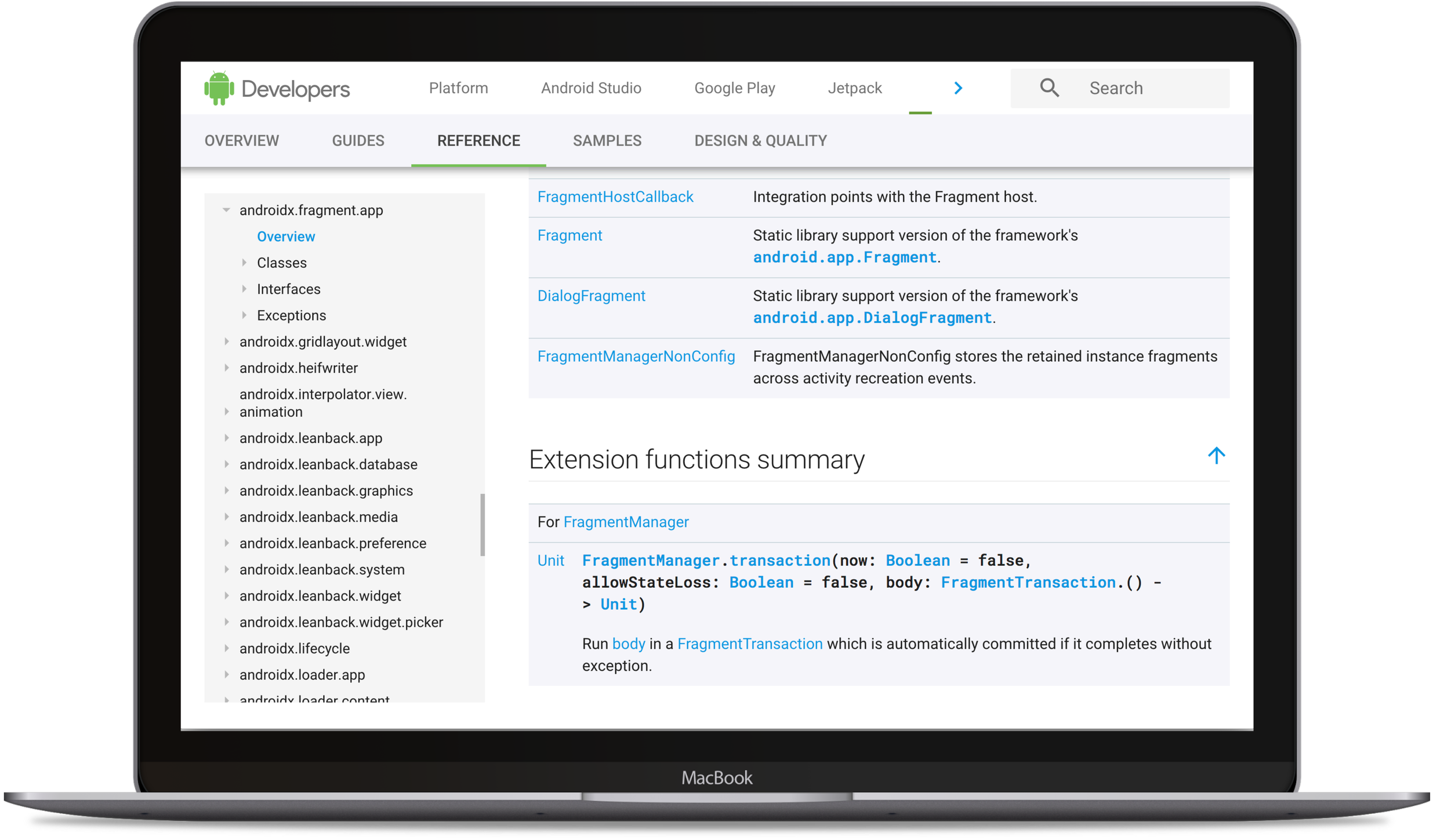
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androidx.leanback.graphics
androidx.leanback.media
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MacBook

Building Kotlin-friendly libraries

Building Kotlin-friendly libraries

- Port public API or entire library to Kotlin

Building Kotlin-friendly libraries

- Port public API or entire library to Kotlin
- Ship sibling artifact with Kotlin extensions

Building Kotlin-friendly libraries

- Port public API or entire library to Kotlin
- Ship sibling artifact with Kotlin extensions
- ???

```kotlin
inline fun CharSequence.isDigitsOnly() = TextUtils.isDigitsOnly(this)

val onlyDigits = phoneNumber.isDigitsOnly()
```

```
class TextUtils {
    static boolean isDigitsOnly(CharSequence str) {
        int len = str.length();
        // …
    }
}

inline fun CharSequence.isDigitsOnly() = TextUtils.isDigitsOnly(this)

val onlyDigits = phoneNumber.isDigitsOnly()
```

```
class TextUtils {
    static boolean isDigitsOnly(@NonNull CharSequence str) {
        int len = str.length();
        // …
    }
}

inline fun CharSequence.isDigitsOnly() = TextUtils.isDigitsOnly(this)

val onlyDigits = phoneNumber.isDigitsOnly()
```

```
class TextUtils {
    static boolean isDigitsOnly(@NonNull CharSequence str) {
        int len = str.length();
        // …
    }
}

inline fun CharSequence.isDigitsOnly() = TextUtils.isDigitsOnly(this)

val onlyDigits = phoneNumber.isDigitsOnly()
```

```
class TextUtils {
    @ExtensionFunction
    static boolean isDigitsOnly(@NonNull CharSequence str) {
        int len = str.length();
        // …
    }
}

inline fun CharSequence.isDigitsOnly() = TextUtils.isDigitsOnly(this)

val onlyDigits = phoneNumber.isDigitsOnly()
```

```
class TextUtils {
    @ExtensionFunction
    static boolean isDigitsOnly(@NonNull CharSequence str) {
        int len = str.length();
        // …
    }
}

inline fun CharSequence.isDigitsOnly() = TextUtils.isDigitsOnly(this)

val onlyDigits = phoneNumber.isDigitsOnly()
```

```
class TextUtils {
    @ExtensionFunction
    static boolean isDigitsOnly(@NonNull CharSequence str) {
        int len = str.length();
        // …
    }
}

val onlyDigits = phoneNumber.isDigitsOnly()
```

```
class TextUtils {
    @ExtensionFunction
    static boolean isDigitsOnly(@NonNull CharSequence str) {
        int len = str.length();
        // …
    }
}

val onlyDigits = phoneNumber.isDigitsOnly()
```

```
class TextUtils {
    @ExtensionFunction
    static boolean isDigitsOnly(@NonNull CharSequence str) {
        int len = str.length();
        // …
    }
}

val onlyDigits = phoneNumber.isDigitsOnly()
// in the bytecode we get
val onlyDigits = TextUtils.isDigitsOnly(phoneNumber)
```

```kotlin
inline fun View.updatePadding(
    left: Int = paddingLeft,
    top: Int = paddingTop,
    right: Int = paddingRight,
    bottom: Int = paddingBottom
) {
    setPadding(left, top, right, bottom)
}

avatarView.updatePadding(left = 10, right = 10)
```

```kotlin
inline fun View.updatePadding(
    left: Int = paddingLeft,
    top: Int = paddingTop,
    right: Int = paddingRight,
    bottom: Int = paddingBottom
) {
    setPadding(left, top, right, bottom)
}

avatarView.updatePadding(left = 10, right = 10)
```

```
class View {
    void setPadding(int left, int top, int right, int bottom) { /* … */ }
}

inline fun View.updatePadding(
    left: Int = paddingLeft,
    top: Int = paddingTop,
    right: Int = paddingRight,
    bottom: Int = paddingBottom
) {
    setPadding(left, top, right, bottom)
}

avatarView.updatePadding(left = 10, right = 10)
```

```
class View {
    void setPadding(
        @KtName("left") int left,
        @KtName("top") int top,
        @KtName("right") int right,
        @KtName("bottom") int bottom
    ) { /* … */ }
}

inline fun View.updatePadding(
    left: Int = paddingLeft,
    top: Int = paddingTop,
    right: Int = paddingRight,
    bottom: Int = paddingBottom
) {
    setPadding(left, top, right, bottom)
}
```

```
class View {
    void setPadding(
        @KtName("left") @DefaultValue("paddingLeft") int left,
        @KtName("top") @DefaultValue("paddingTop") int top,
        @KtName("right") @DefaultValue("paddingRight") int right,
        @KtName("bottom") @DefaultValue("paddingBottom") int bottom
    ) { /* … */ }
}

inline fun View.updatePadding(
    left: Int = paddingLeft,
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class View {
    void setPadding(
        @KtName("left") @DefaultValue("paddingLeft") int left,
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    ) { /* … */ }
}

avatarView.updatePadding(left = 10, right = 10)
```

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class View {
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        @KtName("left") @DefaultValue("paddingLeft") int left,
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        @KtName("right") @DefaultValue("paddingRight") int right,
        @KtName("bottom") @DefaultValue("paddingBottom") int bottom
    ) { /* … */ }
}

avatarView.setPadding(left = 10, right = 10)
```

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class View {
    void setPadding(
        @KtName("left") @DefaultValue("paddingLeft") int left,
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        @KtName("right") @DefaultValue("paddingRight") int right,
        @KtName("bottom") @DefaultValue("paddingBottom") int bottom
    ) { /* … */ }
}

avatarView.setPadding(left = 10, right = 10)
// in bytecode we get
avatarView.setPadding(
    10, avatarView.paddingTop, 10, avatarView.paddingBottom)
```

KEEP-110

KEEP-110

- `@ExtensionFunction` / `@ExtensionProperty` — Turn a static method with at least one argument into an extension function or an extension property.

KEEP-110

- `@ExtensionFunction` / `@ExtensionProperty` — Turn a static method with at least one argument into an extension function or an extension property.
- `@DefaultValue` — Default parameter values.

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- `@DefaultValue` — Default parameter values.
- `@KtName` — An alternate name for methods, fields, and parameters for use by Kotlin code.

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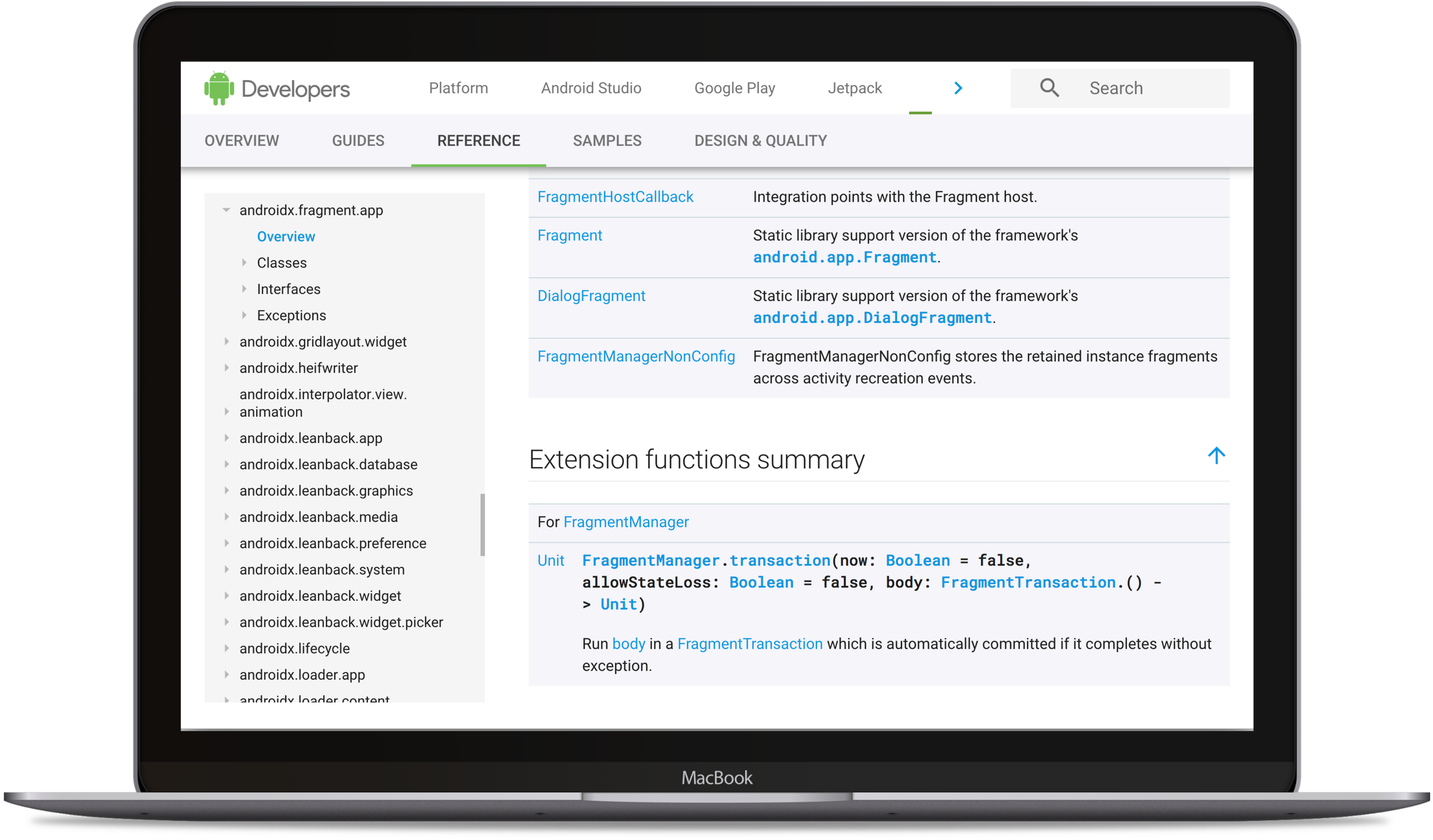
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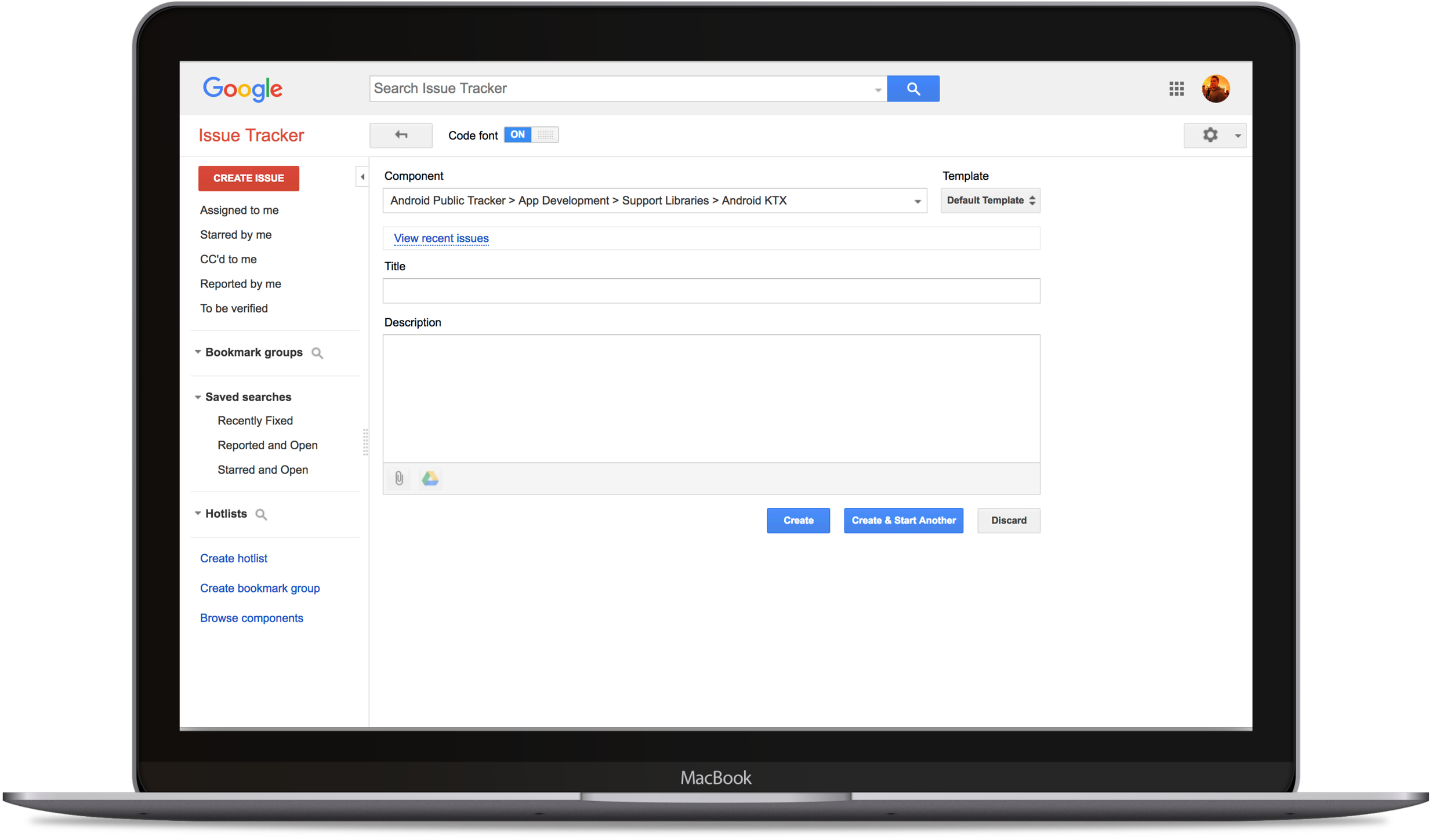
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Issue Tracker
Code font
ON
CREATE ISSUE
Assigned to me
Starred by me
CC'd to me
Reported by me
To be verified
Bookmark groups
Saved searches
Recently Fixed
Reported and Open
Starred and Open
Hotlists
Create hotlist
Create bookmark group
Browse components
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Default Template
View recent issues
Title
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Java annotations for Kotlin sugar

- **Type:** Design proposal
- **Author:** Jake Wharton
- **Status:** Under consideration
- **Prototype:** Partially implemented in Kotlin 1.1.60

Feedback

Discussion of this proposal is held in this issue.

Summary

This proposal adds annotations which enable the use of more Kotlin language features like extension functions, extension properties, default values, and property names for Java code.

- `@ExtensionFunction` / `@ExtensionProperty` - Turn a static method with at least one argument into an extension function or an extension property.
- `@DefaultValue` - Default parameter values.
- `@KtName` - An alternate name for methods, fields, and parameters for use by Kotlin code.

Motivation / use cases

There is a large corpus of Java libraries which, for various reasons, can't or won't port to Kotlin for the foreseeable future. This fact does not render them as obsolete or inferior to a Kotlin library. In fact, a certain portion of Java library authors are sympathetic to Kotlin users and are willing to do more for compatibility.

https://github.com/Kotlin/KEEP/issues/110

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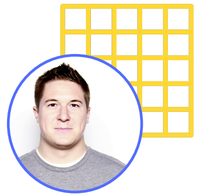
Motivation / use cases

Thank you



Jake Wharton

@JakeWharton