STRV

ANATOMY OF AN SDK ECOSYSTEM

Michal Jenicek

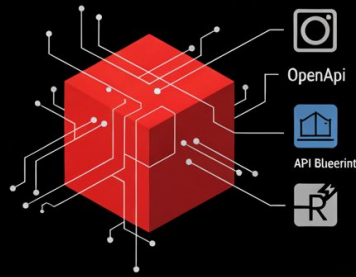
THE MISSION

THE CHALLENGE

- **Complexity**: An SDK isn't just a library. It's a distributed system living inside a hostile host app.

THE APPROACH

- **Deconstruction**: Today, we will dissect a production-grade SDK ecosystem layer by layer to reveal its internal mechanics.



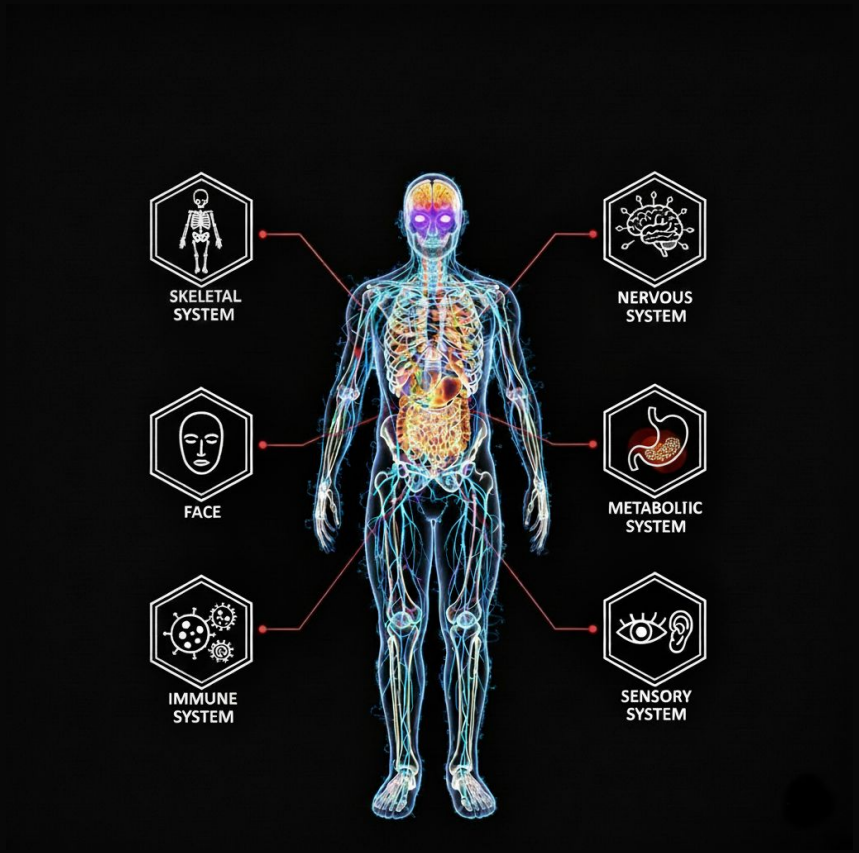
THE SDK ECOSYSTEM

The SDK is more than code.

It has anatomy.

Deconstructing the Ecosystem,

layer by layer.



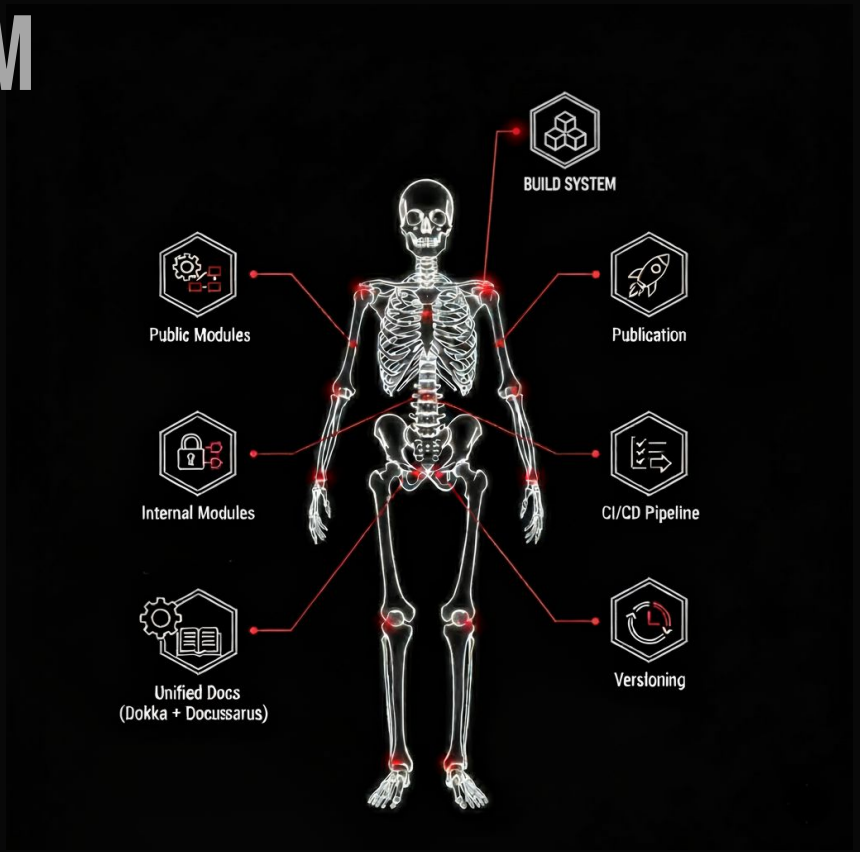
THE SKELETAL SYSTEM

01

01 • THE SKELETAL SYSTEM

Provides the essential framework and gives the ecosystem its structure.

- Modules
- Versioning
- Publication
- Automation



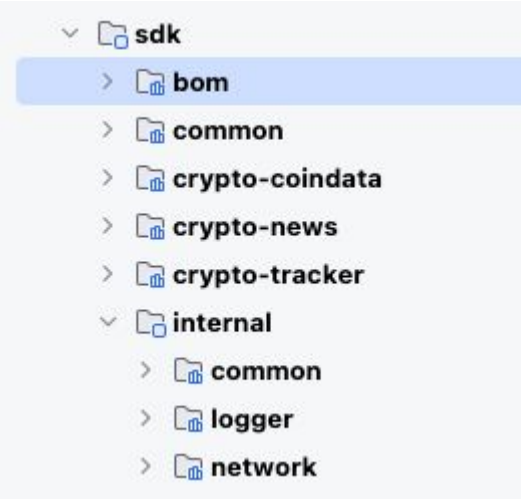
MODULES

THE STRATEGY

- **Segregating** public vs. internal logic
- **Centralizing** shared domain in ***common***
- **Exposing** only feature modules

LESSONS LEARNED

- Strict visibility
- DRY Principle



VERSIONING

THE PAIN POINTS

- Establishing clear traceability

OUR SOLUTION

semver.org

Semantic Versioning 2.0.0

Given a version number MAJOR.MINOR.PATCH, increment the:

1. MAJOR version when you make incompatible API changes
2. MINOR version when you add functionality in a backward compatible manner
3. PATCH version when you make backward compatible bug fixes

VERSIONING

01 SKELETAL

THE PAIN POINTS

- Establishing clear traceability
- Need for guaranteed integrity

OUR SOLUTION

- BOM Integration *(Maven repo)*

```
create<MavenPublication>( name = "bom") {
    groupId = this.groupId
    artifactId = this.name
    version = getLocalPropertyValue( key = "sdk.bom.version")
        ?: getLatestBomVersion(versionTagPrefix = "SDK_BOM_")
```

```
<groupId>cz.kotox.crypto.sdk</groupId>
<artifactId>bom</artifactId>
<version>2025.11.02</version>
<packaging>pom</packaging>
<dependencyManagement>
  <dependencies>
    <dependency>
      <groupId>cz.kotox.crypto.sdk</groupId>
      <artifactId>crypto-tracker</artifactId>
      <version>1.1.1</version>
    </dependency>
    <dependency>
      <groupId>cz.kotox.crypto.sdk</groupId>
      <artifactId>crypto-coindata</artifactId>
      <version>2.1.1</version>
    </dependency>
    <dependency>
      <groupId>cz.kotox.crypto.sdk</groupId>
      <artifactId>crypto-news</artifactId>
      <version>3.1.0</version>
    </dependency>
  </dependencies>
</dependencyManagement>
```

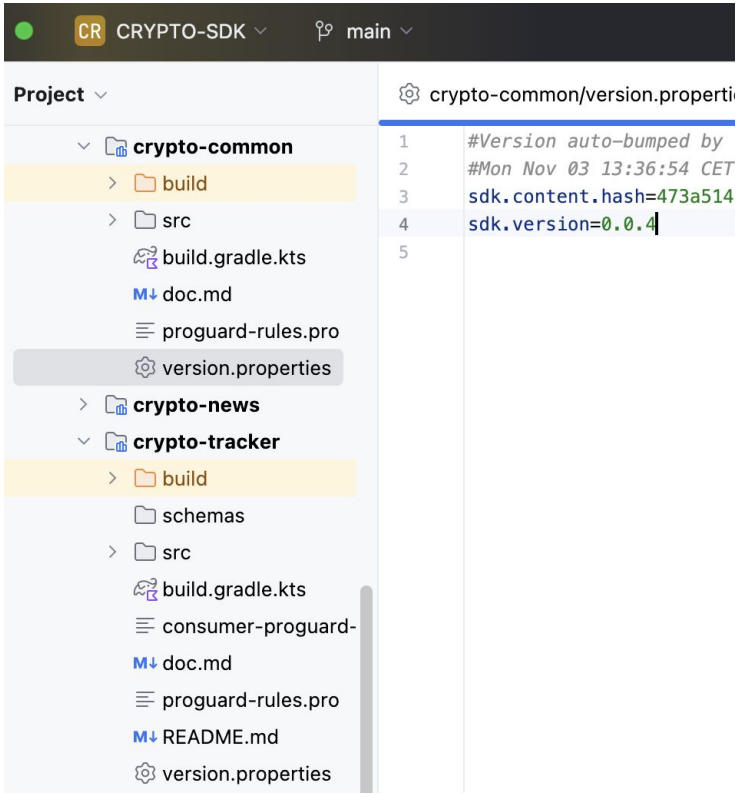
VERSIONING

THE PAIN POINTS

- Establishing clear traceability
- Need for guaranteed integrity
- Eliminating manual errors

OUR SOLUTION

- Zero-Touch Builds



PUBLICATION

THE FLOW

- **BOM** as the unifying container
- **Git Tags** as the release trigger
- **Maven Central** as the destination

PRO TIPS

- Tag-based triggers
- Trust the Pipeline

Tags

SDK_BOM_2025.11.02

8 packages

cz.kotox.crypto.sdk.bom
Published 20 hours ago by Michal Jenicek in cz.kotox.crypto.sdk.bom

cz.kotox.crypto.sdk.crypto-common
Published 20 hours ago by Michal Jenicek in cz.kotox.crypto.sdk.crypto-common

cz.kotox.crypto.sdk.internal.common
Published 20 hours ago by Michal Jenicek in cz.kotox.crypto.sdk.internal.common

cz.kotox.crypto.sdk.internal.logger
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cz.kotox.crypto.sdk.crypto-tracker
Published 20 hours ago by Michal Jenicek in cz.kotox.crypto.sdk.crypto-tracker

CI/CD PIPELINES

01 SKELETAL

THE AUTOMATED FLOW

1. **Verify**: Lint, Unit & Integration Test
2. **Calculate**: Derive version from content
3. **Document**: Auto-generate API docs
4. **Publish**: Upload artifacts

PRODUCTION SAFEGUARDS

- **Local Parity**: The pipeline runs locally exactly as it does on CI. Logic sits in build scripts, not YAML. **Verify & Calculate should be part of local routine.**

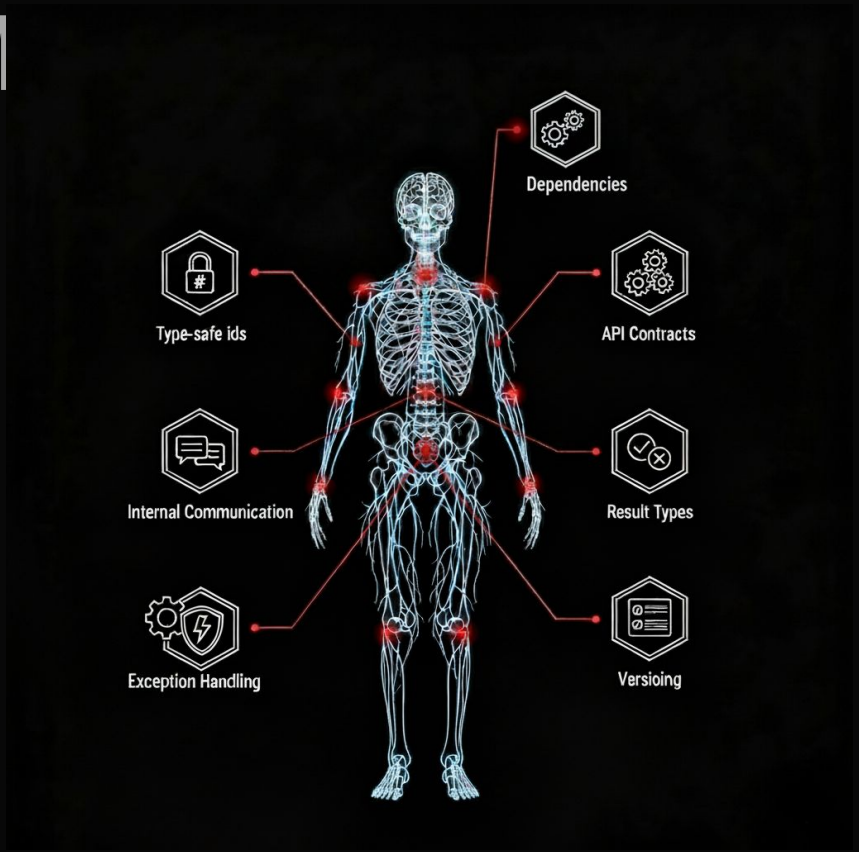
THE NERVOUS SYSTEM

02

02 • THE NERVOUS SYSTEM

Inconsistency breaks the Developer Experience.

- API Contracts
  - Type-safe IDs
  - Error Modeling
- Dependency Hygiene



TYPE SAFE IDS

THE PITFALL: PRIMITIVE OBSESSION

- The Swap Risk
- Runtime Crashes

THE FIX: INLINE CLASSES

- *(Almost)*Zero Overhead
- Self-Documenting

```
/**
 * Represents unique id of the Story across Crypto sdks.
 */
public sealed interface StoryId {  2 Implementations
    /**
     * Human readable unique id of the story usable also as the slug on the web.
     * @property value - human readable unique id of the story.
     */
    @JvmInline
    public value class StorySlug(public val value: String) : StoryId
    /**
     * Unique id of the story in the CMS system.
     * @property value - id of the story in the CMS system.
     */
    @JvmInline
    public value class StoryCmsId(public val value: String) : StoryId
}
```

```
@JvmInline
public value class NewsId(public val value: String)
```

ERROR MODELING 

PHILOSOPHY

- Errors are Data

IMPLEMENTATION

- Typed Error Hierarchy

```
public sealed class ApiError(  20 Usages  4 Inheritors
    message: String,
    cause: Throwable? = null,
) : SdkError(message, cause) {

    public data class ConnectivityError(...) :
        ApiError(message, cause)

    public data class CancellationError(...) :
        ApiError(message, cause)

    public data class EmptyResponseError(...) :
        ApiError(message, cause)

    public data class ResponseError(...) :
        ApiError(message, cause)
}

public fun Exception.transformApiError(errorResponseMessage: String? = null):
    ApiError {...}
```

ERROR MODELING

02 NERVOUS

PHILOSOPHY

- Errors are Data
- The "No-Crash" Guarantee

```
public sealed class Either<out E, out V> {  2 Inheritors
    public data class Value<out V>(val value: V) :
        Either<Nothing, V>()

    public data class Error<out E>(val error: E) :
        Either<E, Nothing>()
```

```
public suspend fun getCoinDetail(coinMarketId: CoinMarketId): Either<SdkError, CoinDetail>
```

IMPLEMENTATION

- Typed Error Hierarchy
- Explicit Contracts

```
fun testGetCoinDetail() = runTest {
    val testTag = "[testGetCoinMarkets]"
    coinData.getCoinDetail( coinMarketId = "usd").fold(
        error = {
            logE( t = null) { "$testTag ERROR: $it" }
            fail("getCoinMarkets failed to return value")
        },
        value = {
            logD { "$testTag VALUE: $it" }
        })
}
```

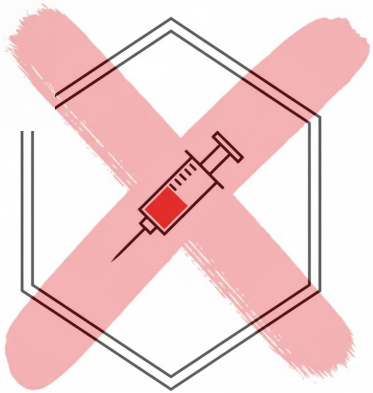
DEPENDENCIES

THE ZERO-BLOAT POLICY

- Transitive Hygiene
- KMP Readiness

ARCHITECTURAL CHOICES

- Constructor Injection over DI Framework
- Network Stack: Ktor(fit) over Retrofit



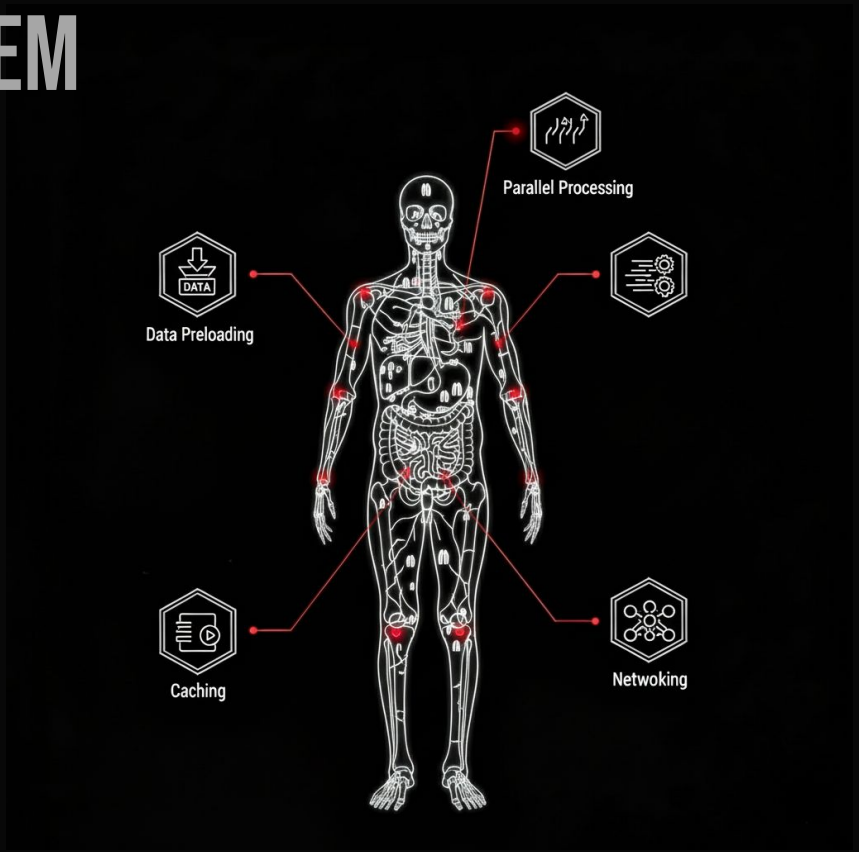
THE METABOLIC SYSTEM

03

03 • THE METABOLIC SYSTEM

An inefficient metabolic system will be slow, drain the battery, and waste resources.

- Network Hygiene
- Data Consistency
- Performance Optimization



NETWORK HYGIENE 

THE PHILOSOPHY: POLITE GUEST

- **Zero-Trust Security**: The binary never contains secrets.
- **Traffic Efficiency**: We minimize radio wake-ups. One user is fine; 10 million users is a DDoS attack.

THE TACTICS: IMPLEMENTATION

- **Credential Injection**: API Keys are injected by the host app at runtime.
- **Exponential Backoff**: Retries must be spaced out to avoid self-DDoSing the backend during outages

DATA CONSISTENCY 

THE PATTERN: REPOSITORIES

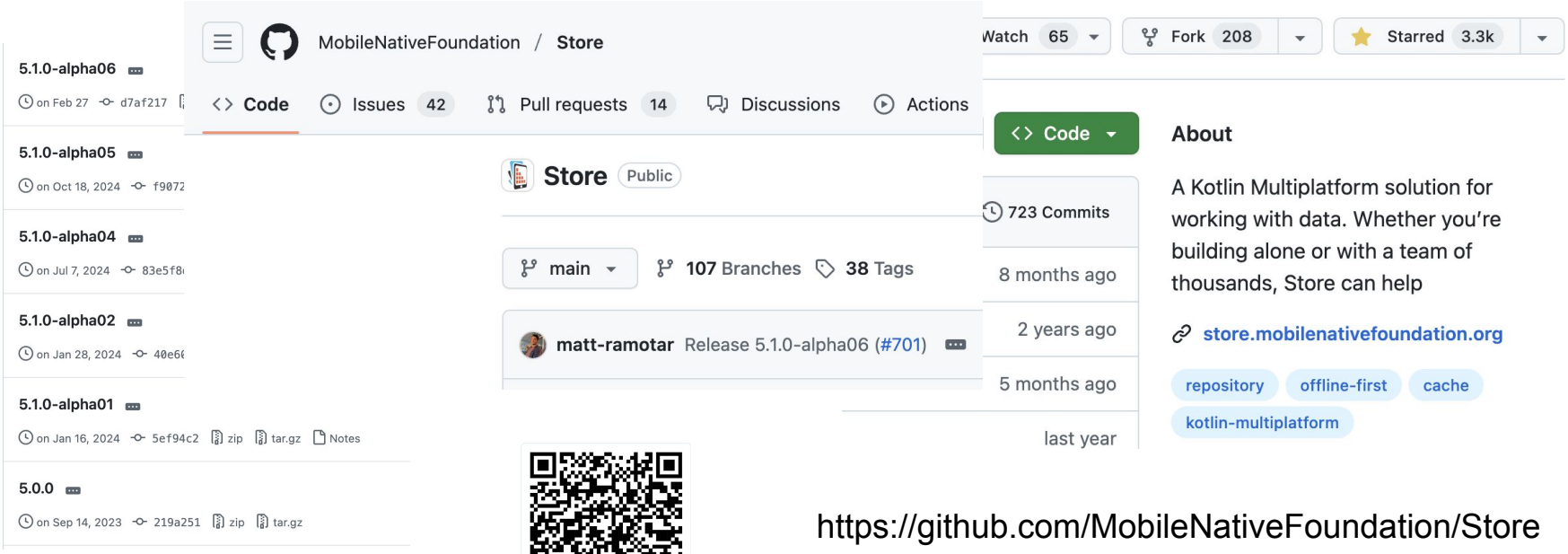
- **Business Logic *(UseCase)***: Orchestrates the flow, remaining blind to the data source.
- **Source Resolution *(Repository)***: *Arbitrates transparently between Disk, Memory, and Network*.

THE TOOLING: DON'T REINVENT

- The Complexity Trap: Implementing **deduplication**, **memory caching**, and **disk persistence** from scratch is error-prone.
- Recommendation: Leverage the STORE library to handle these race conditions out of the box.

https://store.mobilenativefoundation.org/docs/meet-store

STORE



https://github.com/MobileNativeFoundation/Store

PERFORMANCE OPTIMIZATION

03 METABOLIC

CONCURRENCY

- **Non-Blocking by Default**: Heavy lifting is offloaded to background dispatchers. The Main Thread is sacred.
- **Structured Concurrency**: operations inherit the Host's Scope. If the ViewModel clears, the SDK call cancels immediately.

PERCEIVED SPEED

- **Warm Start**: Critical config is pre-fetched during init. The first user interaction is zero-latency.

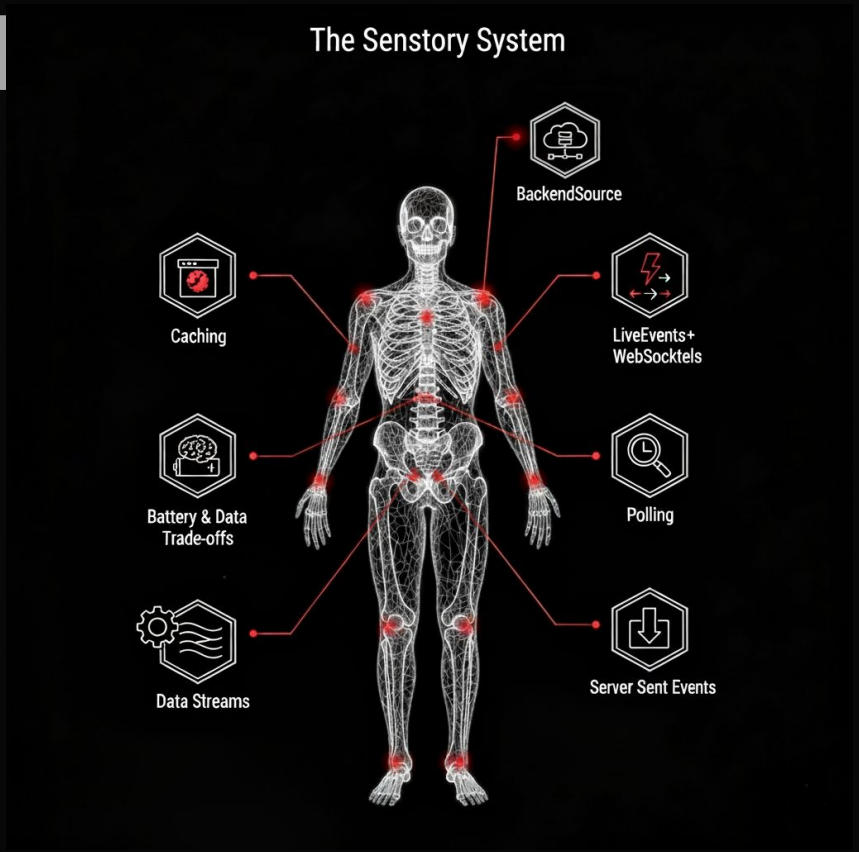
THE SENSORY SYSTEM

04

04 • THE SENSORY SYSTEM

Perceiving the world in real-time. Push vs. Pull.

- Real-Time Perception (SSE/WSS)
- Efficient Updates



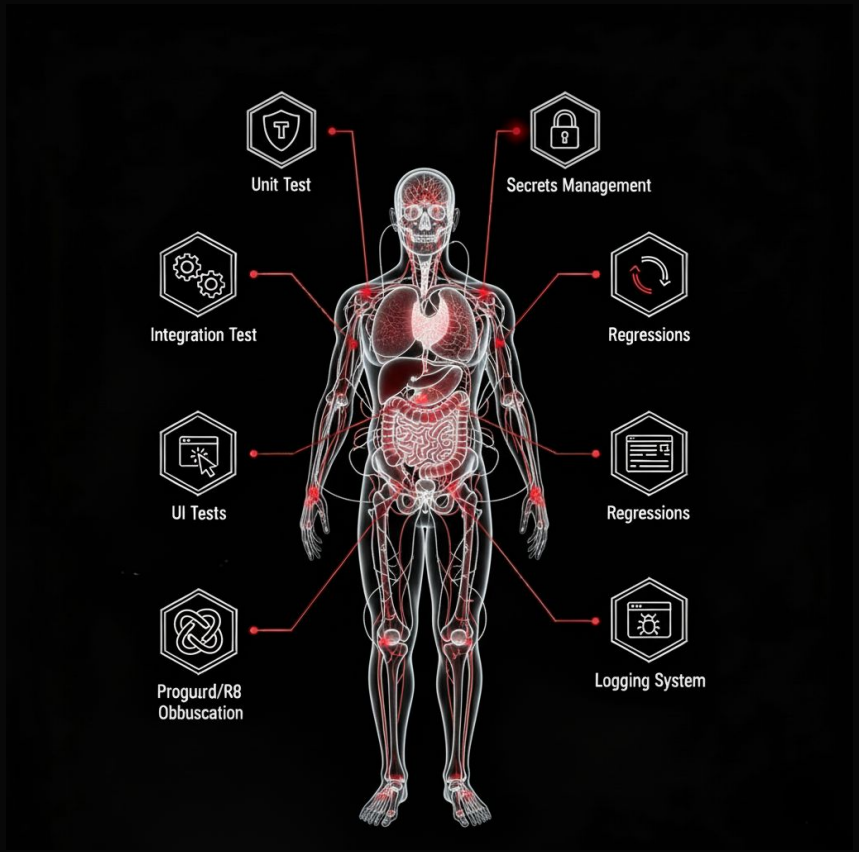
THE IMMUNE SYSTEM

05

05 • THE IMMUNE SYSTEM

Defending against bugs and regressions. A strong immune system is the foundation of Trust.

- Quality Assurance
- Binary Hardening
- Signal Observability



QUALITY ASSURANCE

THE STRATEGY: EARLY DETECTION

- Regression Prevention
- Pressure Testing
- Edge Case Coverage

THE TACTIC: INTEGRATION FROM DAY 1

- Unit Test
- Integration Test

```
@Before
fun setup() {
    context = ApplicationProvider.getApplicationContext()
    coinData = CoinDataBuilder().setLoggerCallback(
        sdkLoggerCallback = object : SDKLoggerCallback {
            override fun onLogMessage(
                tag: String,
                priority: LogPriority,
                t: Throwable?,
                message: String,
            ) {
                println(message = message)
            }
        },
    ).build()
}
```

```
@Test
fun testGetCoinDetail() = runTest {
    val testTag = "[testGetCoinMarkets]"
    coinData.getCoinDetail( coinMarketId = "usd").fold(
        error = {
            logE( t = null) { "$testTag ERROR: $it" }
            fail("getCoinMarkets failed to return value")
        },
        value = {
            logD { "$testTag VALUE: $it" }
        })
}
```

BINARY HARDENING

THE STRATEGY: INTERNAL HIDING

consumer-proguard-rules.pro

```
## Keeps all public classes (and their public/protected members) within the
## 'cz.kotox.crypto.sdk.tracker' package and all its sub-packages,
## EXCEPT for any classes found inside the 'cz.kotox.crypto.sdk.tracker.internal'
## sub-package.
##
## This effectively protects the SDK's public API surface while allowing
## the 'internal' implementation packages to be fully obfuscated and shrunk
## by the consuming app.
-keep public class cz.kotox.crypto.sdk.tracker.**,!cz.kotox.crypto.sdk.tracker.internal.** {
    public protected *;
}
```

BINARY HARDENING 

THE CHALLENGE: DEBUGGABILITY

- **Stack Trace Management**: Obfuscated crashes yield unreadable stack traces. This can be solved by uploading mapping files. Anyway using shared modules makes it hard to use. It’s a challenge.
- **Reproducibility**: New builds generate different obfuscation signatures. This means a single production bug might appear as multiple uniques crashes in monitoring tools.

SIGNAL OBSERVABILITY

THE STRATEGY: DELEGATION

- **Inversion of Control**: The SDK defines a Logger interface, but the host app provides the implementation

```
@Before
fun setup() {
    context = ApplicationProvider.getApplicationContext()
    coinData = CoinDataBuilder().setLoggerCallback(
        sdkLoggerCallback = object : SDKLoggerCallback {
            override fun onLogMessage(
                tag: String,
                priority: LogPriority,
                t: Throwable?,
                message: String,
            ) {
                println(message = message)
            }
        },
    ).build()
}
sdkLoggerCallback = object : SDKLoggerCallback {
    override fun onLogMessage(
        tag: String,
        priority: LogPriority,
        t: Throwable?,
        message: String,
    ) {
        Timber.tag(tag)
        Timber.log(priority = priority.priorityInt, t = t, message = message)
    }
},
```

SIGNAL OBSERVABILITY

THE CHALLENGE: FALSE POSITIVES

- **Alert Fatigue:** Monitoring tools often treat any Exception as an incident.
- **Context Filtering:** We parse exception messages for know “noise” and downgrade their level of importance.

```
public fun SdkError.toLogPriority(): LogPriority =  10 Usages
    when (this) {
        is ApiError.ConnectivityError -> this.logPriority ?: LogPriority.INFO
        is ApiError.CancellationError -> this.logPriority ?: LogPriority.VERBOSE
        is ApiError.EmptyResponseError,
        -> LogPriority.INFO

        is ApiError.UnsupportedSearchParameterError -> LogPriority.WARN
        else -> LogPriority.ERROR
    }

public fun Throwable?.toLogPriority(): LogPriority =  10 Usages
    when (this) {
        is kotlinx.coroutines.CancellationException -> LogPriority.VERBOSE
        else -> {
            if (this?.message?.containsAnyOf(
                    strings = connectivityInfoDictionary,
                    ignoreCase = true,
                ) == true
            ) {
                LogPriority.INFO
            } else {
                LogPriority.ERROR
            }
        }
    }
```

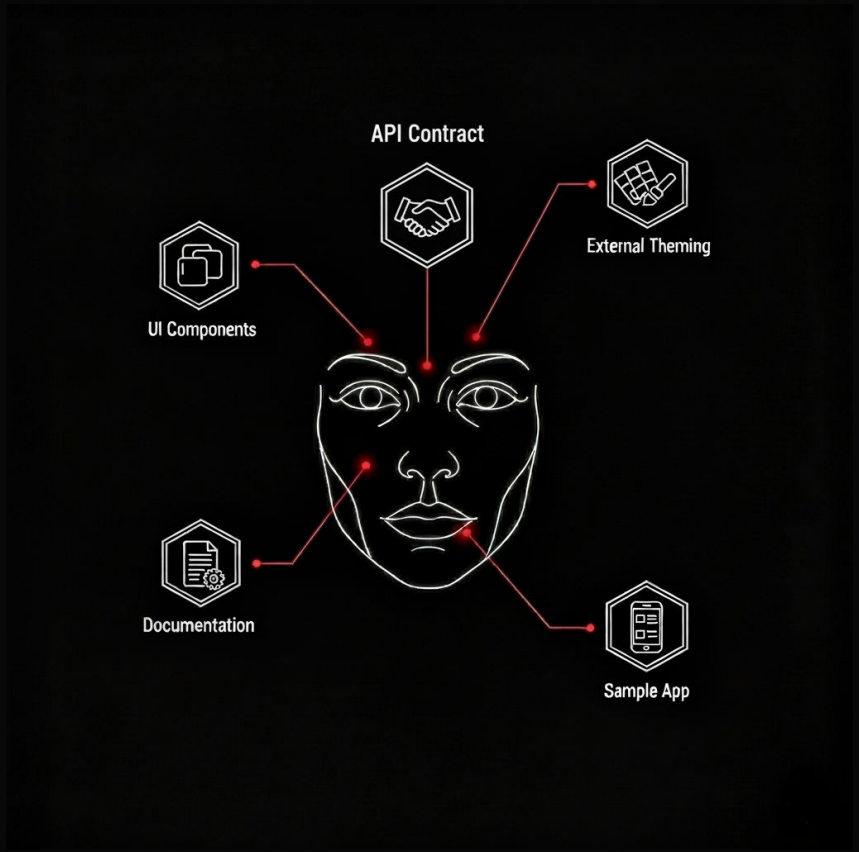
```
public val connectivityInfoDictionary: List<String> =
    listOf(
        "Unable to resolve host",
        "Software caused connection abort",
        "timeout",
        "Read timed out",
        "Broken pipe",
        "failed to connect",
        "Required SETTINGS preface not received",
        "Expected a SETTINGS frame but was",
        "unexpected end of stream",
        "No network connection is available",
        "stream was reset",
        "Connection reset",
        "connection closed",
        "Connection timed out",
        "SSL handshake timed out",
        "SSL handshake aborted",
        "exhausted all routes",
        "Connection closed by peer",
        "Read error",
        "ConnectionShutdownException",
    )
```

THE PUBLIC FACE 06

06 • THE PUBLIC FACE

The part of the ecosystem that developers directly see and interact with.

- UI Component Library
- Theming Strategy
- The Developer Portal
- Reference Implementation



UI COMPONENTS

THE STRATEGY: THE STARTER KIT

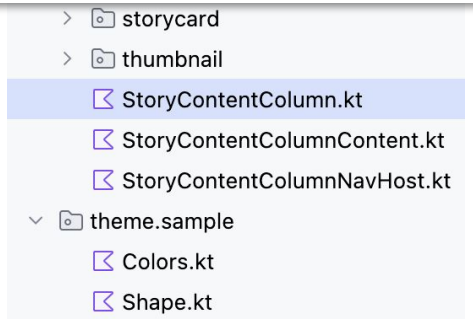
- Rapid Prototyping
- Ejectable by Design

THE IMPLEMENTATION:

COMPOSABLE SLOT API

- Atomic Design

```
@Composable
public fun StoryContentColumn(
    storyContent: StoryContent,
    modifier: Modifier = Modifier,
    contentPadding: PaddingValues = PaddingValues( all = 0.dp),
    onCloseHeaderClick: (() -> Unit)? = null,
    photoPlaceholderShimmeringColor: Color? = null,
    photoPlaceholderShimmeringBackgroundColor: Color? = null,
    padding: Dp = 16.dp,
    headerBottomContent: @Composable () -> Unit = {},
    sdkLoggerCallback: SDKLoggerCallback = SDKLoggerCallbackNoOp(),
) {
    SDKLogger.install( tag = MODULE_IDENTIFIER, sdkLoggerCallback)
```



EXTERNAL THEMING

THE STRATEGY:

MATERIAL 3 COMPLIANCE

- Native Citizens
- Zero-Config Start

THE IMPLEMENTATION:

- Transparent Styling. Material Theme by default.

```
setContent {
    SDKSampleAppTheme {
        MainActivityContent(
            shakeDetector = this,
            restartActivityWithDataCleanUp = {
                finish()
                startActivity(intent)
                viewModel.dataCleanUp()
            },
        )
    }
}
```

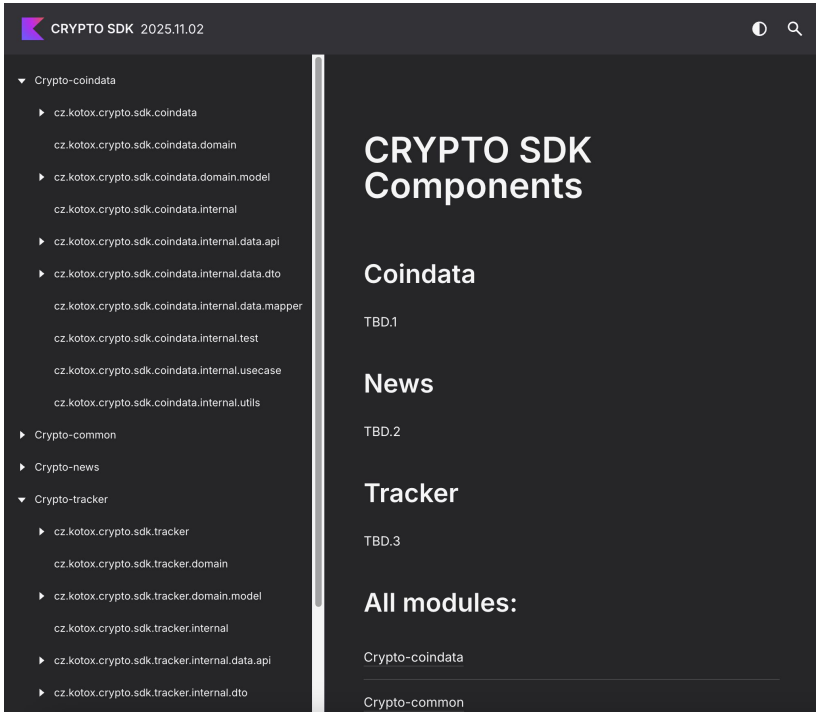
THE API REFERENCE

THE STRATEGY: ZERO DRIFT

- Single Source of Truth
- Automated Generation

THE STACK: DOKKA

- Kotlin-First: We use Dokka to correctly render Kotlin features
- Deep Linking: Every function has permalink.



THE DEVELOPER PORTAL

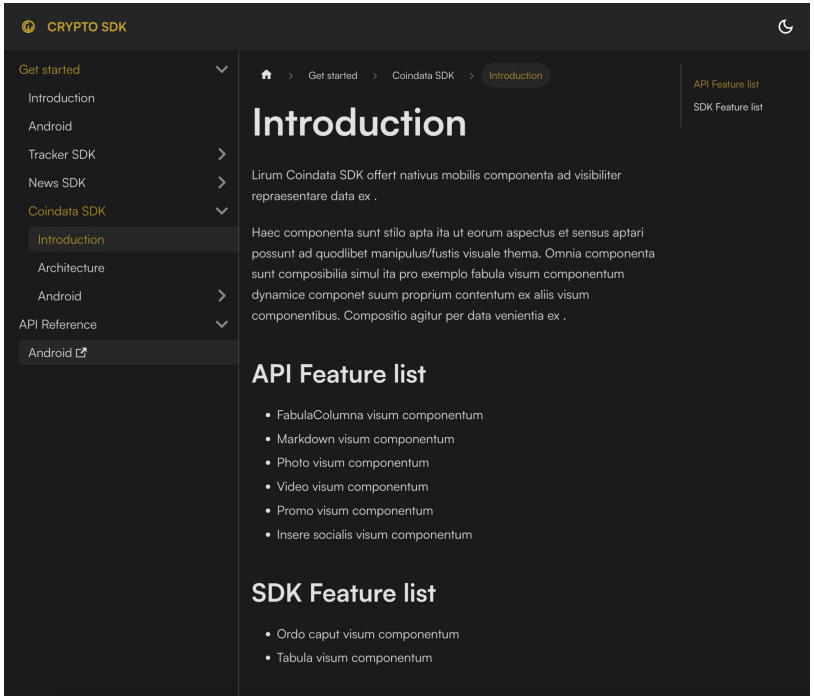
THE STRATEGY

- **Repository Separation:** We host the Portal in a dedicated repository so we don’t pollute git history with doc files.
- **The “5-Minute” Rule**: The portal is designed to get a developer from Zero to Hello World in under 5 minutes.

THE DEVELOPER PORTAL

THE STACK: DOCUSAURUS

- **Markdown-Based:** Writers/Devs commit docs as Markdown. API Reference is attached as an external pages
- **Unified Navigation:** The API Reference is anchored in the main sidebar, serving as a direct gateway to the generated external documentation.



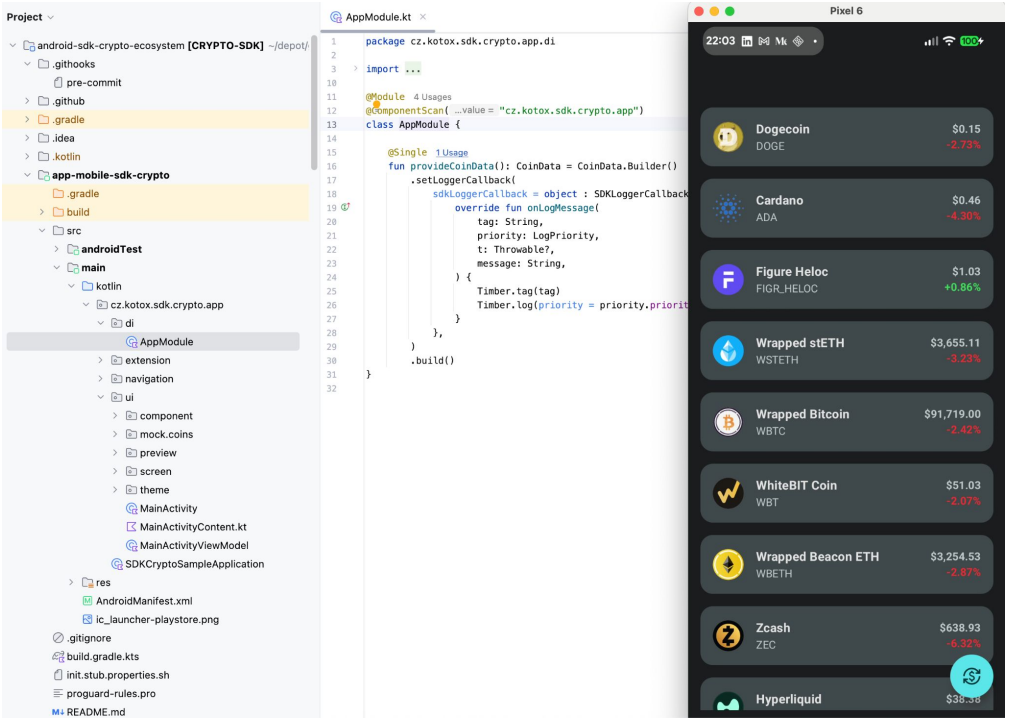
REFERENCE IMPLEMENTATION

THE ROLE: CANONICAL GUIDE

- **Integration Blueprint:** demonstrates integrating every feature of the SDK.
- **Architecture Agnostic**

THE IMPLEMENTATION

- **Low Noise**: Minimal architecture designed to focus strictly on SDK integration.



Explore the **Ecosystem**.
The complete implementation is
Open Source and evolving on GitHub

GITHUB

THE CODE

android-sdk-crypto-ecosystem

THE KNOWLEDGE

android-sdk-crypto-ecosystem-doc