

# Calling Security Framework from Swift

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I spend way too much time interacting with the Security framework. Most Security framework APIs are kinda clunky to call from Swift, largely because they use Core Foundation conventions. However, I see a lot of folks working much harder than they should to call these APIs. This post contains two tips to make your life easier.

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Many Security framework APIs work in terms of `CFDictionary`. I regularly see folks create these dictionaries like so:

```
let query: [String: Any] = [
    kSecClass as String: kSecClassKey,
    kSecMatchLimit as String: kSecMatchLimitAll,
    kSecReturnRef as String: true,
]
var copyResult: CTypeRef?
let status = SecItemCopyMatching(query as CFDictionary, &copyResult)
```

That's much too hard. Try this instead:

```
let query = [
    kSecClass: kSecClassKey,
    kSecMatchLimit: kSecMatchLimitAll,
    kSecReturnRef: true,
] as NSDictionary
var copyResult: CTypeRef?
let status = SecItemCopyMatching(query, &copyResult)
```

Much nicer.

Security framework APIs have a wide variety of ways to indicate an error:

- Some routines return an `OSStatus` and that's it.
- Some routines return an `OSStatus` and an 'out' value.
- Some routines return a pointer, where `nil` indicates an error.
- Some routines return a pointer, where `nil` indicates an error, with a `CFError` 'out' value.
- Some routines return a Boolean, where false indicates an error, with a `CFError` 'out' value.

In Swift you really just want to call the API and have it throw. The code pasted in at the end of this post helps with that. It declares a bunch of overloaded `secCall(...)` functions, one for each of the cases outlined above. It takes code like this:

```
let query = [
    kSecClass: kSecClassKey,
    kSecMatchLimit: kSecMatchLimitAll,
    kSecReturnRef: true,
] as NSDictionary
var copyResult: CTypeRef? = nil
let err = SecItemCopyMatching(query, &copyResult)
guard err == errSecSuccess else {
    throw NSError(domain: NSOSStatusErrorDomain, code: Int(err))
}
let keys = copyResult! as! [SecKey]
```

and turns it into this:

```
let query = [
    kSecClass: kSecClassKey,
    kSecMatchLimit: kSecMatchLimitAll,
    kSecReturnRef: true,
] as NSDictionary
let keys = try secCall { SecItemCopyMatching(query, $0) } as! [SecKey]
```

Still not exactly pretty, but definitely an improvement.

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```
let myEmail = "eskimo" + "1" + "@" + "apple.com"
```

```
/// Calls a Security framework function, throwing if it returns an error.
///
/// For example, the `SecACLRemove` function has a signature like this:
/// ...
/// func SecACLRemove(...) -> OSStatus
/// ...
///
/// and so you call it like this:
/// ...
/// try secCall { SecACLRemove(acl) }
/// ...
///
/// - Parameter body: A function that returns an `OSStatus` value.
/// - Throws: If `body` returns anything other than `errSecSuccess`.

func secCall<_ body: () -> OSStatus> throws {
    let err = body()
    guard err == errSecSuccess else {
        throw NSError(domain: NSOSStatusErrorDomain, code: Int(err), userInfo: nil)
    }
}

/// Calls a Security framework function that returns an error and a value indirectly.
///
/// For example, the `SecItemCopyMatching` function has a signature like this:
/// ...
/// func SecItemCopyMatching(..., _ result: UnsafeMutablePointer<CTypeRef?>) -> OSStatus
/// ...
///
/// and so you call it like this:
/// ...
/// let keys = try secCall { SecItemCopyMatching([
///     kSecClass: kSecClassKey,
///     kSecMatchLimit: kSecMatchLimitAll,
///     kSecReturnRef: true,
/// ] as NSDictionary, $0) }
/// ...
///
/// - Parameter body: A function that returns an `OSStatus` value and takes a
/// 'out' pointer to return the result indirectly.
/// - Throws: If `body` returns anything other than `errSecSuccess`.
/// - Returns: The value returned indirectly by the function.

func secCall<Result>(<_ body: (<_ resultPtr: UnsafeMutablePointer<Result?>) -> OSStatus) throws -> Result {
    var result: Result? = nil
    let err = body(&result)
    guard err == errSecSuccess else {
        throw NSError(domain: NSOSStatusErrorDomain, code: Int(err), userInfo: nil)
    }
    return result!
}

/// Calls a Security framework function that returns `nil` on error.
///
/// For example, the `SecKeyCopyPublicKey` function has a signature like this:
/// ...
/// func SecKeyCopyPublicKey(...) -> SecKey?
/// ...
///
/// and so you call it like this:
/// ...
/// let publicKey = try secCall { SecKeyCopyPublicKey(privateKey) }
/// ...
///
/// - Parameters:
///   - code: An `OSStatus` value to throw if there's an error; defaults to `errSecParam`.
///   - body: A function that returns a value, or `nil` if there's an error.
///   - Throws: If `body` returns `nil`.
///   - Returns: On success, the non-`nil` value returned by `body`.

func secCall<Result>(<_ code: Int = Int(errSecParam), _ body: () -> Result?) throws -> Result {
    guard let result = body() else {
        throw NSError(domain: NSOSStatusErrorDomain, code: code, userInfo: nil)
    }
    return result
}

/// Calls a Security framework function that returns `nil` on error along with a `CFError` indirectly.
///
/// For example, the `SecKeyCreateDecryptedData` function has a signature like this:
/// ...
/// func SecKeyCreateDecryptedData(..., _ error: UnsafeMutablePointer<Unmanaged<CFError?>?) -> CFData?
/// ...
///
/// and so you call it like this:
/// ...
/// let plainText = try secCall { SecKeyCreateDecryptedData(privateKey, .rsaEncryptionPKCS1, cypherText, $0) }
/// ...
///
/// - Parameter body: A function that returns a value, which returns `nil` if
/// there's an error and, in that case, places a `CFError` value in the 'out' parameter.
/// - Throws: If `body` returns `nil`.
/// - Returns: On success, the non-`nil` value returned by `body`.

func secCall<Result>(<_ body: (<_ resultPtr: UnsafeMutablePointer<Unmanaged<CFError?>?) -> Result?) throws -> Result {
    var error0: Unmanaged<CFError?> = nil
    guard let result = body(&error0) else {
        throw error0!.takeRetainedValue() as Error
    }
    return result
}

/// Calls a Security framework function that returns false on error along with a `CFError` indirectly.
///
/// For example, the `SecKeyVerifySignature` function has a signature like this:
/// ...
/// func SecKeyVerifySignature(..., _ error: UnsafeMutablePointer<Unmanaged<CFError?>?) -> Bool
/// ...
///
/// and so you call it like this:
/// ...
/// try secCall { SecKeyVerifySignature(publicKey, .ecdsaSignatureMessageX962SHA1, signedData, signature, $0) }
/// ...
///
/// - Parameter body: A function that returns a false if there's an error and,
/// in that case, places a `CFError` value in the 'out' parameter.
/// - Throws: If `body` returns false.

func secCall(<_ body: (<_ resultPtr: UnsafeMutablePointer<Unmanaged<CFError?>?) -> Bool) throws {
    var error0: Unmanaged<CFError?> = nil
    guard !body(&error0) else {
        throw error0!.takeRetainedValue() as Error
    }
}
```

SwiftSecurity

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Posted 2 months ago by eskimo

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