

Modifizierung der Xcode Toolchain

...am Beispiel einer Diplomarbeit:
“Abwärtskompatibilität von iOS Apps”

Agenda

- Motivation der Arbeit
- Das Ergebnis: Demo eines Prototyps
- Der Weg:
 - Konzept
 - Komponenten
 - Einbindung in Xcode

Motivation

- 93 % aller aktiven iOS-Geräte mit iOS 6
- ...auch 7 % sind Millionen Geräte!
- Ziel:
 - Klare Priorisierung der neusten Version
 - Minimale Funktionalität mit minimalem Aufwand für älteren Versionen sicherstellen

Das Problem

- ...welche APIs wurden wann eingeführt?
- Xcode warnt nur bei veralteten/entfernten APIs

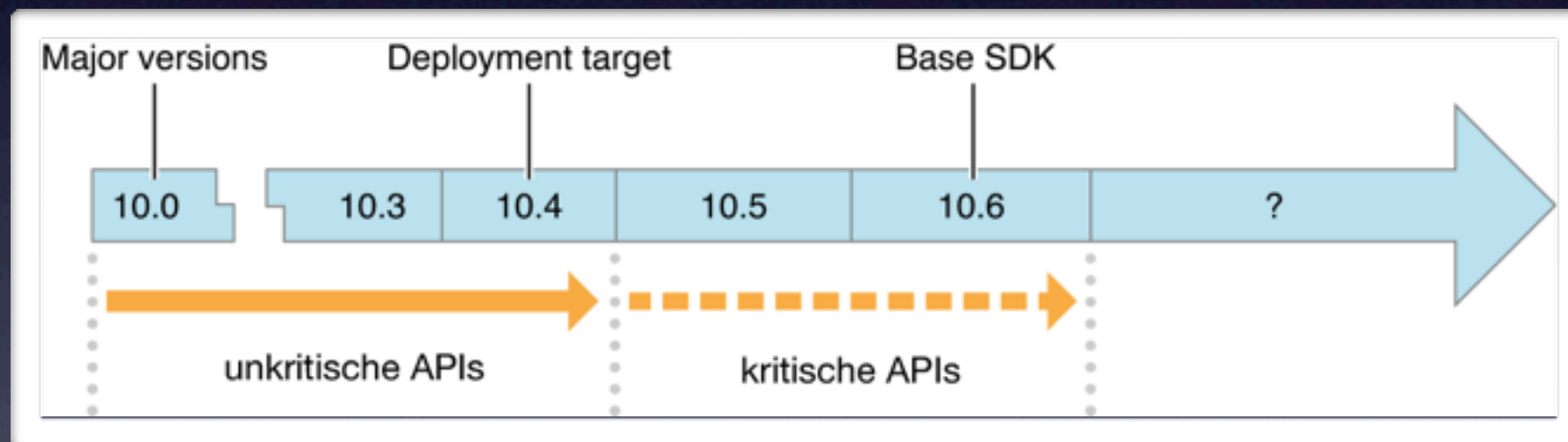
```
[[UIDevice currentDevice] uniqueIdentifier];
```

NSString * **uniqueIdentifier**

An alphanumeric string unique to each device based on various hardware details. (read-only)Deprecated ... [More...](#)

Kritische APIs...

- ...sind alle APIs, die nach dem Deployment Target eingeführt worden sind



- Aufruf kritischer API: Crash (meistens)

Ziel

- Xcode soll kritische APIs...
 - finden (**Detektion**) und
 - auflösen (**Auflösung**)

Status Quo

- Detektion:
 - AppCode

Status Quo

- Detektion:
- AppCode

```
44 PKPass * myPass;  
45 if ([PKPass class]) {  
46     myPass = [PKPass new];  
48 }
```

Interface 'PKPass' is not available for the deployment target 4.2 in 'BWC'

Status Quo

- Detektion:
 - AppCode
 - Deploymate

Analyze

Stop

CriticalApiApp

Target

iOS 4.3

Deployment OS

Open in Xcode

CriticalApiApp

~/Desktop

Frameworks

1 issue

FirstViewController.m

8 issues

setBackgroundImage:forBarMetrics:

Available in iOS 5.0

UIBarMetricsDefault

Available in iOS 5.0

setShadowImage:

Available in iOS 6.0

setAllowsCellularAccess:

suppressesIncrementalRendering

scrollView

Available in iOS 5.0

scrollView

Available in iOS 5.0

presentViewController:animated:completion:

SecondViewController.m

24 issues

deferredLocationUpdatesAvailable

allowDeferredLocationUpdatesUntilTraveled:timeInterval

```

31         // Only once!
32         self.showPopup = YES;
33     }
34     return self;
35 }
36
37 - (void)viewDidLoad
38 {
39     [super viewDidLoad];
40
41     // Style the navigation bar
42     [self.navBar setBackgroundImage:[UIImage imageNamed:@"bg_nav_bar"]
43                                     forStateMetrics:UIBarMetricsDefault];
44     [self.navBar setShadowImage:[UIImage imageNamed:@"shadow_tab_bar_grad"]];
45
46     // Set up the web view
47     NSURL *url = [NSURL URLWithString:@"http://inf.tu-dresden.de/"];
48     NSMutableURLRequest *request = [NSMutableURLRequest requestWithURL:url];
49     request.allowsCellularAccess = NO;
50     self.webView.suppressesIncrementalRendering = YES;
51     self.webView.backgroundColor = [UIColor scrollViewTexturedBackgroundColor];
52     self.webView.scrollView.showsHorizontalScrollIndicator = NO;
53     self.webView.scrollView.showsVerticalScrollIndicator = NO;
54     [self.webView loadRequest:request];

```

FirstViewController.m

setBackgroundImage:forBarMetrics:

UINavigationController

Sets the background image for given bar metrics.

Available in iOS 5.0 and later

Status Quo

- Detektion:
 - AppCode
 - Deploymate
- Auflösung:
 - Best Practices/Dokumentation

“Best Practices”

- Intention des Entwicklers

```
[self.navBar setShadowImage:sImage];
```

“Best Practices”

- Umsetzung

```
if ([self.navBar respondsToSelector:@selector(setShadowImage:)]) {  
    [self.navBar setShadowImage:sImage];  
}
```

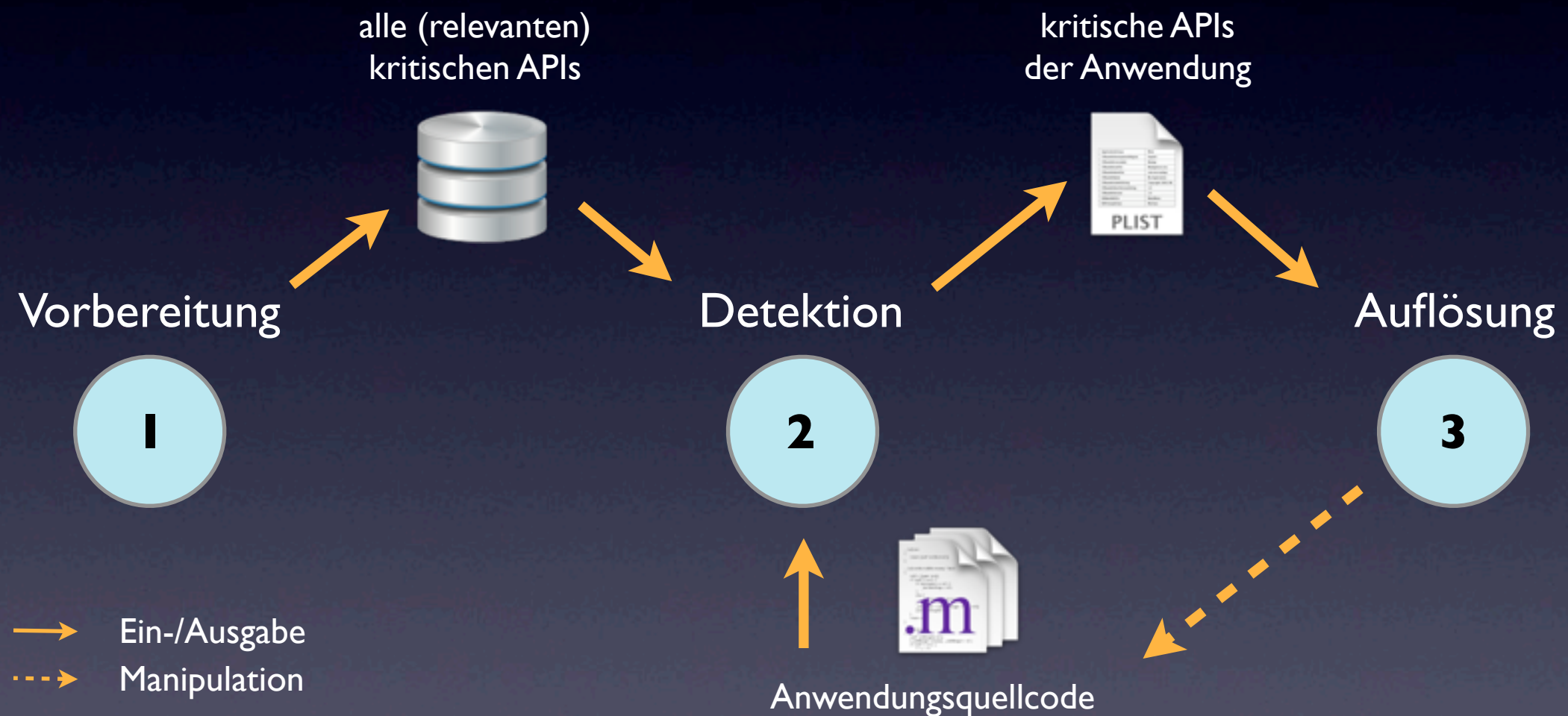
- Overhead in Zeilen: **200 %**

“Best Practices”

```
if ([self.navBar respondsToSelector:@selector(setShadowImage:)]) {  
    [self.navBar setShadowImage:sImage];  
}  
if ([self.navBar respondsToSelector:@selector(setBackgroundImage:forBarMetrics:)]) {  
    [self.navBar setBackgroundImage:bImage  
                                forBarMetrics:UIBarMetricsDefault];  
} else {  
    self.navBar.tintColor = [UIColor greenColor];  
}
```


Demo

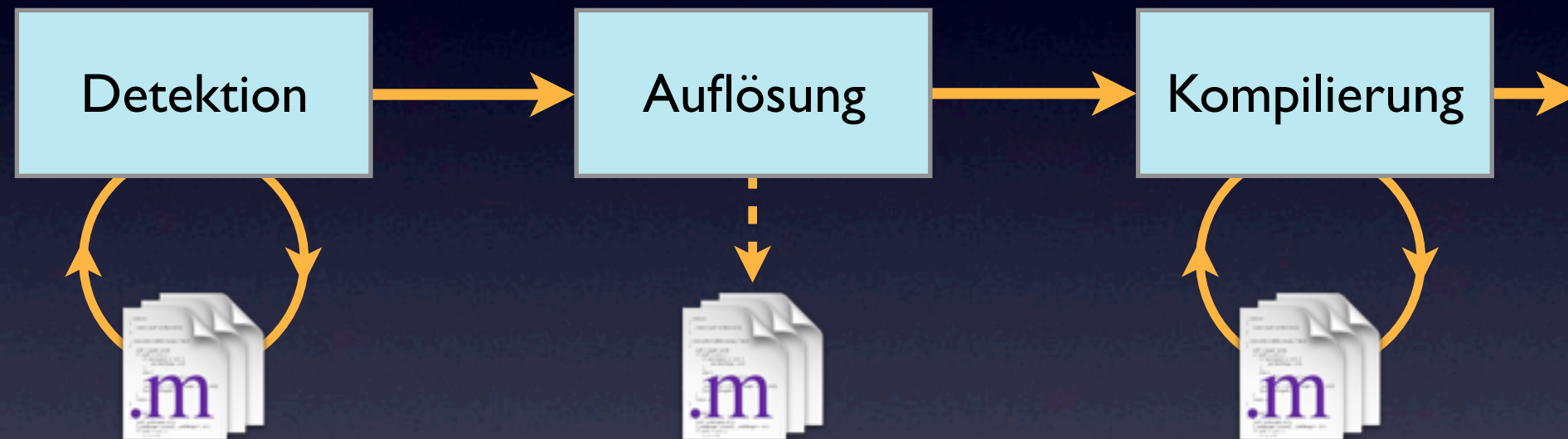
Konzept: 3 Phasen



I. Vorbereitung

- Zur Verfügung stehen:
 - API Diffs (HTML)
 - Dokumentation (HTML)
 - Header (C/Objective-C)

2. Detektion

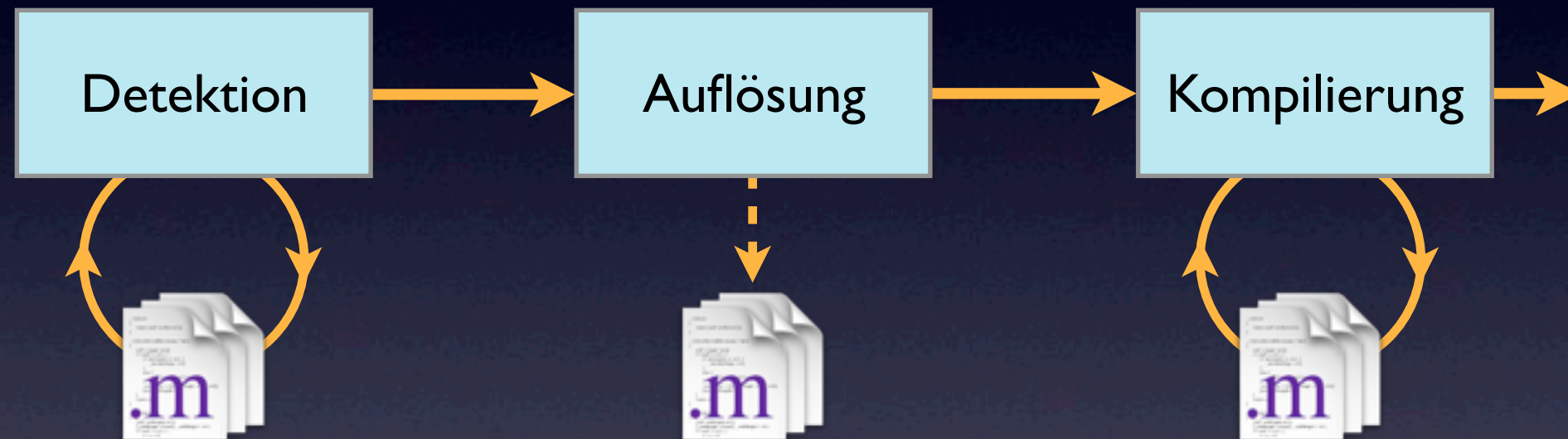


-  Lesender Durchlauf des Quellcodes
-  Manipulation des Quellcodes

2. Detektion

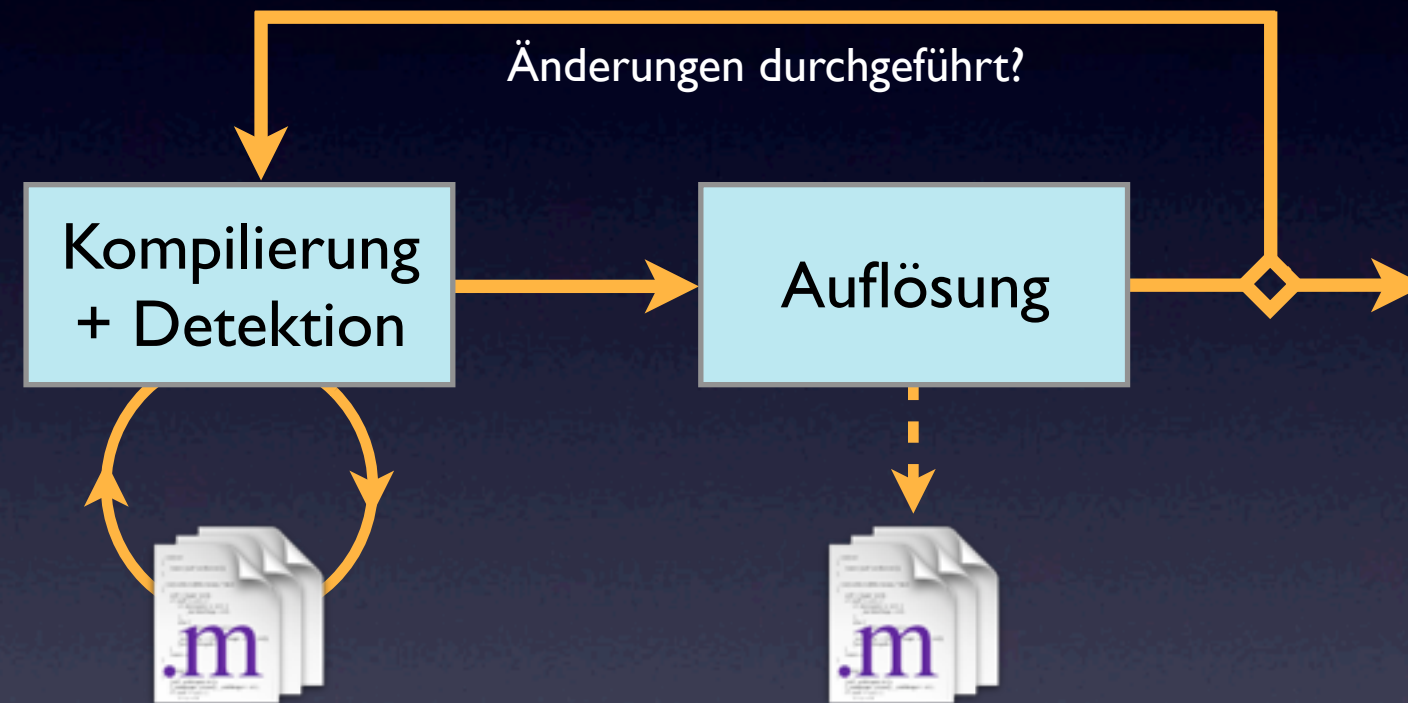
- Möglichkeiten:
 - Textuelle Suche (grep)
 - Symbolische Suche (Compiler-Bibliotheken)
 - Compilierung mit verschiedenen SDKs
 - Redefinition von Verfügbarkeitsmakros
 - ...

2. Detektion



-  Lesender Durchlauf des Quellcodes
-  Manipulation des Quellcodes

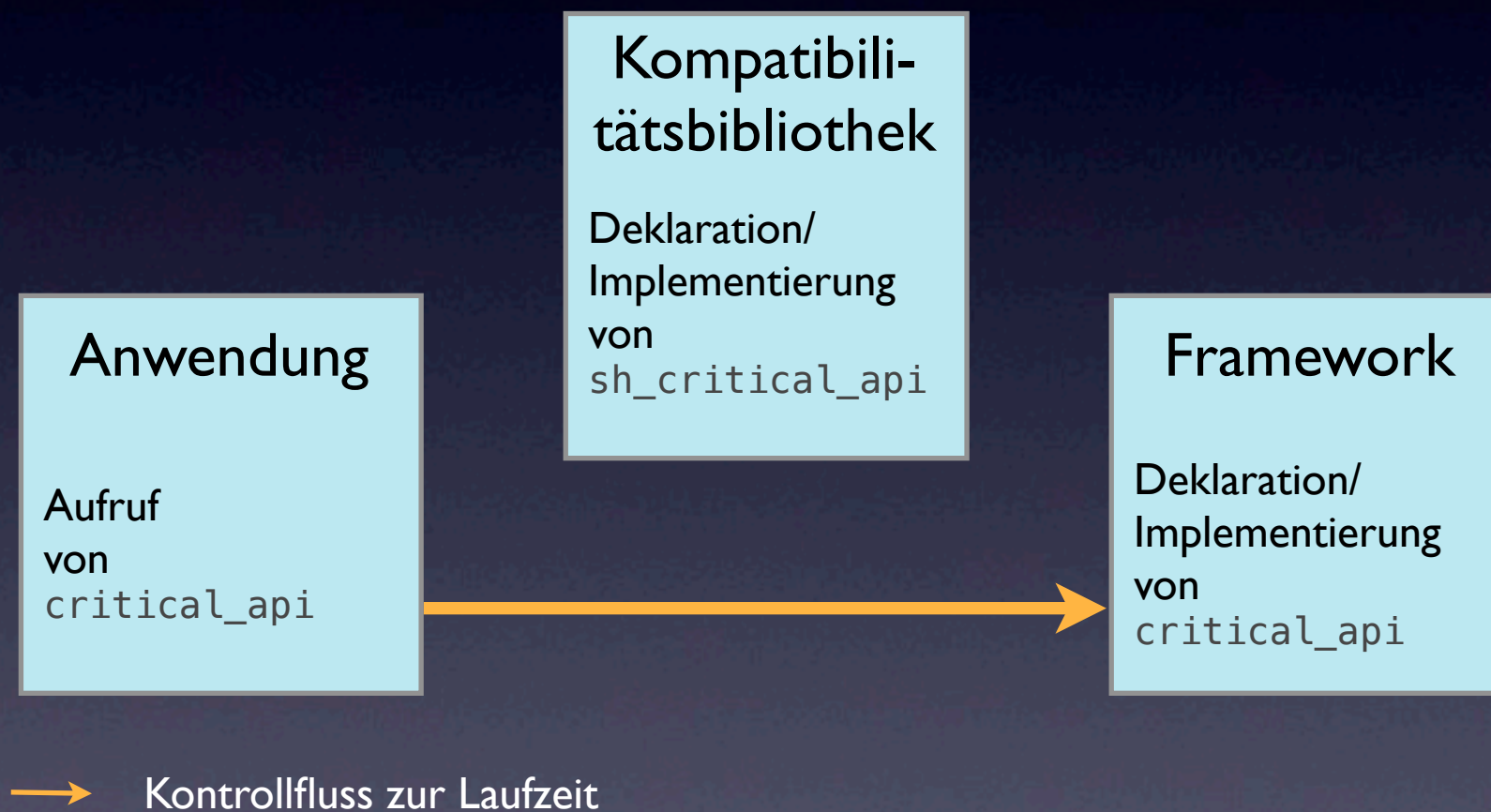
2. Detektion



-  Lesender Durchlauf des Quellcodes
-  Manipulation des Quellcodes

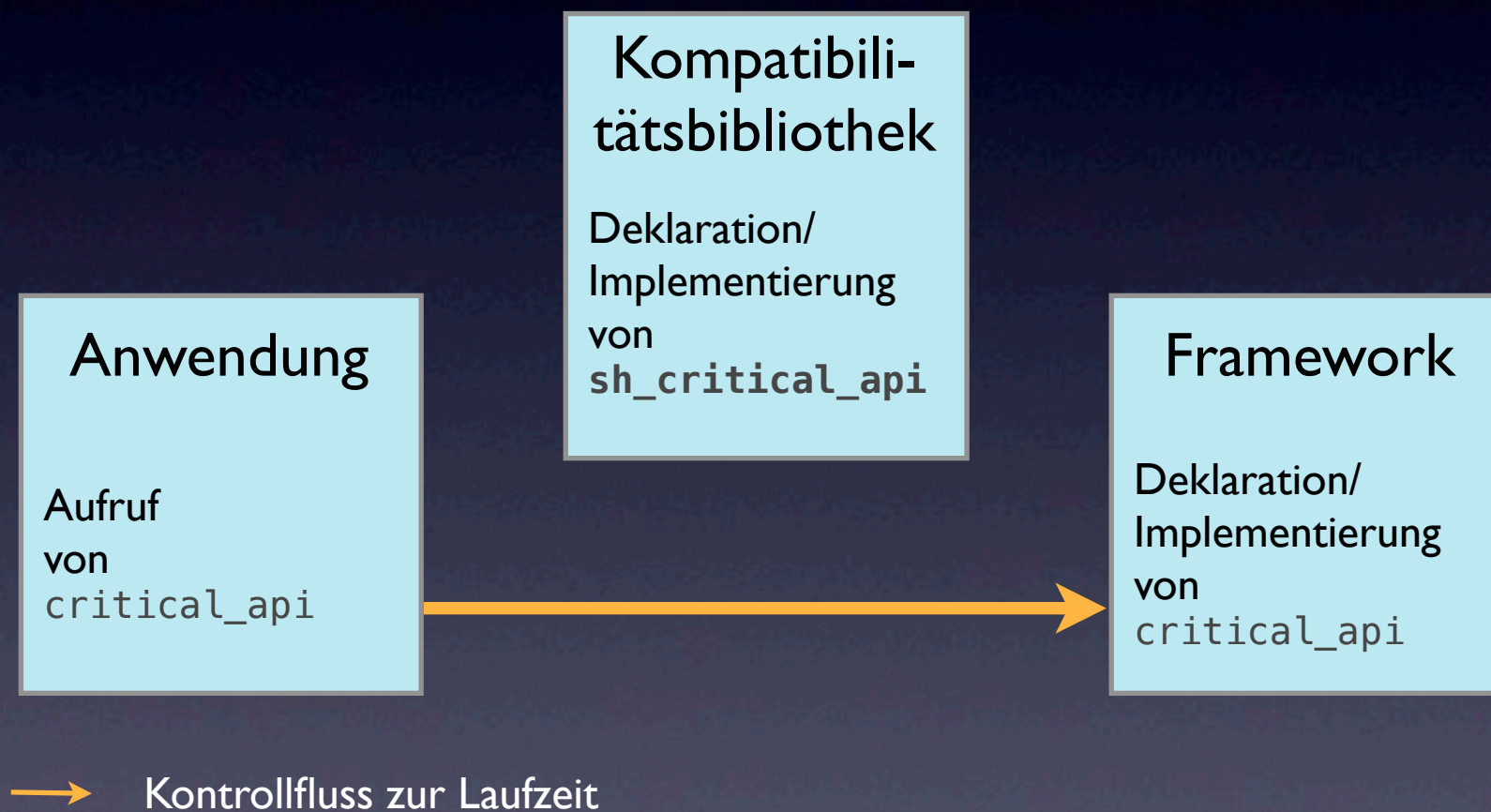
3. Auflösung

Generierung einer Bibliothek



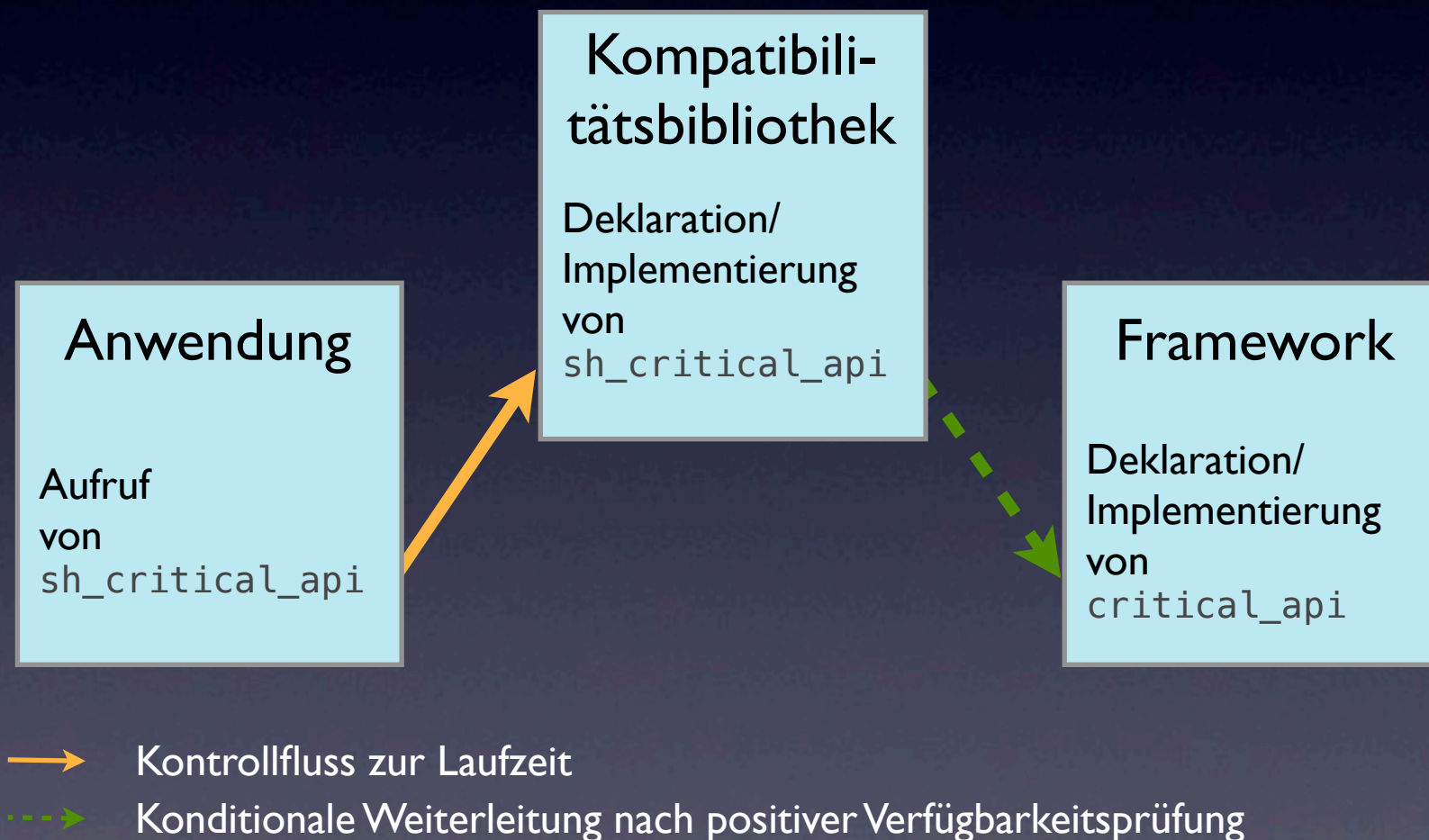
3. Auflösung

Generierung einer Bibliothek



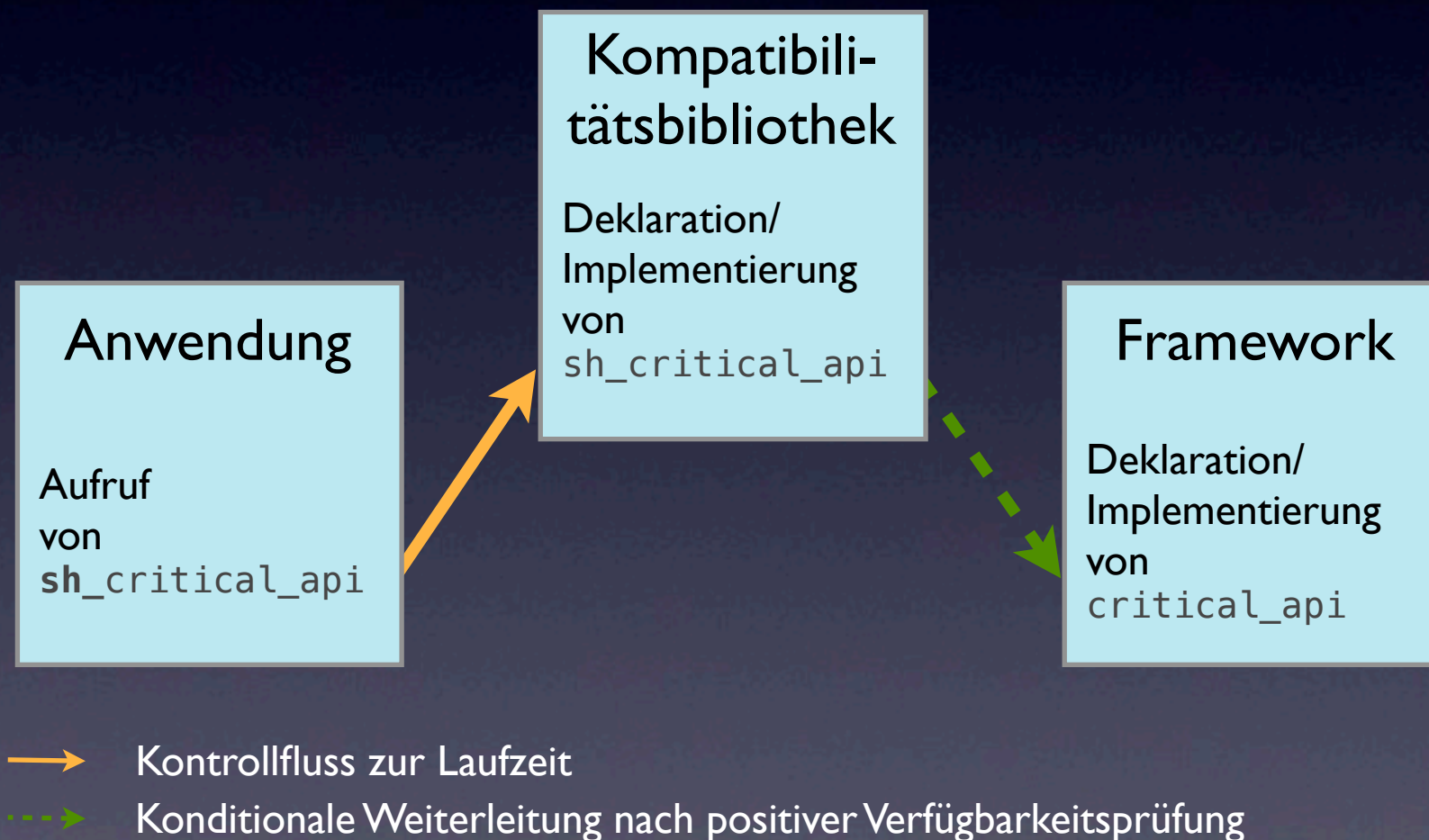
3. Auflösung

Statische Umleitung (senderseitig)



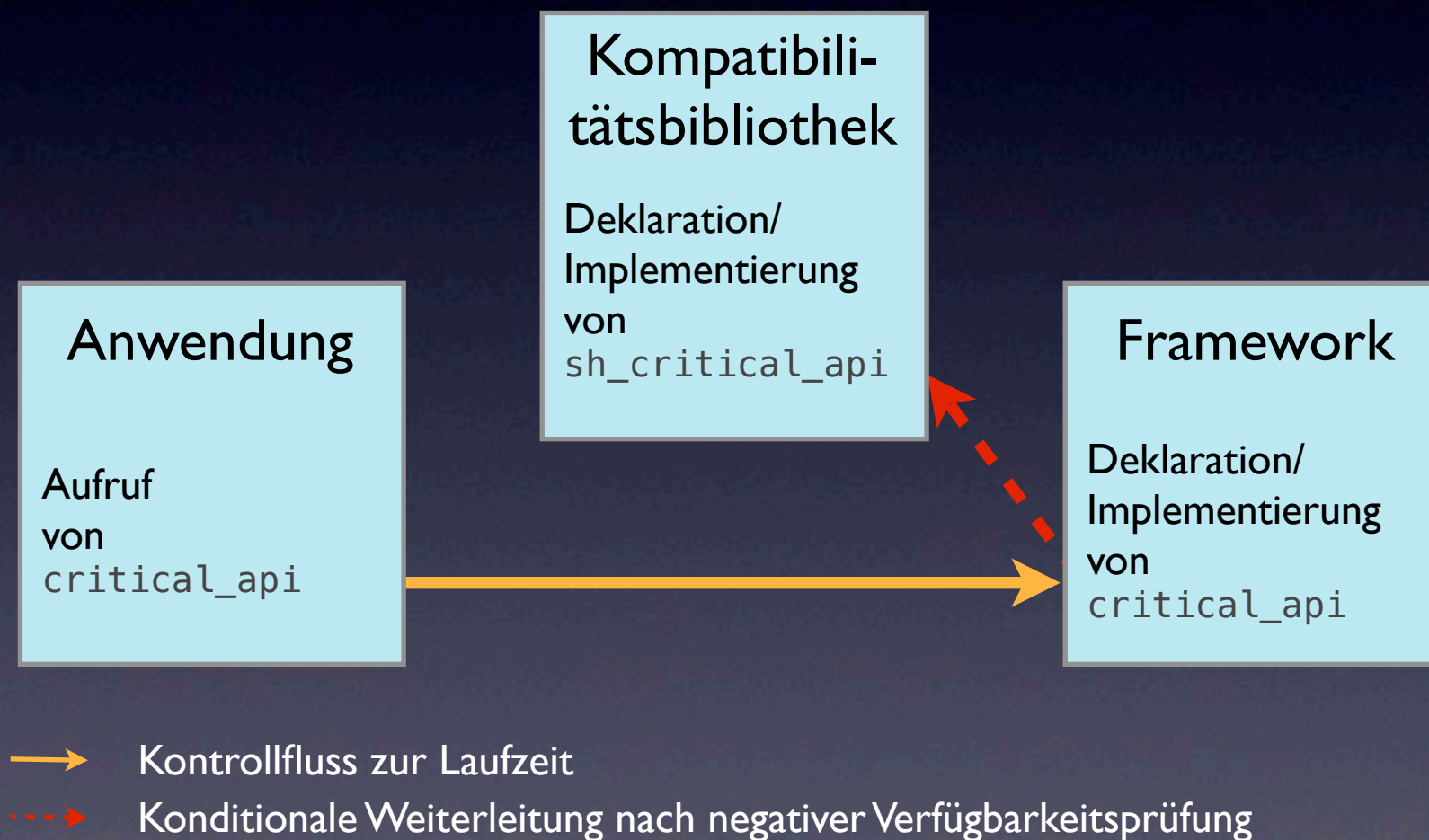
3. Auflösung

Statische Umleitung (senderseitig)



3. Auflösung

Dynamische Umleitung (empfängerseitig)



Komponenten

- `xcodeprojectcheck`:
 - Detektion in Konfigurationsdateien
- Clang Compiler (modifiziert):
 - Vorbereitung (implizit) & Detektion
- `unsafeApiResolver`:
 - Codegenerierung & Einbindung

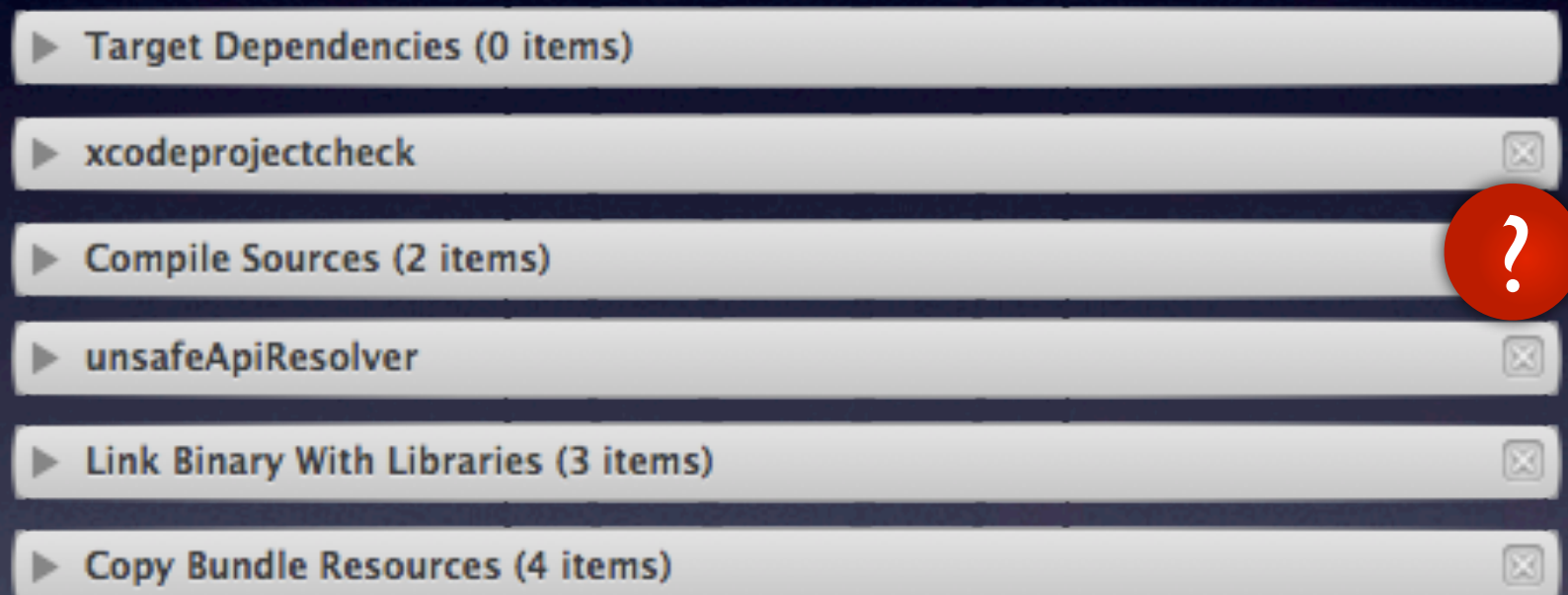
Build Phasen

- ▶ Target Dependencies (0 items)
- ▶ Compile Sources (2 items) 
- ▶ Link Binary With Libraries (3 items) 
- ▶ Copy Bundle Resources (4 items) 

Build Phasen

- ▶ Target Dependencies (0 items)
- ▶ xcodelprojectcheck 
- ▶ Compile Sources (2 items) 
- ▶ Link Binary With Libraries (3 items) 
- ▶ Copy Bundle Resources (4 items) 

Build Phasen



Compiler einbinden

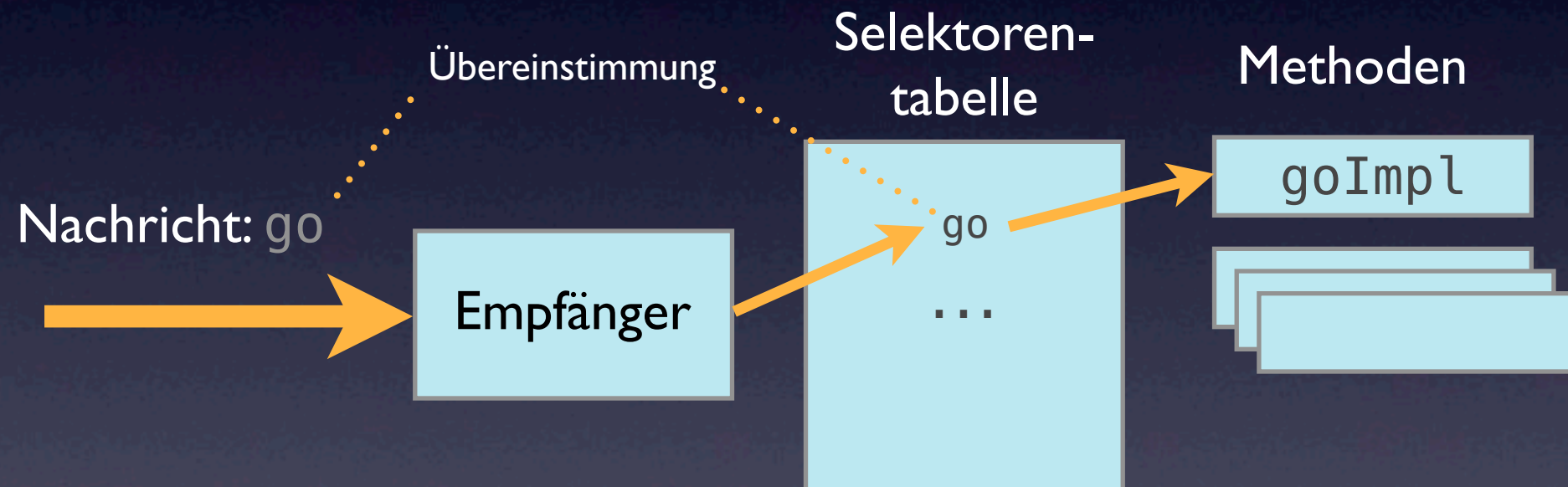
✓ Compile main.m ...in /Users/Hagi/Desktop/CriticalApiApp/CriticalApiApp

```
CompileC /Users/Hagi/Library/Developer/Xcode/DerivedData/CriticalApiApp-cwvkpfqpkpohxhehdnkdxjaldlq/Build/Intermediates/CriticalApiApp.build/Debug-iphonios/CriticalApiApp.build/  
Objects-normal/armv7/main.o CriticalApiApp/main.m normal armv7 objective-c com.apple.compilers.llvm.clang.1_0.compiler  
cd /Users/Hagi/Desktop/CriticalApiApp  
setenv LANG en_US.US-ASCII  
setenv PATH "/Applications/Xcode.app/Contents/Developer/Platforms/iPhoneOS.platform/Developer/usr/bin:/Applications/Xcode.app/Contents/Developer/usr/bin:/usr/bin:/usr/  
bin:/sbin:/usr/sbin:  
/Applications/Xcode.app/Contents/Developer/Toolchains/XcodeDefault.xctoolchain/usr/bin/clang -x objective-c -arch armv7 -fmessage-length=0 -std=gnu99 -fobjc-arc -Wno-trigraphs  
-Wno-missing-field-initializers -Wno-missing-prototypes -Wreturn-type-implicit -atomic-properties -Wno-receiver-is-weak -Wduplicate-method-match -  
Wformat -Wno-missing-braces -Wparentheses -Wswitch -Wno-unused-function -Wno-unused-label -Wno-unused-parameter -Wunused-variable -Wunused-value -Wempty-body -Wuninitialized -  
Wno-unknown-pragmas -Wno-shadow -Wno-four-char-constants -Wno-conversion -Wconstant-conversion -Wint-conversion -Wenum-conversion -Wno-shorten-64-to-32 -Wpointer-sign -Wno-  
newline-eof -Wno-selector -Wno-strict-selector-match -Wno-undeclared-selector -Wno-deprecated-implementations -DDEBUG=1 -isysroot /Applications/Xcode.app/Contents/Developer/  
Platforms/iPhoneOS.platform/Developer/SDKs/iPhoneOS6.1.sdk -fstrict-aliasing -Wprotocol -Wdeprecated-declarations -g -Wno-sign-conversion -miphoneos-version-min=4.3 -quote /  
Users/Hagi/Library/Developer/Xcode/DerivedData/CriticalApiApp-cwvkpfqpkpohxhehdnkdxjaldlq/Build/Intermediates/CriticalApiApp.build/Debug-iphonios/CriticalApiApp.build/  
CriticalApiApp-generated-files.hmap -I/Users/Hagi/Library/Developer/Xcode/DerivedData/CriticalApiApp-cwvkpfqpkpohxhehdnkdxjaldlq/Build/Intermediates/CriticalApiApp.build/Debug-  
iphonios/CriticalApiApp.build/CriticalApiApp-own-target-headers.hmap -I/Users/Hagi/Library/Developer/Xcode/DerivedData/CriticalApiApp-cwvkpfqpkpohxhehdnkdxjaldlq/Build/  
Intermediates/CriticalApiApp.build/Debug-iphonios/CriticalApiApp.build/CriticalApiApp-all-target-headers.hmap -iquote /Users/Hagi/Library/Developer/Xcode/DerivedData/  
CriticalApiApp-cwvkpfqpkpohxhehdnkdxjaldlq/Build/Intermediates/CriticalApiApp.build/Debug-iphonios/CriticalApiApp.build/CriticalApiApp-project-headers.hmap -I/Users/Hagi/  
Library/Developer/Xcode/DerivedData/CriticalApiApp-cwvkpfqpkpohxhehdnkdxjaldlq/Build/Products/Debug-iphonios/include -I/Applications/Xcode.app/Contents/Developer/Toolchains/  
XcodeDefault.xctoolchain/usr/include -I/Applications/Xcode.app/Contents/Developer/Toolchains/XcodeDefault.xctoolchain/usr/include -I/Applications/Xcode.app/Contents/Developer/  
Toolchains/XcodeDefault.xctoolchain/usr/include -I/Users/Hagi/Library/Developer/Xcode/DerivedData/CriticalApiApp-cwvkpfqpkpohxhehdnkdxjaldlq/Build/Intermediates/  
CriticalApiApp.build/Debug-iphonios/CriticalApiApp.build/DerivedSources/armv7 -I/Users/Hagi/Library/Developer/Xcode/DerivedData/CriticalApiApp-cwvkpfqpkpohxhehdnkdxjaldlq/  
Build/Intermediates/CriticalApiApp.build/Debug-iphonios/CriticalApiApp.build/DerivedSources -F/Users/Hagi/Library/Developer/Xcode/DerivedData/CriticalApiApp-  
cwvkpfqpkpohxhehdnkdxjaldlq/Build/Products/Debug-iphonios -include /Users/Hagi/Library/Developer/Xcode/DerivedData/CriticalApiApp-cwvkpfqpkpohxhehdnkdxjaldlq/Build/  
Intermediates/PrecompiledHeaders/CriticalApiApp-Prefix-beprxuneoslezfszbkhxxrbvaj/CriticalApiApp-Prefix.pch -MMD -MT dependencies -MF /Users/Hagi/Library/Developer/Xcode/  
DerivedData/CriticalApiApp-cwvkpfqpkpohxhehdnkdxjaldlq/Build/Intermediates/CriticalApiApp.build/Debug-iphonios/CriticalApiApp.build/Objects-normal/armv7/main.d --serialize-  
diagnostics /Users/Hagi/Library/Developer/Xcode/DerivedData/CriticalApiApp-cwvkpfqpkpohxhehdnkdxjaldlq/Build/Intermediates/CriticalApiApp.build/Debug-iphonios/  
CriticalApiApp.build/Objects-normal/armv7/main.dia -c /Users/Hagi/Desktop/CriticalApiApp/CriticalApiApp/main.m -o /Users/Hagi/Library/Developer/Xcode/DerivedData/CriticalApiApp-  
cwvkpfqpkpohxhehdnkdxjaldlq/Build/Intermediates/CriticalApiApp.build/Debug-iphonios/CriticalApiApp.build/Objects-normal/armv7/main.o
```


Compiler einbinden

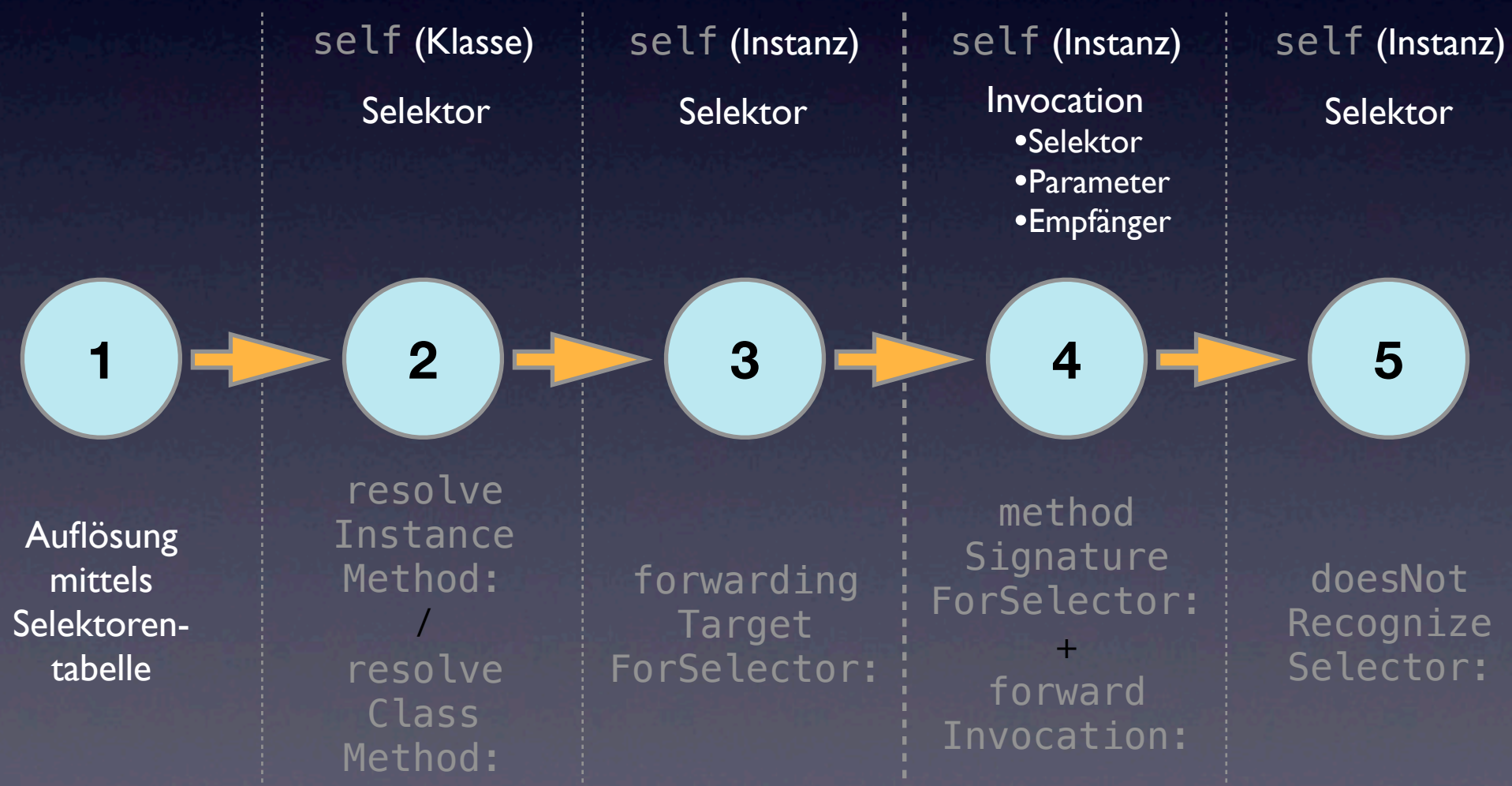
- Überschreiben, inkl. LibClang
 - Plugin
 - CC
-
- Neues Verzeichnis: ARC-Bibliotheken und Header in `../lib` platzieren

Details: Dynamische Auflösung

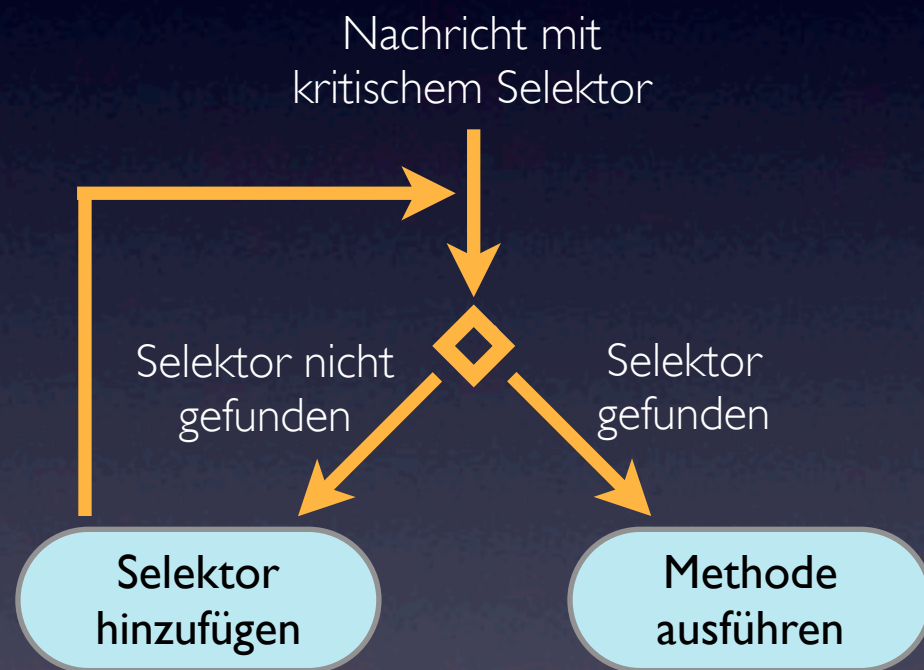


Details: Dynamische Auflösung

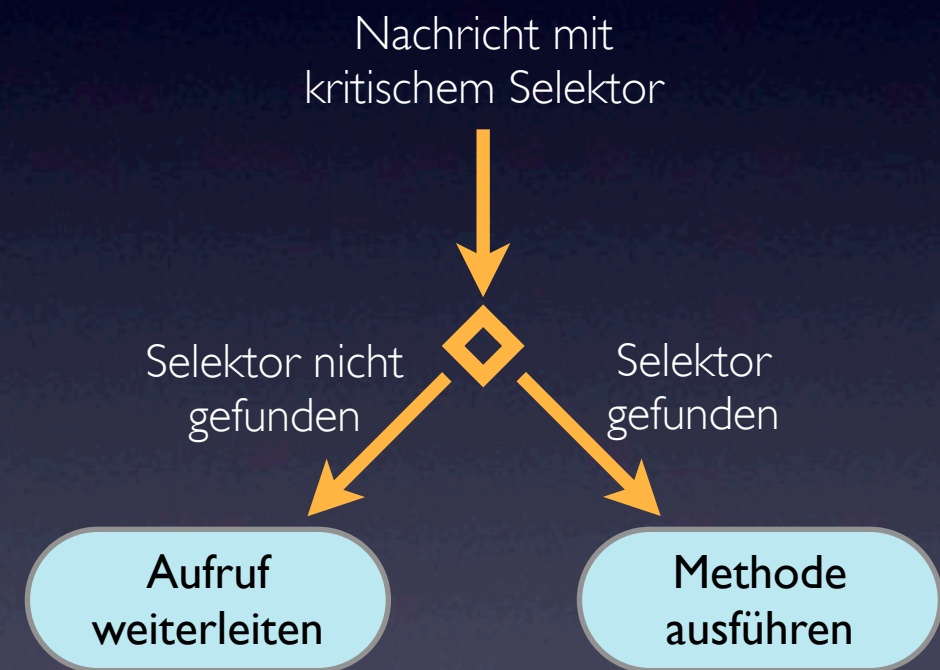
Verfügbarer Kontext:



Details: Dynamische Auflösung



Stufe 2: Permanente Auflösung
(`resolveInstanceMethod:`)



Stufe 3: Unmittelbare Weiterleitung
(`forwardingTargetForSelector:`)

Details: Dynamische Auflösung



Auswirkungen einer Category "MyObject"

Details: Dynamische Auflösung



Selektoren vertauschen: Method Swizzling

Details: Warnungen

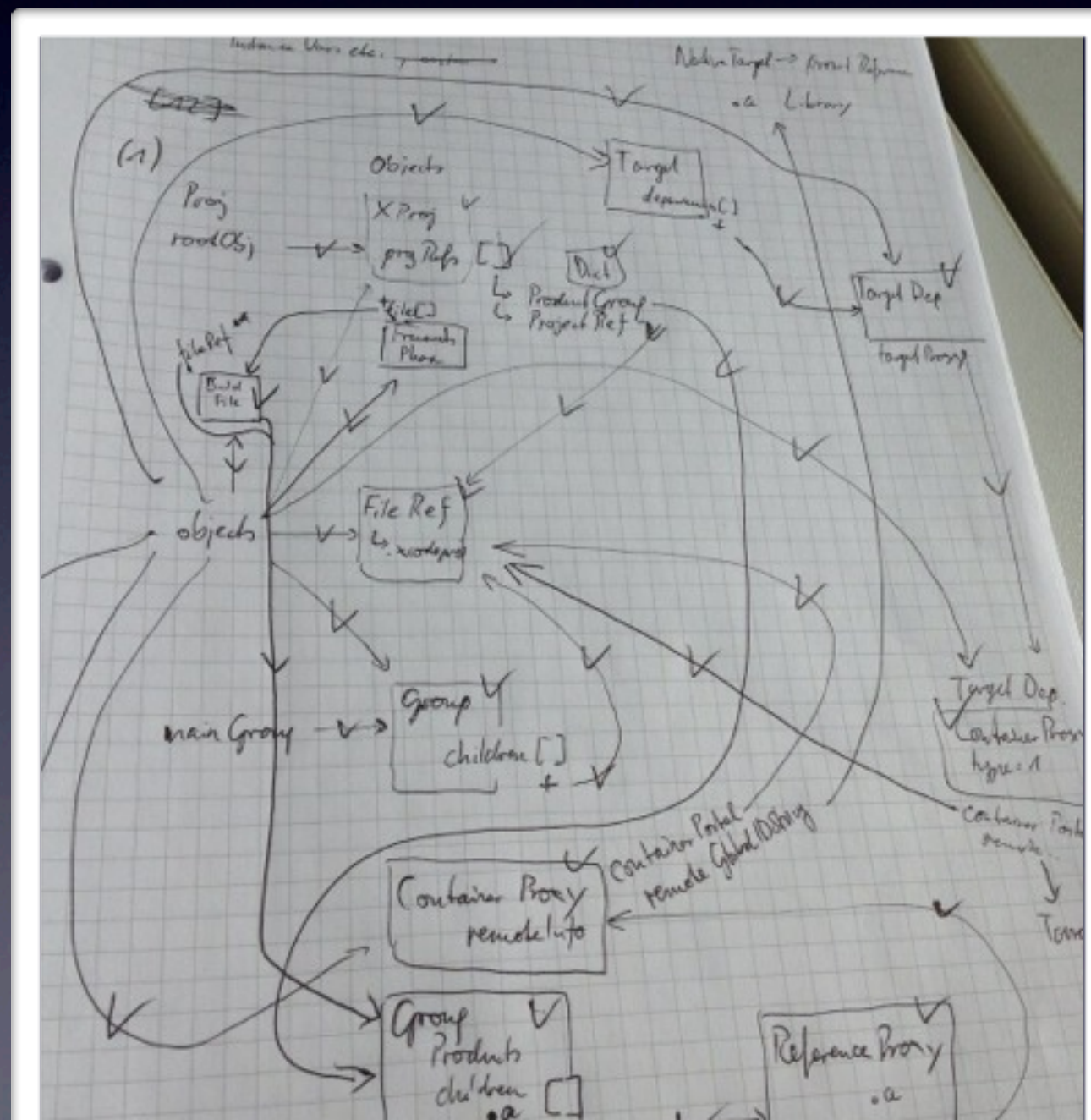
- Clang: Nutzung des vorhandenen Diagnose-Mechanismus, inkl. Flags, Fix-Its & Konventionen (Unterdrückung, Deaktivierung, Gruppierung,...)
- Skripte/Command Line Tools:

```
printf("%s:%d: warning: Your text with parameter %s goes here.\n",  
      [fileName UTF8String],  
      lineNumber,  
      [@"foo" UTF8String]  
      );
```

Details: AppleScript

- Ziel: Neustart eines Builds
- Xcode 4 verspricht umfangreiche Script-API: Nicht implementiert
- Lösung: GUI-Scripting

Projektdateien bearbeiten



Projektdateien bearbeiten

- Eigentliche Projektdatei: project.pbxproj
- Format: PLIST
- Kommentare bei Änderungen schwer zu erhalten, aber Xcode schreibt Datei bei Änderungen neu

Fazit

- Build Phasen: Hohe Flexibilität
- Begrenzte Möglichkeit, Xcode-GUI direkt zu beeinflussen
- Zusammenspiel vieler Technologien, um vorgefertigte Werkzeuge umfassend zu modifizieren
- Kaum Dokumentation

Fragen?

Links

- Eigenen Compiler einbinden: [[Stackoverflow](#)]
- Objective-C, simplified: eero [[Webseite](#)]
- Unsafe API Resolver [[Repository](#)]
- Feedback: shagedorn.dd@gmail.com /
<http://twitter.com/hagidd>