传送门：AopTestDemo

1. 场景需求

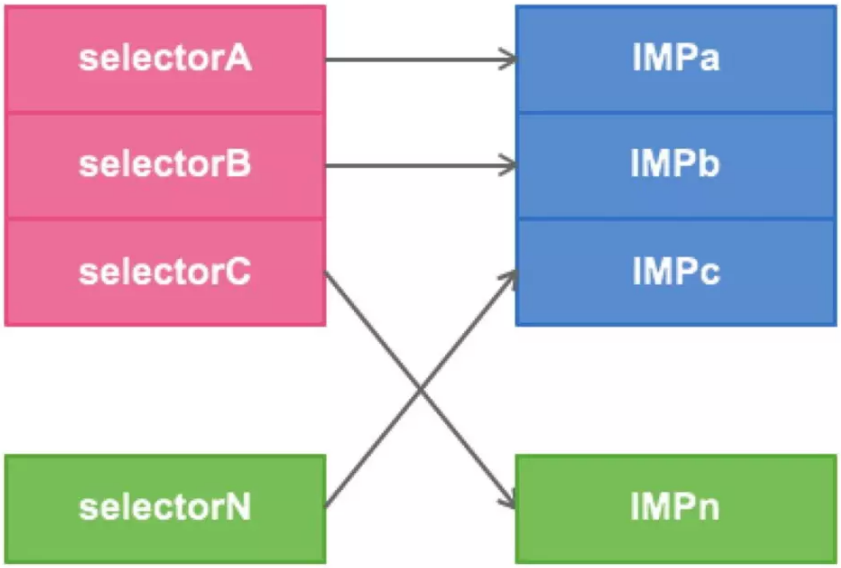
- 统计UIViewController加载次数
- 统计UIButton点击次数
- 统计自定义方法的执行
- 统计UITableView的Cell点击事件

工程说明，首页Test1ViewController，其中有4个按钮，点击第一个按钮打印，第二个到第四个按钮分别跳转到Test2ViewController，Test3ViewController，Test4ViewController。

> 技术选型：

- 手动复制统计的代码逻辑一个个地粘贴到需要统计的类和方法中去。工作量大，可维护性差，仅适用统计埋点极少的情况。
- 通过继承和重写系统方法 -- 利用写好统计的一个基类，让需要VC继承自该基类，或者调用重写过统计逻辑的按钮基类等等。
- 简单的分类，添加类方法或者示例方法 -- 将统计逻辑封装在分类方法里面，在需要统计的地方导入并调用分类方法。
- 替换系统方法的分类：通过运行时Runtime的办法 -- 利用Method Swizzling机制进行方法替换：替换原来的需要在里面统计却不含统计逻辑的方法 为 新的包含了统计逻辑的方法。
- 通过AOP的方法 -- 利用Aspect框架对需要进行统计的方法进行挂钩（hook），并注入包含了统计逻辑的代码块（block）。

2. 为VC设计的分类：运行时Method Swizzling方案



> 场景需求：需要监听全局的某一类的同一方法

这种方案被监听的方法单一，但会影响全局的所有的类的该方法。例如下面的分类，即使你不`import`，只要存在于工程就会影响。

- UIViewController+Trace

```
#import "UIViewController+Trace.h"
#import "TraceHandler.h"
#import <objc/runtime.h>
#import <objc/objc.h>
#import "Aspects.h"

@implementation UIViewController (Trace)

#pragma mark - 1.自定义实现方法
+ (void)load{
    swizzleMethod([self class], @selector(viewDidAppear:),
@selector(swizzled_viewDidAppear:));
}

- (void)swizzled_viewDidAppear:(BOOL)animated{
    // call original implementation
    [self swizzled_viewDidAppear:animated];
    // Begin statistics Event
    [TraceHandler statisticsWithEventName:@"UIViewController"];
}

void swizzleMethod(Class class,SEL originalSelector,SEL
```

```
swizzledSelector){
    // the method might not exist in the class, but in its
superclass
    Method originalMethod = class_getInstanceMethod(class,
originalSelector);
    Method swizzledMethod = class_getInstanceMethod(class,
swizzledSelector);

    // class_addMethod will fail if original method already exists
    BOOL didAddMethod = class_addMethod(class, originalSelector,
method_getImplementation(swizzledMethod),
method_getTypeEncoding(swizzledMethod));

    // the method doesn't exist and we just added one
    if (didAddMethod) {
        class_replaceMethod(class, swizzledSelector,
method_getImplementation(originalMethod),
method_getTypeEncoding(originalMethod));
    }
    else {
        method_exchangeImplementations(originalMethod,
swizzledMethod);
    }
}

@end
```

- TraceHandler.m

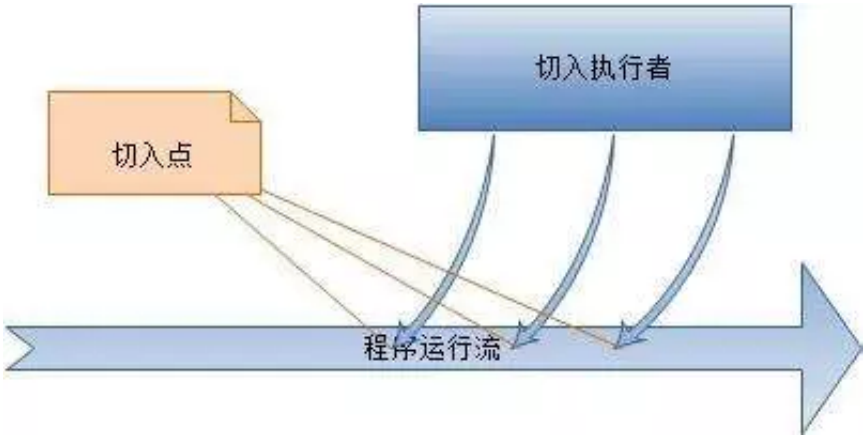
```
#import "TraceHandler.h"

@implementation TraceHandler

+ (void)statisticsWithEventName:(NSString *)eventName{
    NSLog(@"-----> %@",eventName);
}

@end
```

3. 为VC设计的分类：AOP编程方案



> 场景需求：该方案的适用特点同上第二节。

Aspects 是iOS平台一个轻量级的面向切面编程(AOP)框架，只包括两个方法：一个类方法，一个实例方法。

```
+ (id<AspectToken>)aspect_hookSelector:(SEL)selector
                      withOptions:(AspectOptions)options
                       usingBlock:(id)block
                            error:(NSError **)error;
```

```
- (id<AspectToken>)aspect_hookSelector:(SEL)selector
                      withOptions:(AspectOptions)options
                       usingBlock:(id)block
                            error:(NSError **)error;
```

函数使用方式简单易懂，挂钩的方式为三种：

```
typedef NS_OPTIONS(NSUInteger, AspectOptions) {
    AspectPositionAfter   = 0,            /// 在原始方法后调用（默认）
    AspectPositionInstead = 1,            /// 替换原始方法
    AspectPositionBefore  = 2,            /// 在原始方法前调用

    AspectOptionAutomaticRemoval = 1 << 3 /// 在执行1次后自动移除
};
```

调用示例代码：

```
[UIViewController aspect_hookSelector:@selector(viewWillAppear:)
withOptions:AspectPositionAfter usingBlock:^(id<AspectInfo>
aspectInfo, BOOL animated) {
    NSLog(@"View Controller %@ will appear animated: %tu",
aspectInfo.instance, animated);
} error:NULL];
```

这段代码是给UIViewController的viewWillAppear:挂钩一个Block，在原始方法执行完成后，打印字符串。

- UIViewController+Trace

```
#pragma mark - 2.使用Aspects框架
+ (void)load{
    [UIViewController aspect_hookSelector:@selector(viewDidAppear:)
                              withOptions:AspectPositionAfter

usingBlock:^(id<AspectInfo>aspectInfo){
                                  NSString *className =
NSStringFromClass([[aspectInfo instance] class]);;
                                   [TraceHandler
statisticsWithEventName:className];
                                } error:nil];
}
```

4. 为全局AppDelegate设计的分类：AOP编程方案

> 场景需求：需要监听不同类，不同按钮，系统方法，及表单元点击事件

方案特点：是可代码配置需要监听的清单字典，并且需要注入的统计代码块block也可以写在这个清单里面。

- AppDelegate+Trace.m

```objc
#import "AppDelegate+Trace.h"
#import "TraceManager.h"

@implementation AppDelegate (Trace)

+ (void)setupLogging{
    NSDictionary *configDic = @{
                                    @"ViewController":@{
                                            @"des":@"show
ViewController",
                                            },
                                    @"Test1ViewController":@{
                                            @"des":@"show
Test1ViewController",
                                            @"TrackEvents":@[@{

@"EventDes":@"click action1",

@"EventSelectorName":@"action1",

@"block":^(id<AspectInfo>aspectInfo){

NSLog(@"统计 Test1ViewController action1 点击事件");
                                                                    },
                                                                    },
                                                                @{

@"EventDes":@"click action2",

@"EventSelectorName":@"action2",

@"block":^(id<AspectInfo>aspectInfo){

NSLog(@"统计 Test1ViewController action2 点击事件");
                                                                    },
                                                                    }],
                                            },
                                    @"Test2ViewController":@{
                                            @"des":@"show
Test2ViewController",
                                            }
                                    };

    [TraceManager setUpWithConfig:configDic];
}

@end
```

- TraceManager.m

```
#import "TraceManager.h"

@import UIKit;

typedef void (^AspectHandlerBlock)(id<AspectInfo> aspectInfo);

@implementation TraceManager

+ (void)setUpWithConfig:(NSDictionary *)configDic{
    // hook 所有页面的viewDidAppear事件
    [UIViewController aspect_hookSelector:@selector(viewDidAppear:)
                                withOptions:AspectPositionAfter
                                 usingBlock:^(id<AspectInfo>
aspectInfo){

dispatch_async(dispatch_get_global_queue(DISPATCH_QUEUE_PRIORITY_DE
FAULT, 0), ^{
                                        NSString *className =
NSStringFromClass([[aspectInfo instance] class]);
                                        NSString *des =
configDic[className][@"des"];
                                        if (des) {
                                            NSLog(@"%@",des);
                                        }
                                    });
                                } error:NULL];

    for (NSString *className in configDic) {
        Class clazz = NSClassFromString(className);
        NSDictionary *config = configDic[className];

        if (config[@"TrackEvents"]) {
            for (NSDictionary *event in config[@"TrackEvents"]) {
                SEL selekor =
NSSelectorFromString(event[@"EventSelectorName"]);
                AspectHandlerBlock block = event[@"block"];

                [clazz aspect_hookSelector:selekor
                                withOptions:AspectPositionAfter
                                 usingBlock:^(id<AspectInfo>
aspectInfo){
```

```
dispatch_async(dispatch_get_global_queue(DISPATCH_QUEUE_PRIORITY_DE
FAULT, 0), ^{
                                        block(aspectInfo);
                                    });
                                }error:NULL];
            }
        }
    }
}

@end
```

5. 在AppDelegate的类方法中根据Plist监听清单进行HOOK

> 场景需求：需要监听不同类，不同按钮，系统方法，及表单元点击事件

方案特点：是可代码配置需要监听的清单Plist，但是不能将需要注入的统计代码块block写在这个清单Plist里面。

- EventList.plist

▼ Root	Dictionary	(2 items)
▼ Test3ViewController	Array	(1 item)
▼ Item 0	Dictionary	(2 items)
EventId	String	newButtonClick
MethodName	String	buttonClick
▼ Test4ViewController	Array	(4 items)
▼ Item 0	Dictionary	(2 items)
EventId	String	otherButtonClick
MethodName	String	otherButtonClick
▼ Item 1	Dictionary	(3 items)
EventId	String	testClick
MethodName	String	testClick:
▶ Params	Array	(2 items)
▼ Item 2	Dictionary	(2 items)
EventId	String	tapClick
MethodName	String	tapClick
▼ Item 3	Dictionary	(2 items)
EventId	String	tableView:didSelectRowAtIndexPath:
MethodName	String	tableView:didSelectRowAtIndexPath:

- AspectMananer.m

```
#pragma mark --- 监控button的点击事件
+ (void)trackBttonEvent{

    __weak typeof(self) ws = self;

    //设置事件统计
    //放到异步线程去执行

dispatch_async(dispatch_get_global_queue(DISPATCH_QUEUE_PRIORITY_DE
FAULT, 0), ^{
        //读取配置文件，获取需要统计的事件列表
        NSString *path = [[NSBundle mainBundle]
pathForResource:@"EventList" ofType:@"plist"];
        NSDictionary *eventStatisticsDict = [[NSDictionary alloc]
initWithContentsOfFile:path];
        for (NSString *classNameString in
eventStatisticsDict.allKeys) {
            //使用运行时创建类对象
            const char * className = [classNameString UTF8String];
            //从一个字串返回一个类
            Class newClass = objc_getClass(className);

            NSArray *pageEventList = [eventStatisticsDict
objectForKey:classNameString];
            for (NSDictionary *eventDict in pageEventList) {
                //事件方法名称
                NSString *eventMethodName =
eventDict[@"MethodName"];
                SEL seletor =
NSSelectorFromString(eventMethodName);
                NSString *eventId = eventDict[@"EventId"];

                [ws trackEventWithClass:newClass selector:seletor
eventID:eventId];
                [ws trackTableViewEventWithClass:newClass
selector:seletor eventID:eventId];
                [ws trackParameterEventWithClass:newClass
selector:seletor eventID:eventId];
            }
        }
    });
}

#pragma mark -- 1.监控button和tap点击事件(不带参数)
+ (void)trackEventWithClass:(Class)klass selector:(SEL)selector
```

```
eventID:(NSString*)eventID{

    [klass aspect_hookSelector:selector
withOptions:AspectPositionAfter usingBlock:^(id<AspectInfo>
aspectInfo) {

        NSString *className =
NSStringFromClass([aspectInfo.instance class]);
        NSLog(@"className--->%@",className);
        NSLog(@"event----->%@",eventID);
        if ([eventID isEqualToString:@"xxx"]) {
//            [EJServiceUserInfo isLogin]?[MobClick event:eventID]:
[MobClick event:@"???"];
        }else{
//            [MobClick event:eventID];
        }
    } error:NULL];
}

#pragma mark -- 2.监控button和tap点击事件（带参数）
+ (void)trackParameterEventWithClass:(Class)klass selector:
(SEL)selector eventID:(NSString*)eventID{

    [klass aspect_hookSelector:selector
withOptions:AspectPositionAfter usingBlock:^(id<AspectInfo>
aspectInfo,UIButton *button) {

        NSLog(@"button---->%@",button);
        NSString *className =
NSStringFromClass([aspectInfo.instance class]);
        NSLog(@"className--->%@",className);
        NSLog(@"event----->%@",eventID);

    } error:NULL];
}

#pragma mark -- 3.监控tableView的点击事件
+ (void)trackTableViewEventWithClass:(Class)klass selector:
(SEL)selector eventID:(NSString*)eventID{

    [klass aspect_hookSelector:selector
withOptions:AspectPositionAfter usingBlock:^(id<AspectInfo>
aspectInfo,NSSet *touches, UIEvent *event) {

        NSString *className =
NSStringFromClass([aspectInfo.instance class]);
        NSLog(@"className--->%@",className);
        NSLog(@"event----->%@",eventID);
```

```
        NSLog(@"section---->%@",[event
valueForKeyPath:@"section"]);
        NSLog(@"row---->%@",[event valueForKeyPath:@"row"]);
        NSInteger section = [[event
valueForKeyPath:@"section"]integerValue];
        NSInteger row = [[event
valueForKeyPath:@"row"]integerValue];

        //统计事件
        if (section == 0 && row == 1) {
//            [MobClick event:eventID];
        }

    } error:NULL];
}
```

- Appdelegate.m调用

```
[AspectMananer trackBttonEvent];
```