



进程退出机制

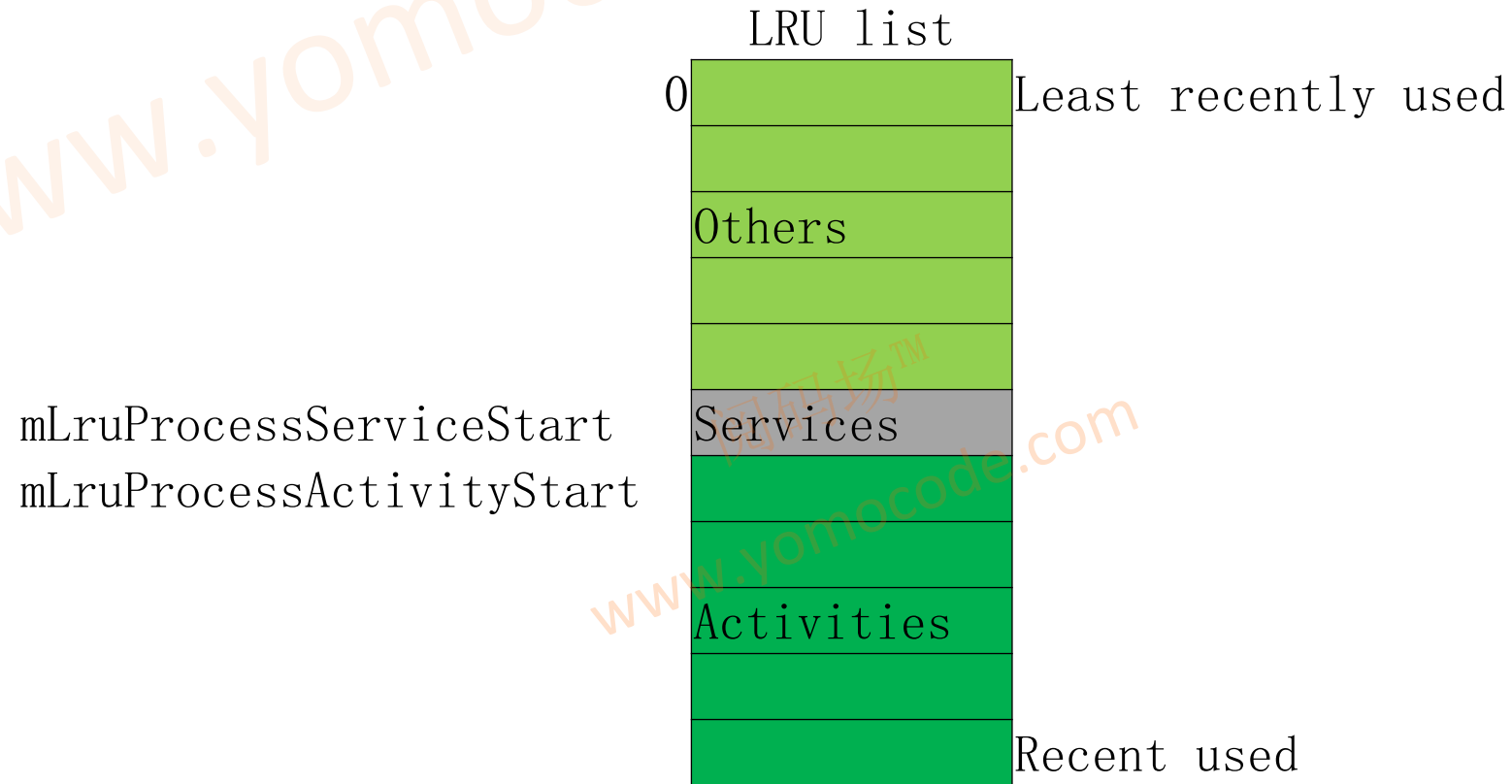
- 不主动退出
- 动机
 - 最大限度复用进程
 - 提供较好的用户体验
- 原因
 - 移动设备性能相对较弱
 - 应用被重复开启的概率高

三种进程退出机制

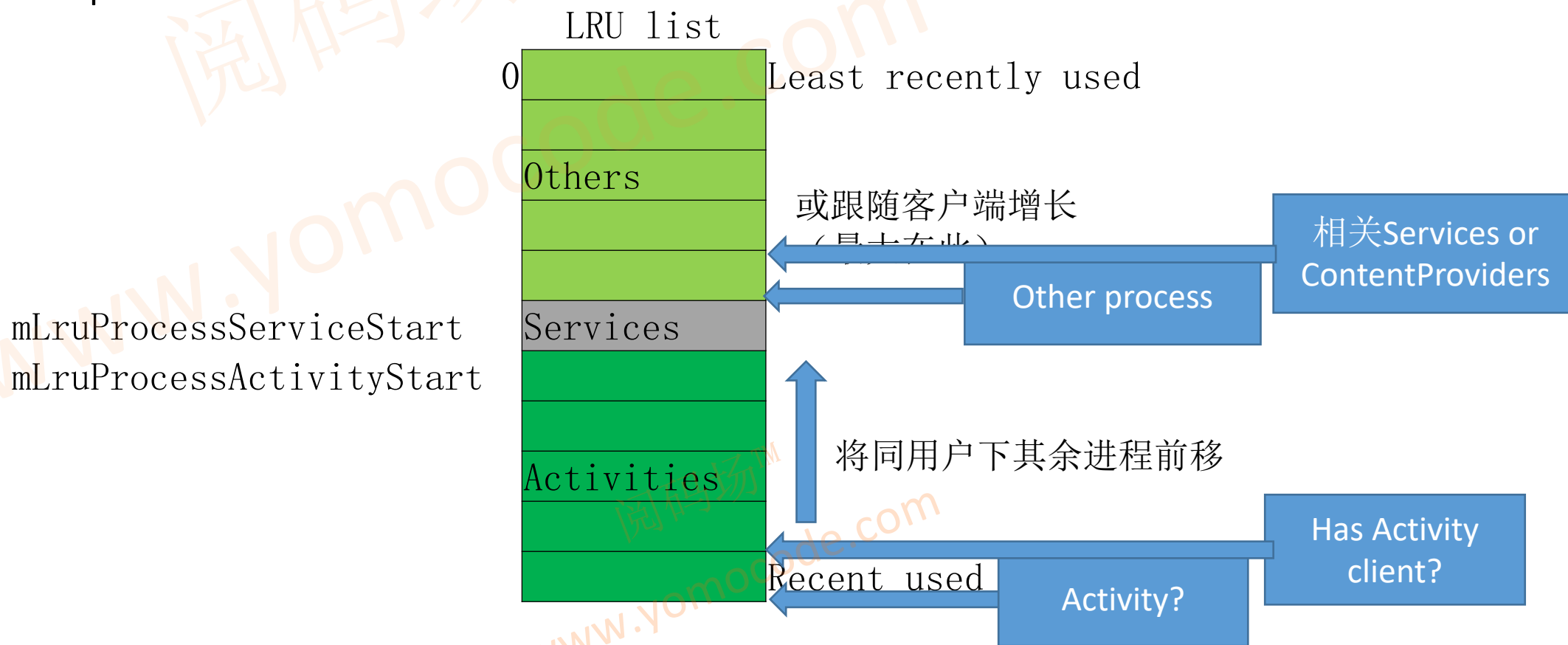
- 命令强制结束
- ActivityManagerService主动清理
- OOM清理

- LRU list
- ADJ

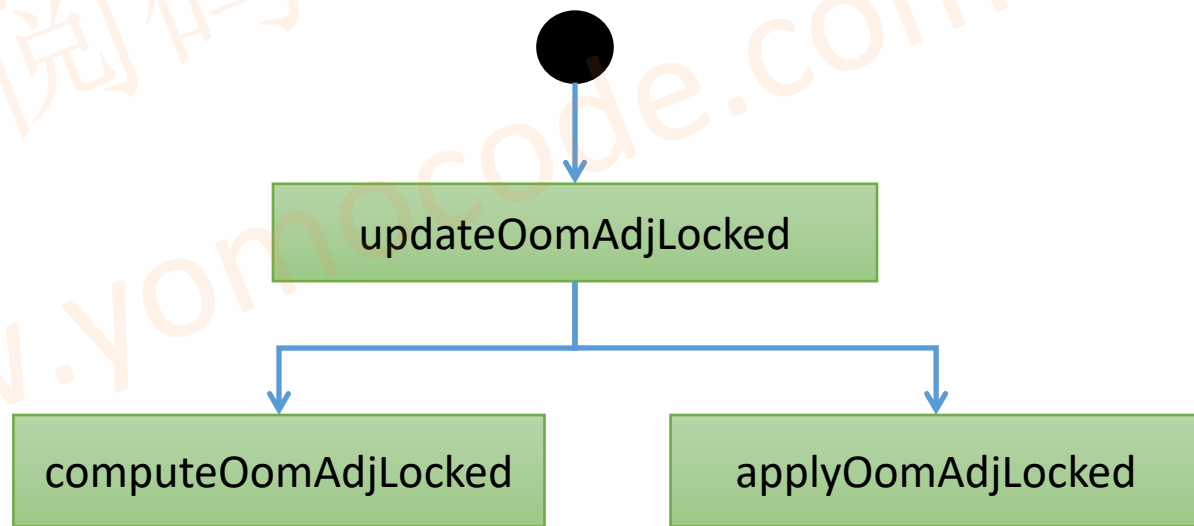
LRU(Least Recently Used)



- updateLruProcessLocked



ADJ

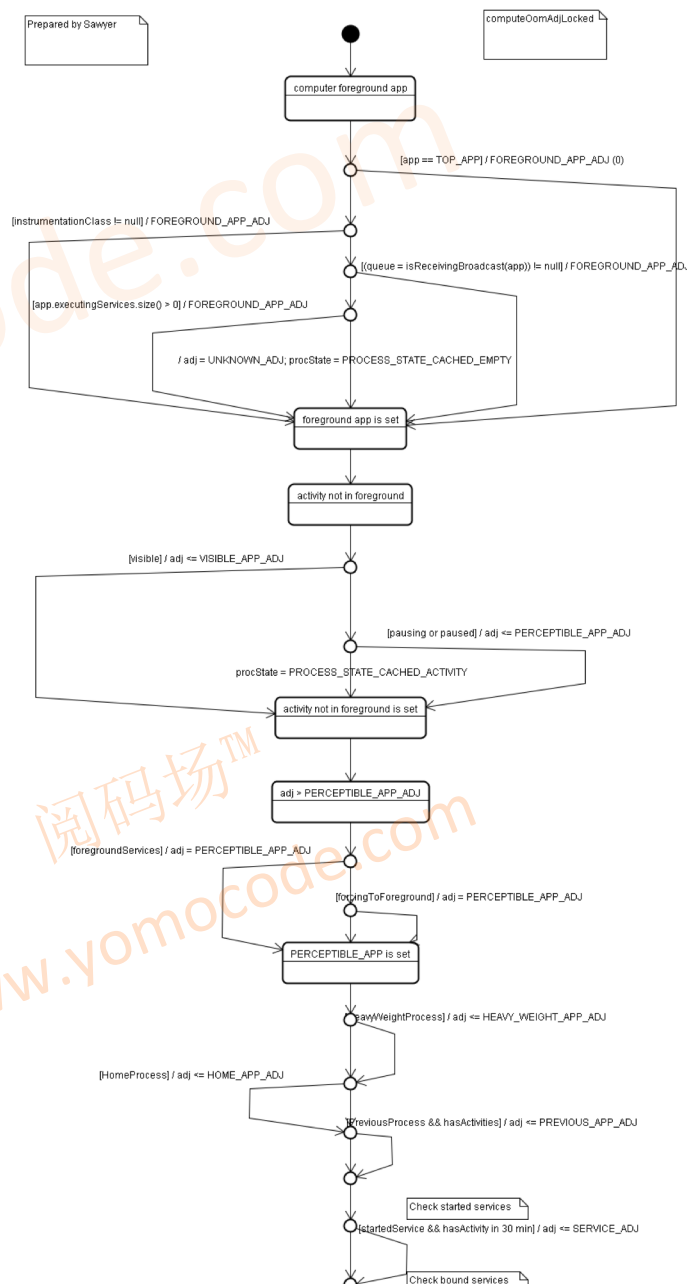


ADJ

- ProcessList

UNKNOWN_ADJ	1001
CACHED_APP_MAX_ADJ	906
CACHED_APP_MIN_ADJ	900
SERVICE_B_ADJ	800
PREVIOUS_APP_ADJ	700
HOME_APP_ADJ	600
SERVICE_ADJ	500
HEAVY_WEIGHT_APP_ADJ	400
BACKUP_APP_ADJ	300
PERCEPTIBLE_APP_ADJ	200
VISIBLE_APP_ADJ	100
VISIBLE_APP_LAYER_MAX	99
FOREGROUND_APP_ADJ	0
PERSISTENT_SERVICE_ADJ	-700
PERSISTENT_PROC_ADJ	-800
SYSTEM_ADJ	-900
NATIVE_ADJ	-1000

前台进程相关



ADJ

- ProcessList

UNKNOWN_ADJ	1001
CACHED_APP_MAX_ADJ	906
CACHED_APP_MIN_ADJ	900
SERVICE_B_ADJ	800
PREVIOUS_APP_ADJ	700
HOME_APP_ADJ	600
SERVICE_ADJ	500
HEAVY_WEIGHT_APP_ADJ	400
BACKUP_APP_ADJ	300
PERCEPTIBLE_APP_ADJ	200
VISIBLE_APP_ADJ	100
VISIBLE_APP_LAYER_MAX	99
FOREGROUND_APP_ADJ	0
PERSISTENT_SERVICE_ADJ	-700
PERSISTENT_PROC_ADJ	-800
SYSTEM_ADJ	-900
NATIVE_ADJ	-1000

Slot for cached/empty process

Cache/Empty ADJ slot	
900	CACHED_APP_MIN_ADJ
901	For cached process
902	For empty process
903	For cached process
904	For empty process
905	For cached process
906	CACHED_APP_MAX_ADJ

基于LRU list逆序

命令强制结束

- forceStopPackage
 - killPackageProcessesLocked
- killBackgroundProcesses

forceStopPackageLocked(packageName, userId)

killPackageProcessesLocked(packageName, userId, appId)

ActivityManagerService

检查packageName, uid, appId

sendSignalQuiet(pid, SIGNAL_KILL)

Process.java

kill(pid, SIGNAL_KILL)

android_util_Process.cpp

ProcessMap

ProcessRecord

ProcessRecord

ProcessRecord

ProcessRecord

ProcessRecord

ProcessRecord

命令强制结束

- killBackgroundProcesses
 - killPackageProcessesLocked(ProcessList.SERVICE_ADJ)

killBackgroundProcesses(packageName, userId)

killPackageProcessesLocked(packageName, userId, appId)

ActivityManagerService

sendSignalQuiet(pid, SIGNAL_KILL)

Process.java

kill(pid, SIGNAL_KILL)

android_util_Process.cpp

检查packageName, uid, appId
且ADJ >= SERVICE_ADJ

ProcessMap

ProcessRecord

ProcessRecord

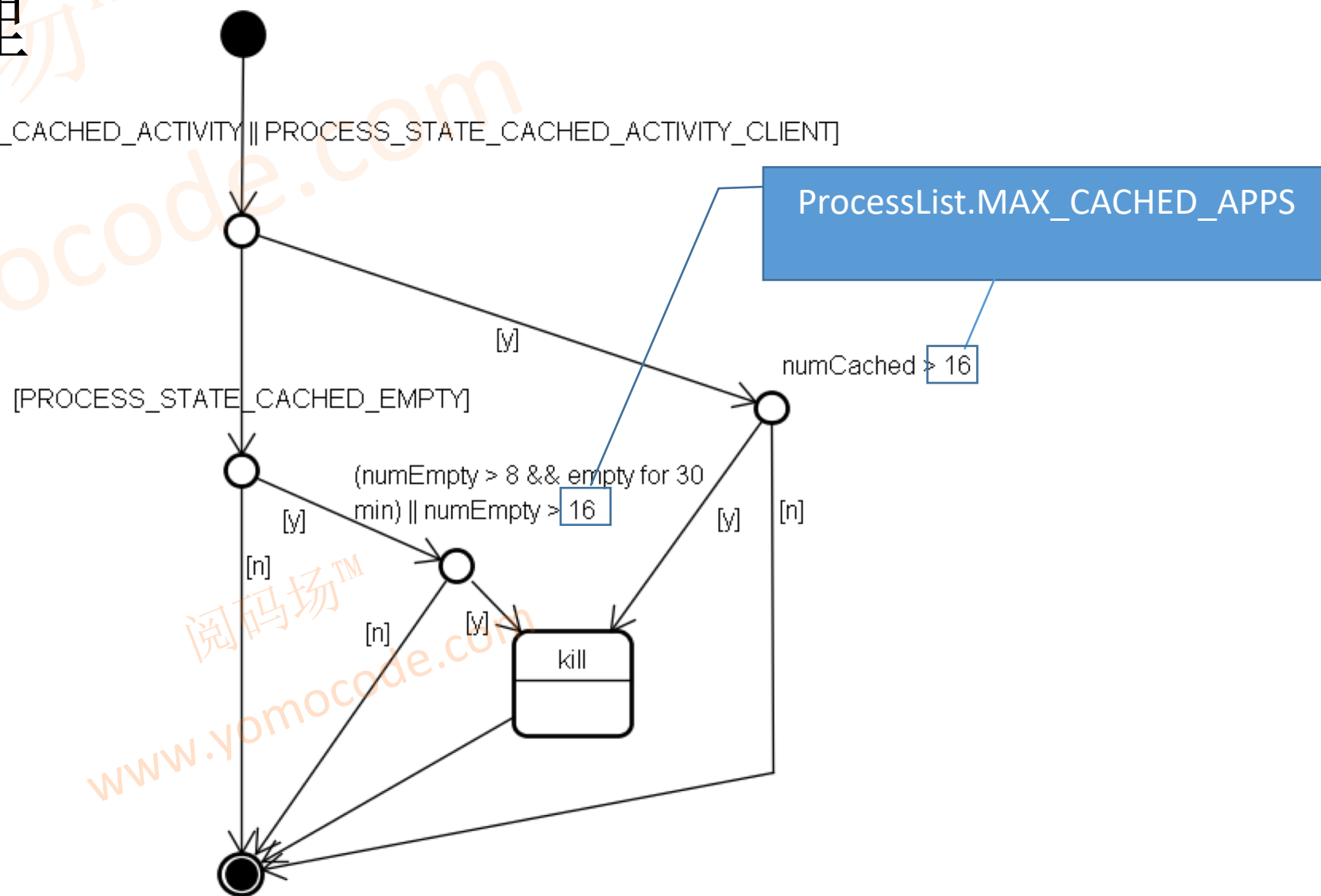
ProcessRecord

ProcessRecord

ProcessRecord

ProcessRecord

AMS主动清理



Trim Memory

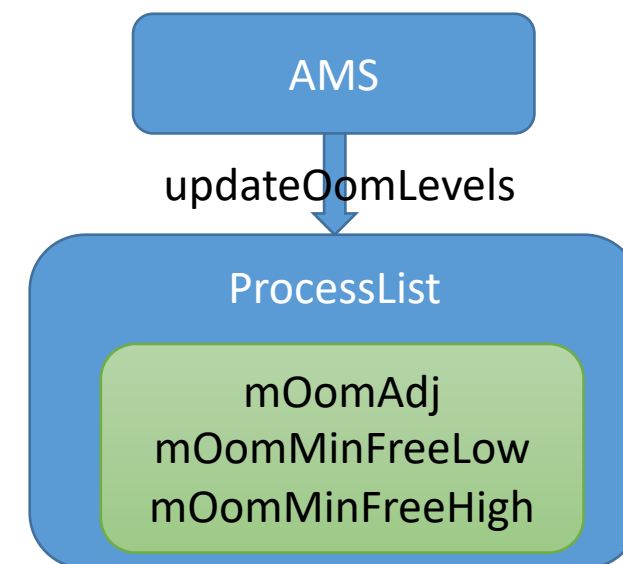
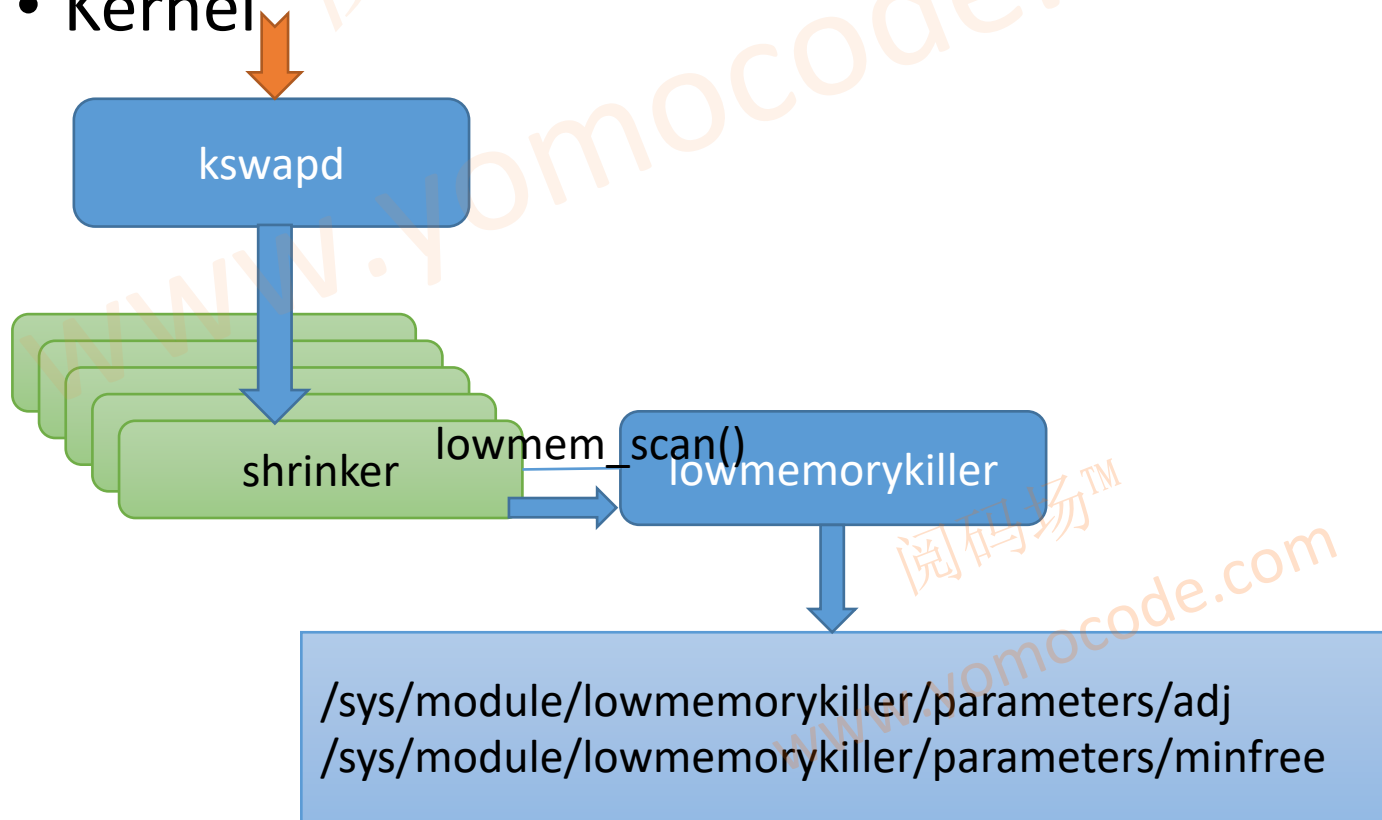
- onLowMemory
- onTrimMemory
 - Application
 - Activity
 - Fragment
 - Service
 - ContentProvider

OOM的最后一刀

- LowMemoryKiller
- Imkd

LowMemoryKiller

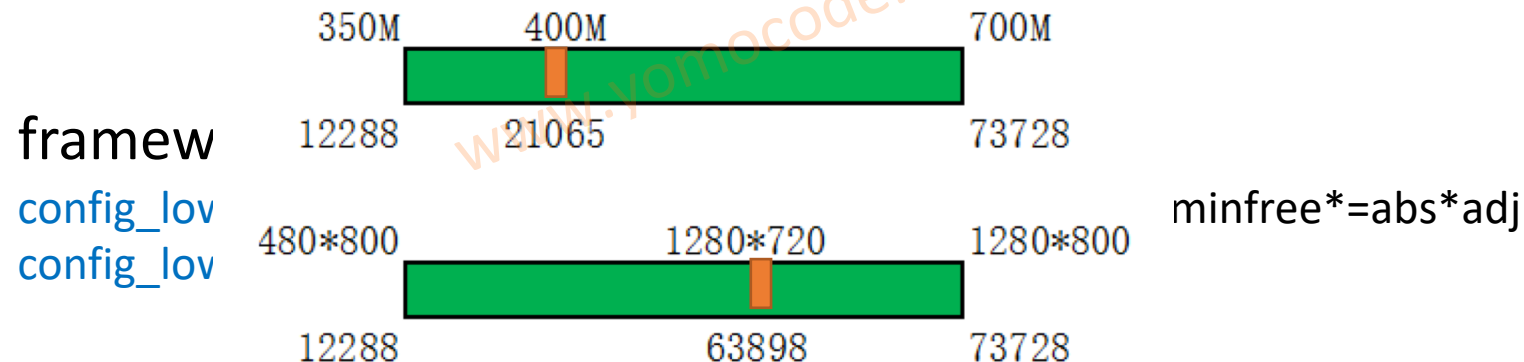
- Kernel



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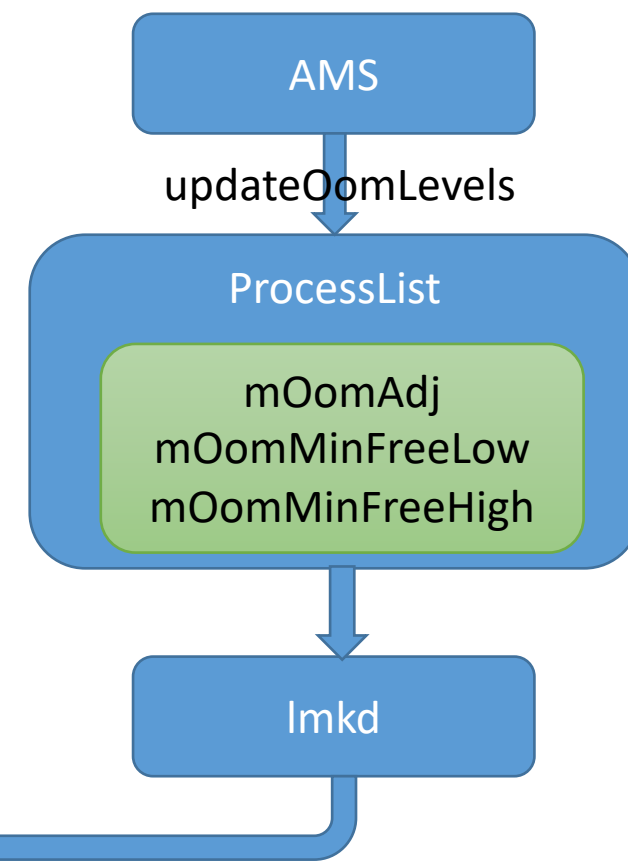
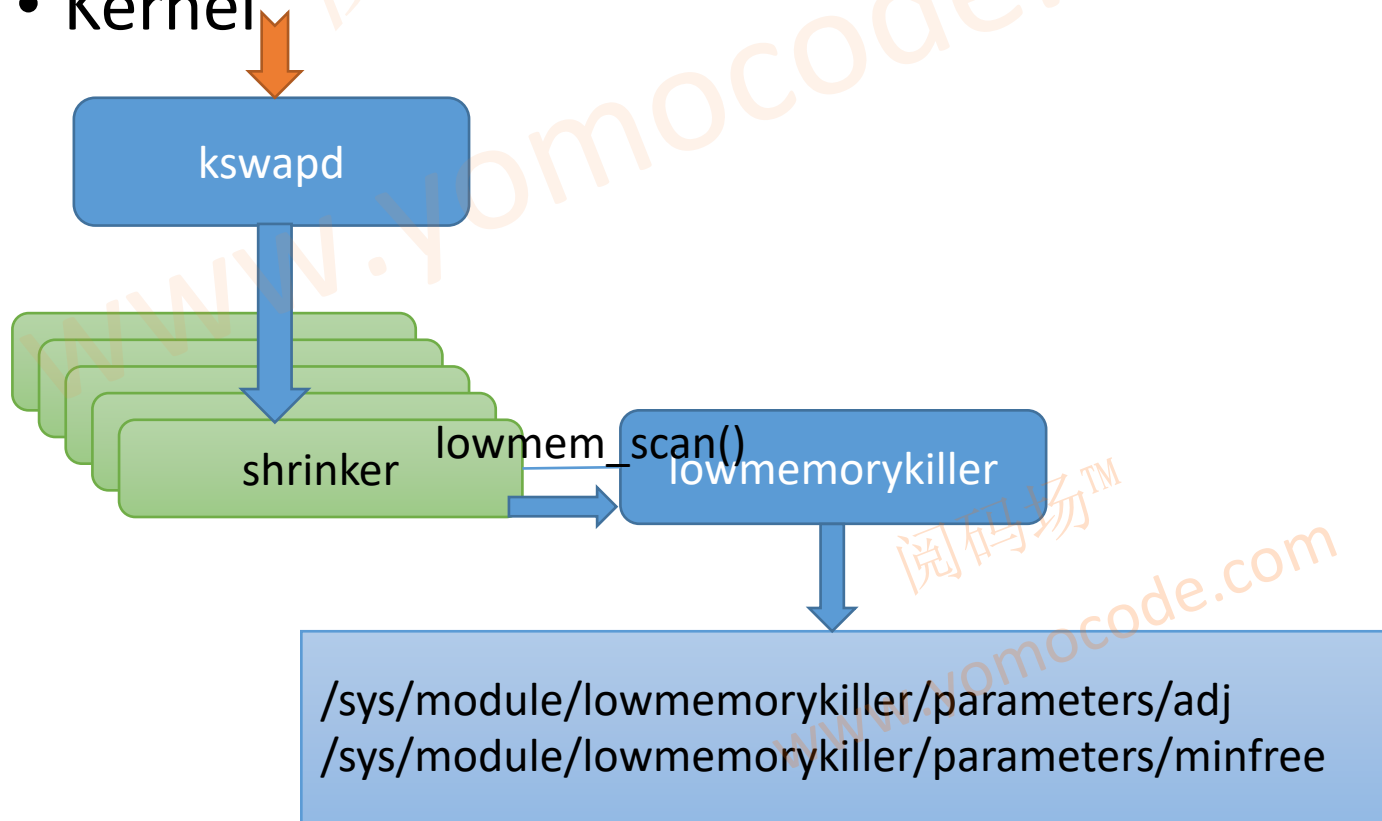
private final int[] mOomAdj = new int[] {
    FOREGROUND_APP_ADJ, VISIBLE_APP_ADJ, PERCEPTIBLE_APP_ADJ,
    BACKGROUND_APP_ADJ, CACHED_APP_MIN_ADJ, CACHED_APP_MAX_ADJ,
};
// These are the low-end OOM level limits. This is
// HVGA or smaller phone with less than 512MB. Val
private final int[] mOomMinFreeLow = new int[] {
    12288, 18432, 24576,
    36864, 43008, 49152
};
// These are the high-end OOM level limits. This is

```



LowMemoryKiller

- Kernel

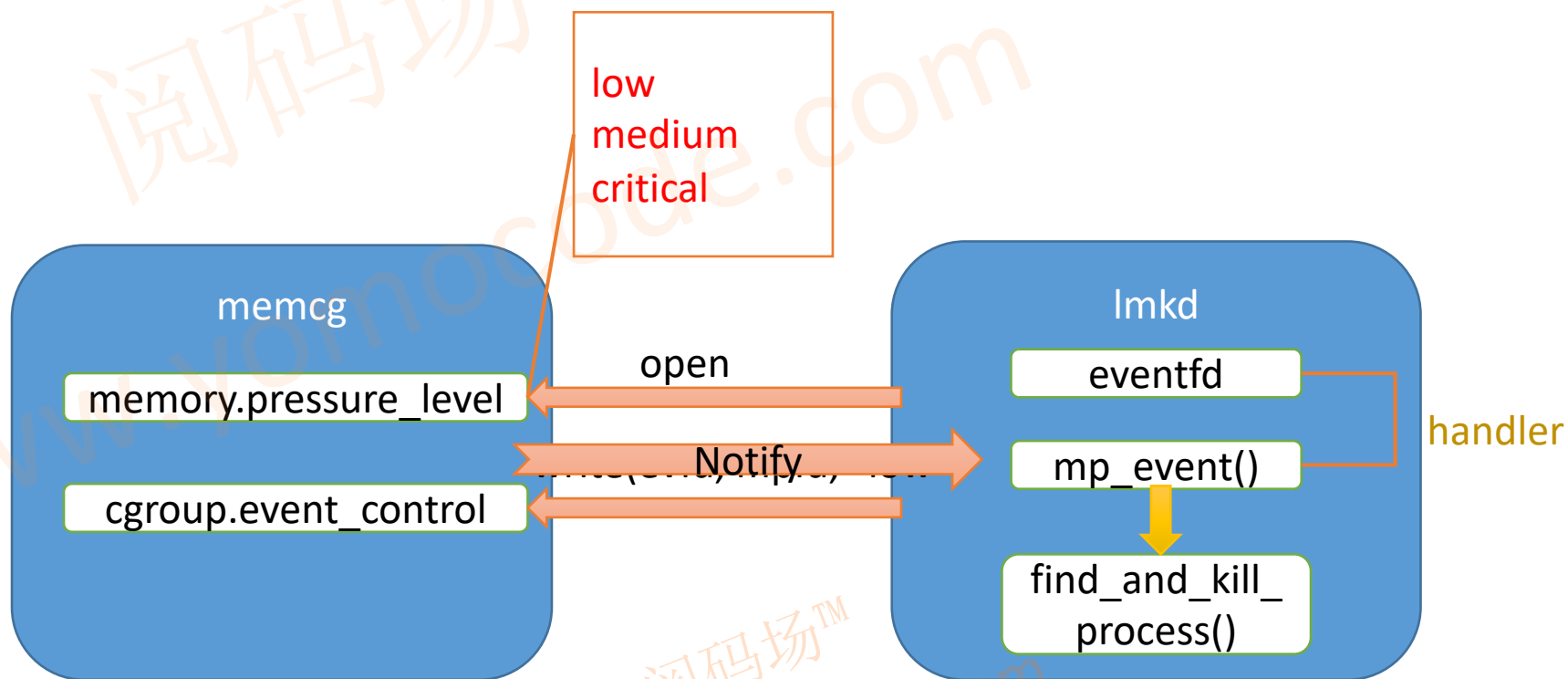


ADJ	Value	MinFree
CACHED_APP_MAX_ADJ	906	180M
	905	
	904	
	903	
	902	
	901	
CACHED_APP_MIN_ADJ	900	144M
SERVICE_B_ADJ	800	
PREVIOUS_APP_ADJ	700	
HOME_APP_ADJ	600	
SERVICE_ADJ	500	
HEAVY_WEIGHT_APP_ADJ	400	
BACKUP_APP_ADJ	300	126M
PERCEPTIBLE_APP_ADJ	200	108M
VISIBLE_APP_ADJ	100	90M
VISIBLE_APP_LAYER_MAX	99	
FOREGROUND_APP_ADJ	0	72M
PERSISTENT_SERVICE_ADJ	-700	
PERSISTENT_PROC_ADJ	-800	
SYSTEM_ADJ	-900	
NATIVE_ADJ	-1000	



Imkd

- Memory CGroup
 - /dev/memcg

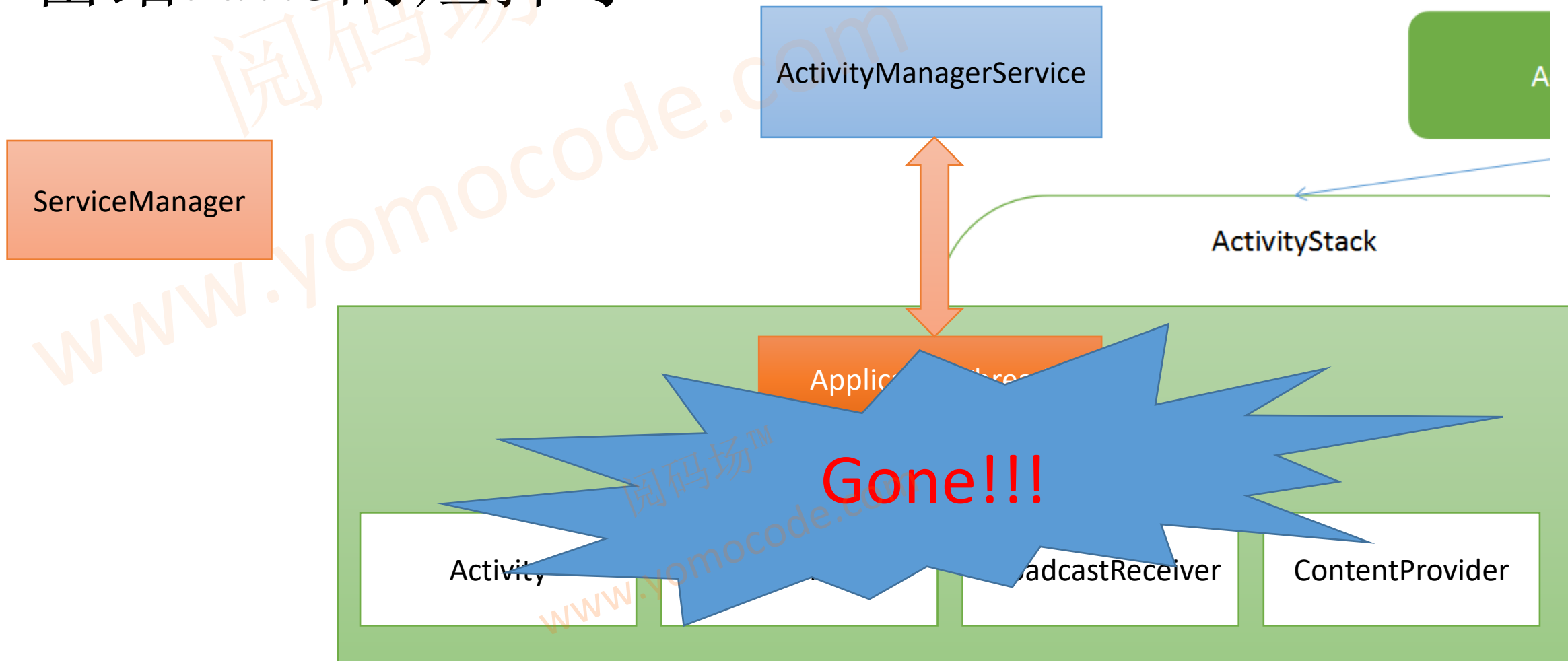


留给AMS的烂摊子

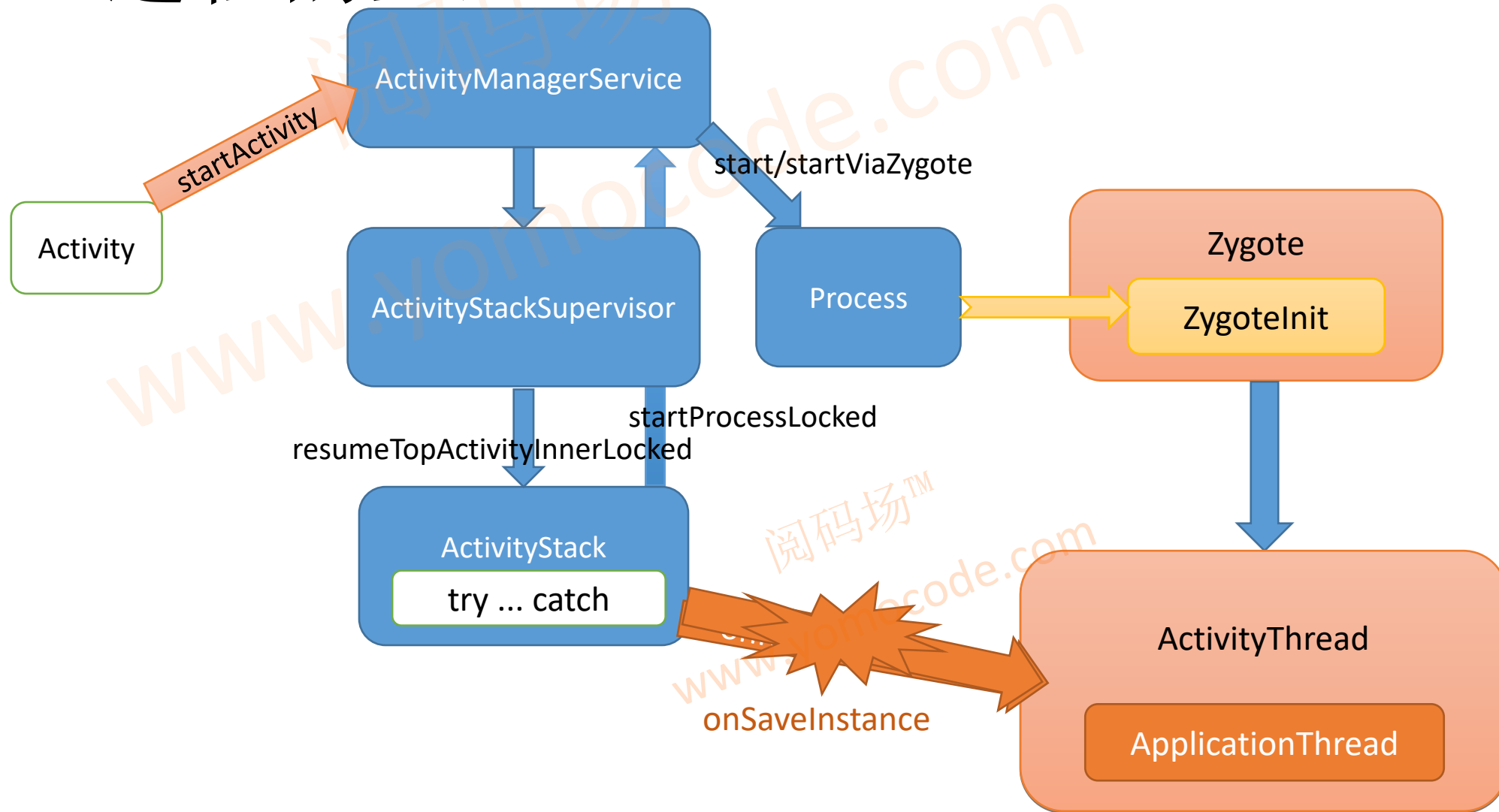
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进程的重生





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