

数亿级用户规模下的 React native工程实践



berg



ABOUT ME

- 雷志兴 - berg
- 手机百度架构师
- 微信公众号： DevLife
 - 前端、Native端融合
 - 前端基础技术、工程化



OUTLINE

- 为什么选择React native
- 与现有业务和迭代融合
- 性能优化实践
- React Native的工程价值



手机百度

- 迭代周期：4周
- 主要Feature：数十个
- 开发工时：数千人时
- 跨部门，沟通成本高
- 业务种类多，集成成本高



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过去解耦方案

迭代速度慢
开发、集成成本高
准入流程长



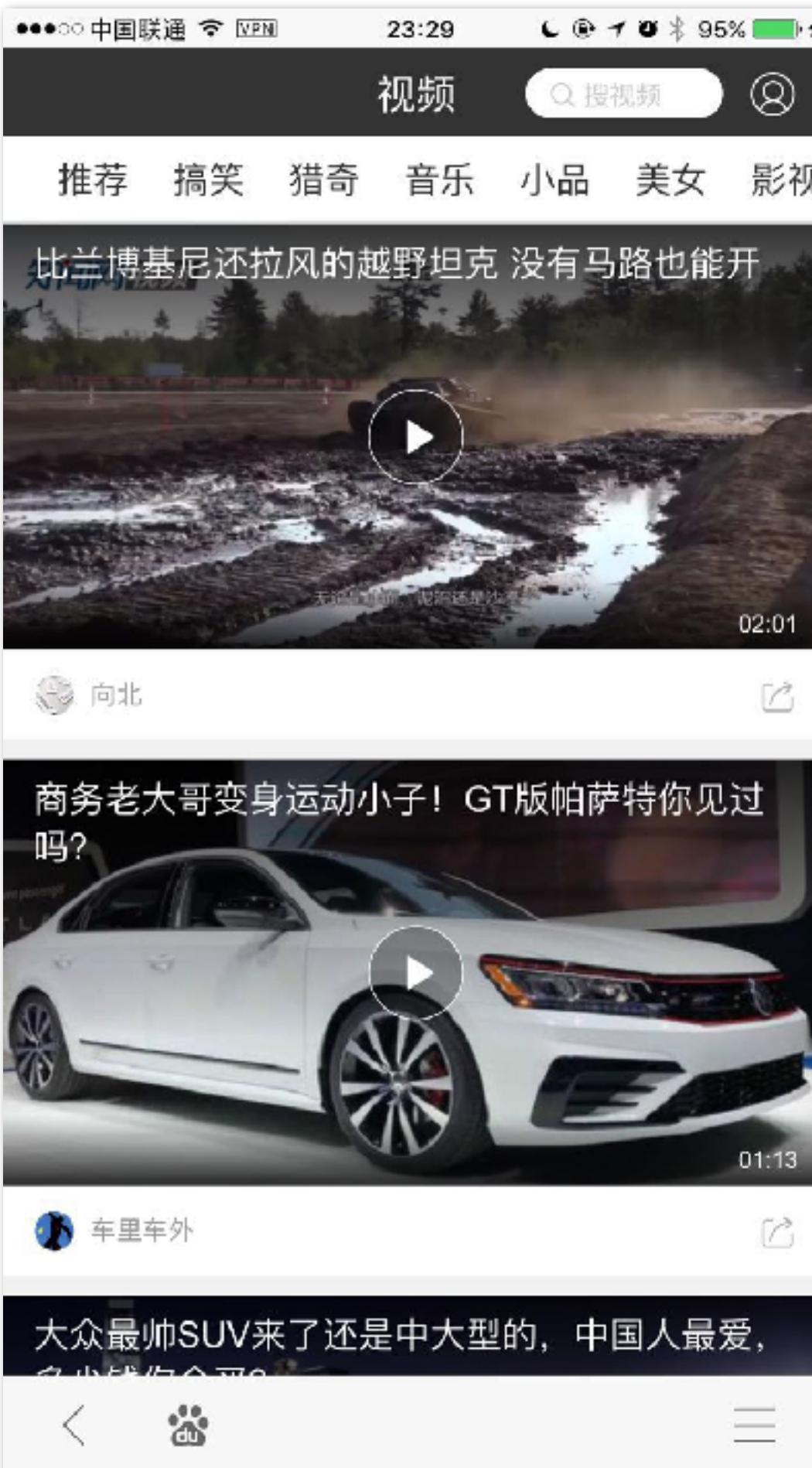
APK插件/SDK



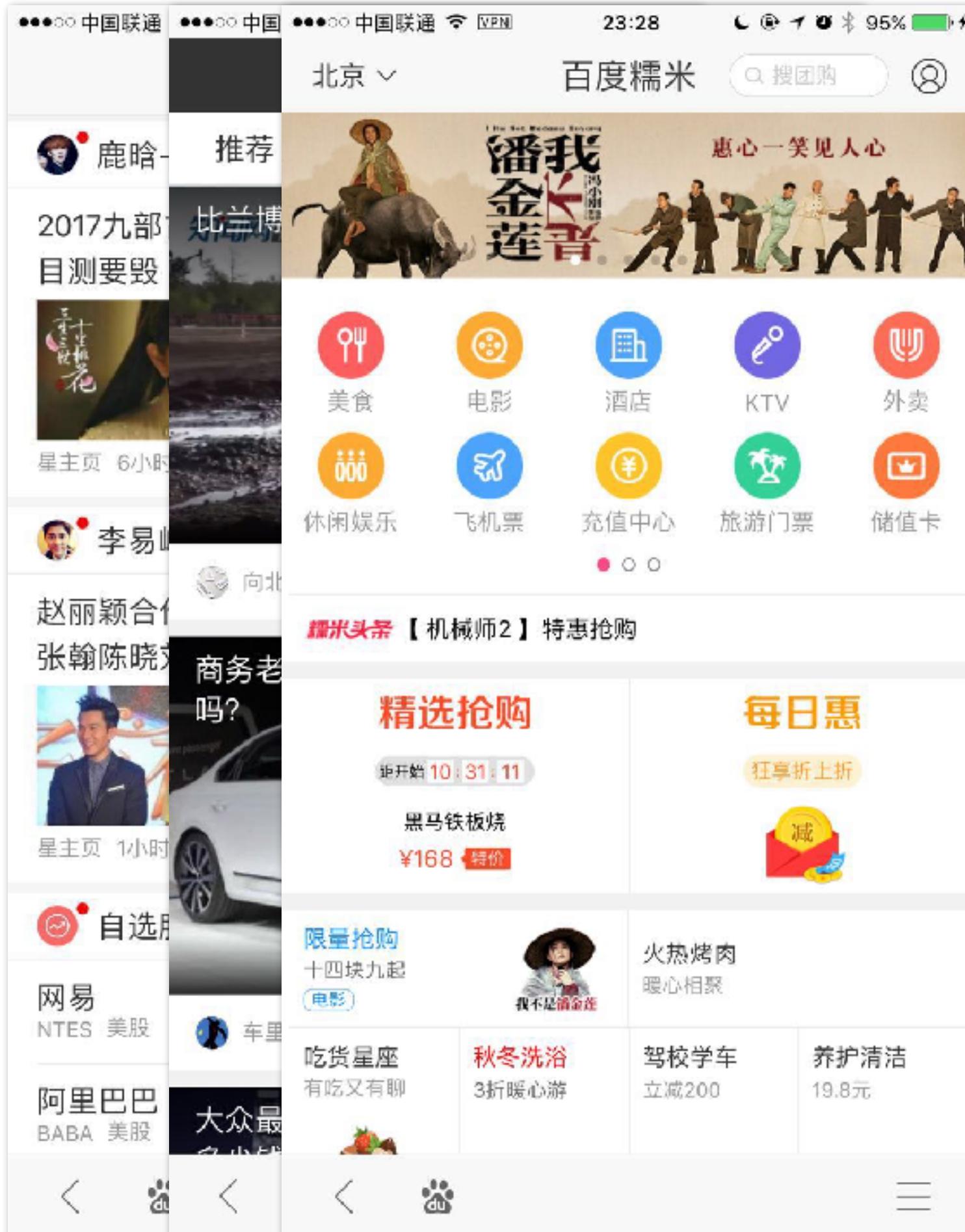
Hybrid

体验、效果差
本地能力依赖发版

React Native@手机百度

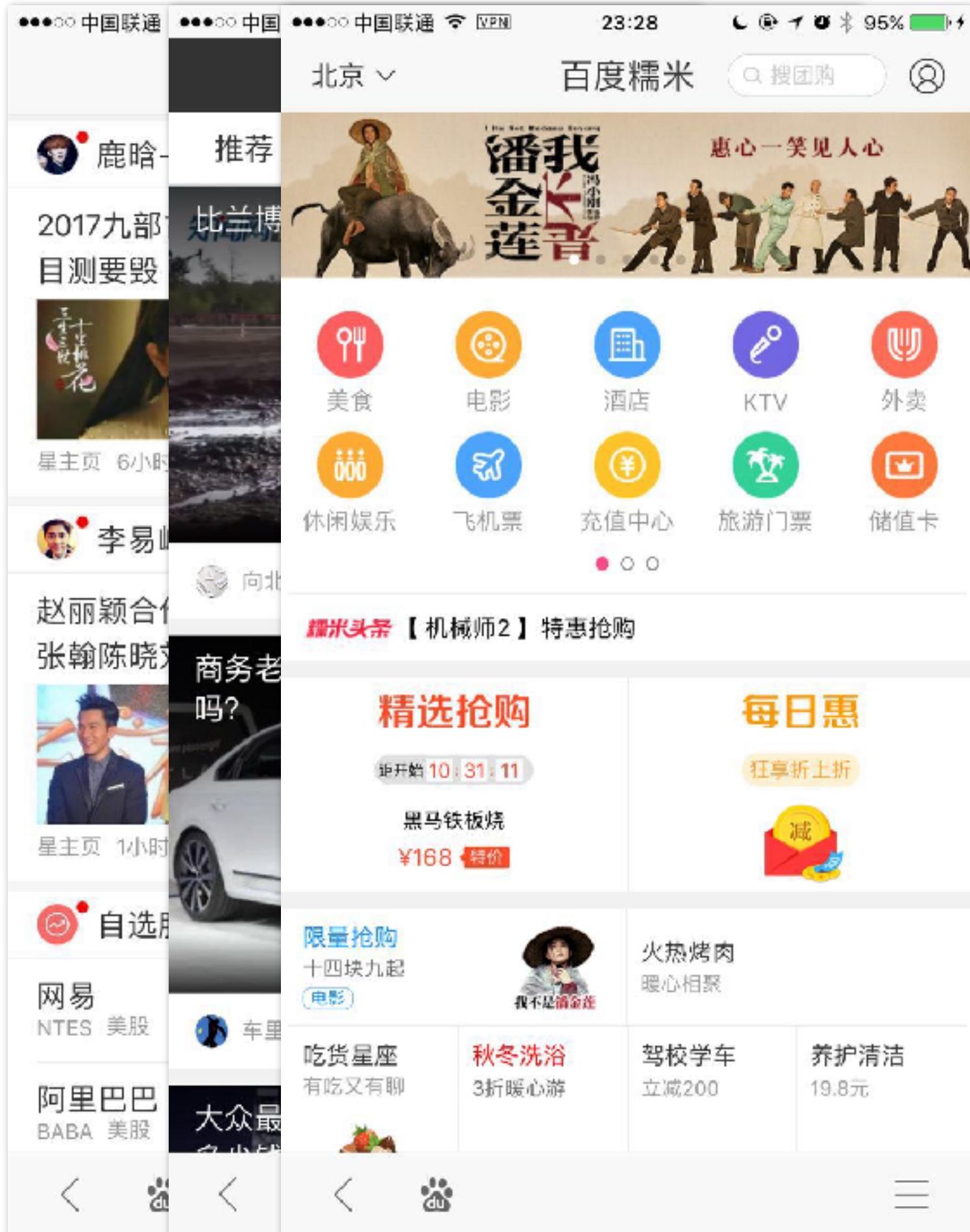


React Native@手机百度



- RN版本: **v0.35**
- RN用户数: **2亿+**
- RN启动次数: **15亿+**
- 总崩溃率: **0.07%**
- 24h收敛率: **98%**
- **5-8倍的迭代速度**

React Native 的工程实践



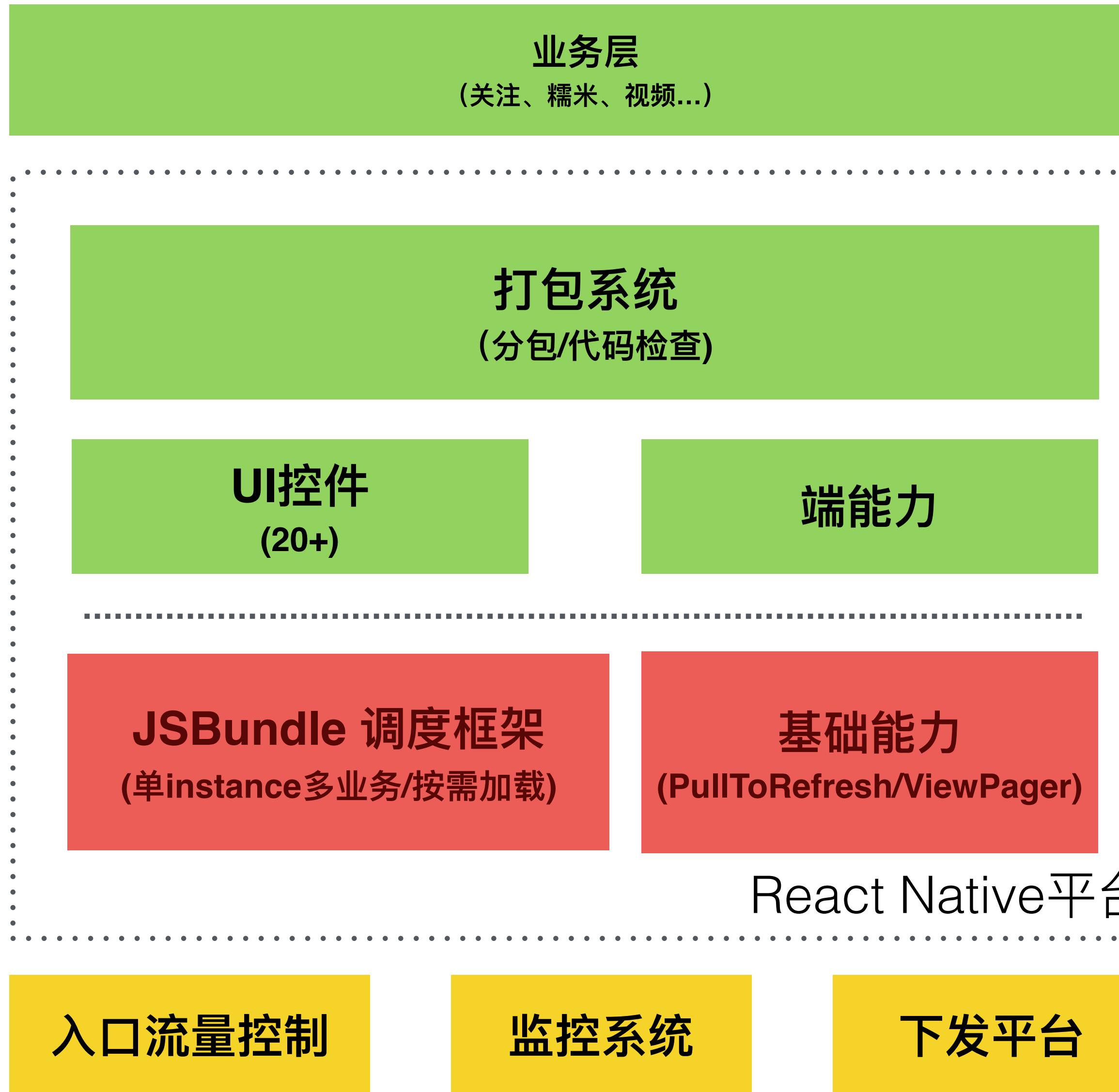
- 与现有业务融合
选型、人力投入、回退方案…
- 迭代流程、质量控制
准入、灰度、发布、回滚、监控…
- 性能优化
加载时间、Listview、动画…

需要系统性的考虑



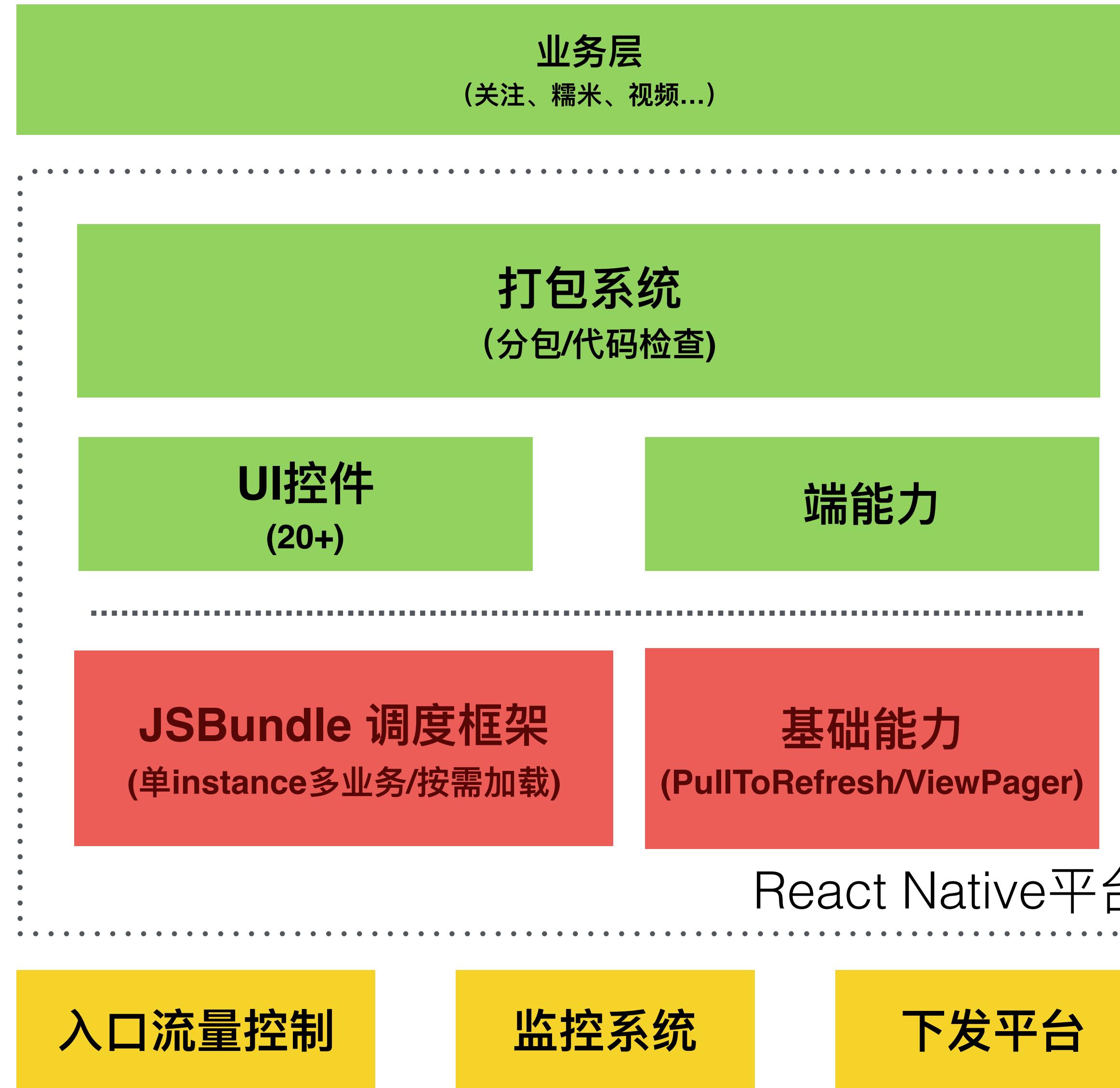
与现有业务融合

整体架构 - 兼容性



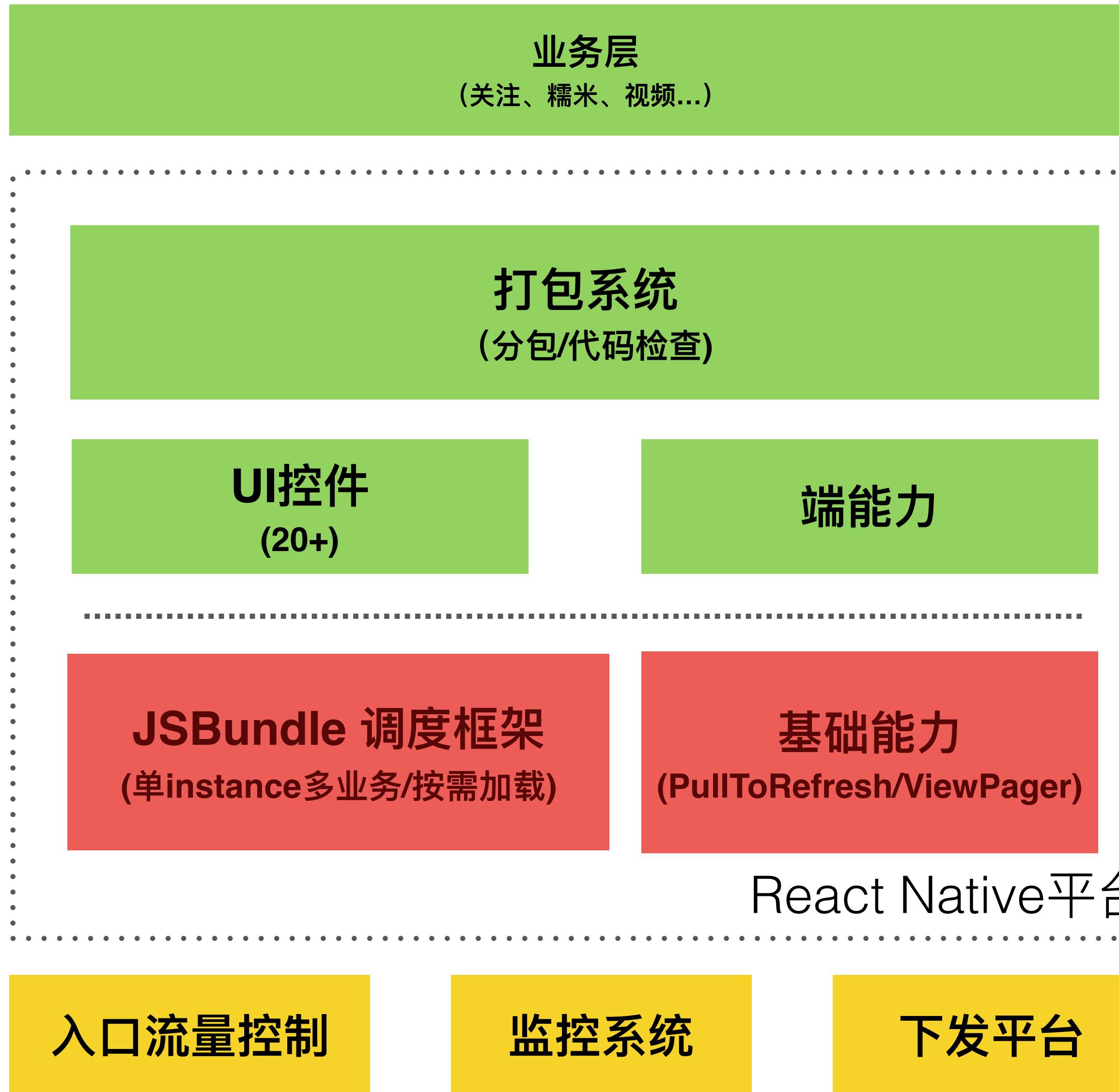
- Android:
 - >=4.1 (99%)
 - V29 >=4.4 (88%)
listview滑动内存释放缓慢，或与硬件加速有关
- iOS: >=8.0 (95%)
- 与宿主工程的兼容性
soLoader、Fresco、OKHttp

整体架构 - 兼容性



- 降级和兼容方案
 - 随时回撤
 - AB Test

整体架构 - 业务层



- HTML -> JSX
- CSS -> CSS-layout
无float/px/css继承/css sprites
- ES 5 -> ES 6
- DOM -> React native View
- 推荐Redux
统一管理state，减少事件滥用

业务层

- HTML -> JSX
 - CSS -> CSS-layout
无float/px/css继承/css sprites
 - ES 5 -> ES 6
 -
 -
 -
 -
 -
 -
 -
 -
 - 性能
 - 空间换时间、便利性换性能
 - 减少重绘、减少通讯

统一交互协议

React Native



Native

```
1 import {invoke} from 'baidu-invoke';
2 invoke('ClassName.methodName', {
3     key: value
4 })
5     .then(data => console.log(data.result))
6     .catch(error => console.log(error.code, error.message));
```

React Native



Native

```
1 import {eventListener} from 'baidu-invoke';
2 let event = eventListener.addListener($type, evt => {});
3 event.remove();
4 eventListener.removeAllListeners($type);
```

React Native



Native

JS

```
1 {
2     "rn_bundle_id": "rnplugin.myattention",
3     "rn_component_name": "MyAttention"
4 }
```

React Native

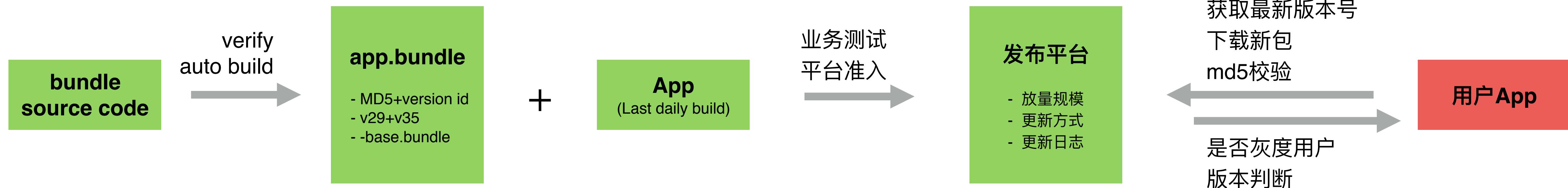
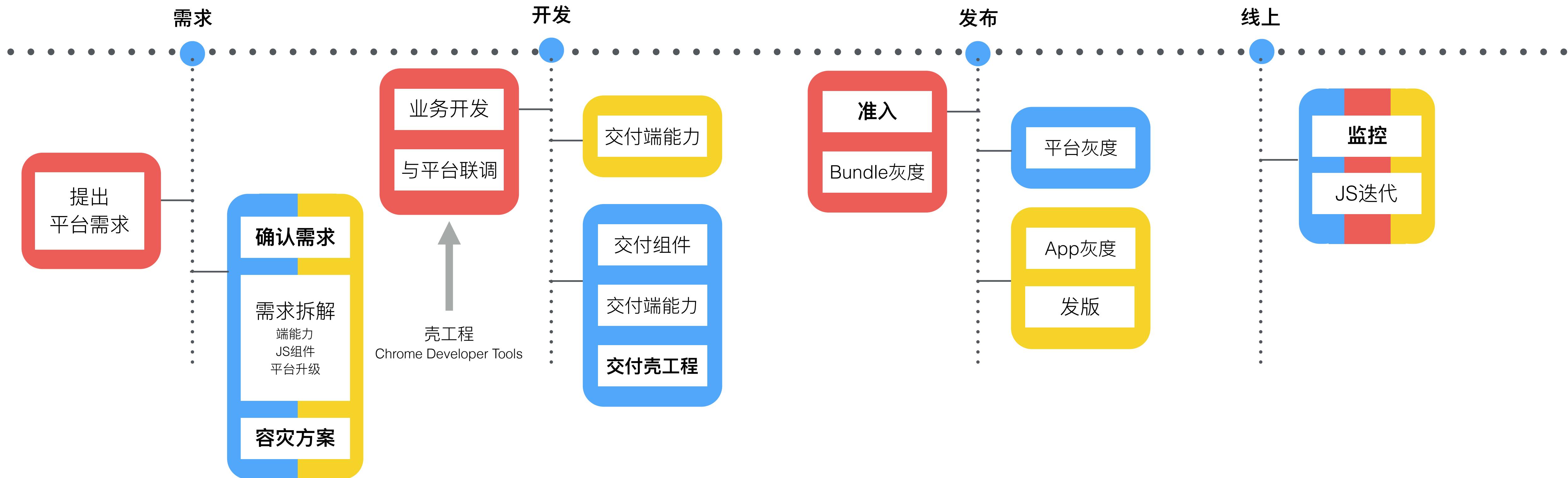


Server

通用增量接口

融入迭代流程

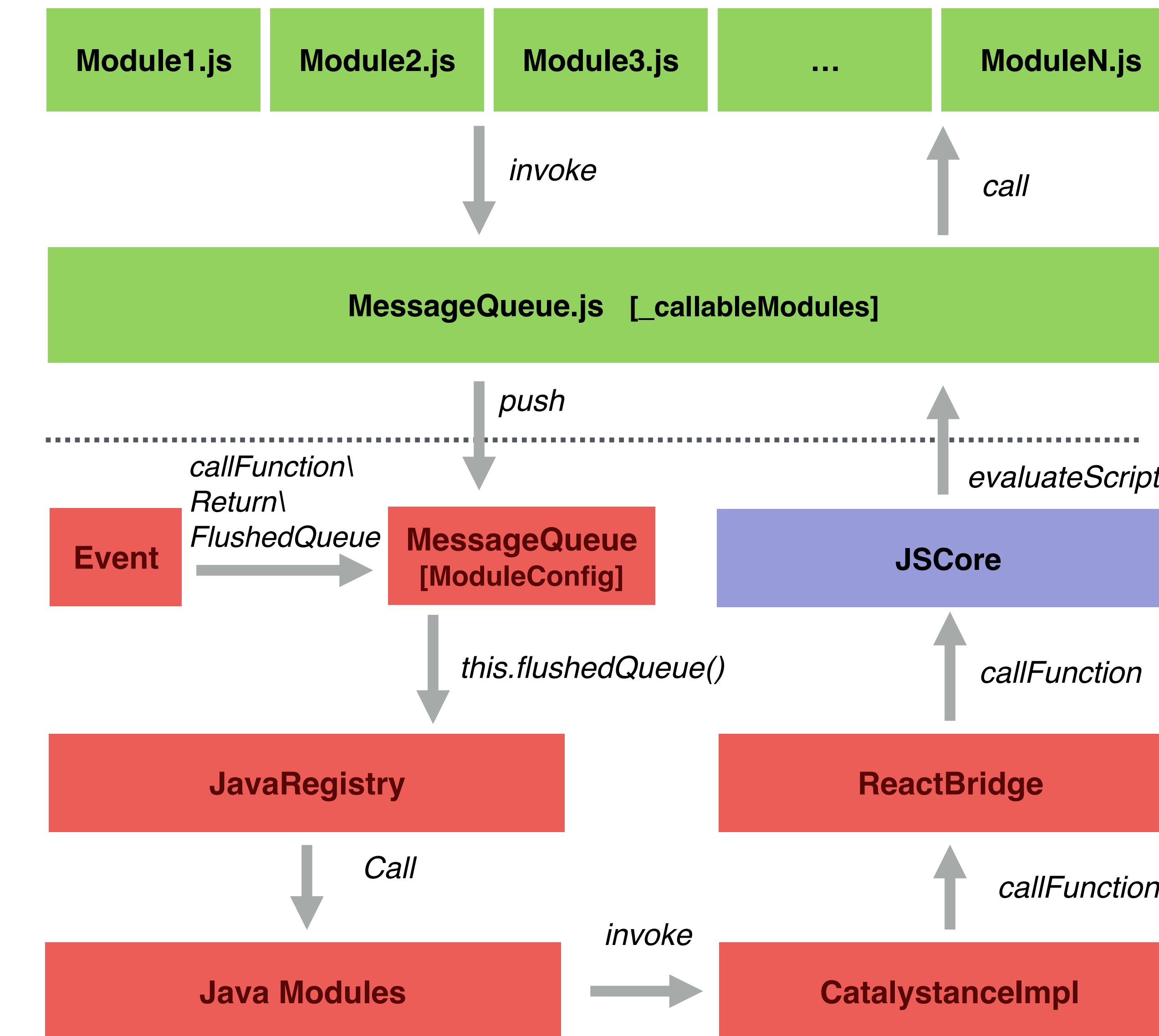
业务方 RN平台 APP端



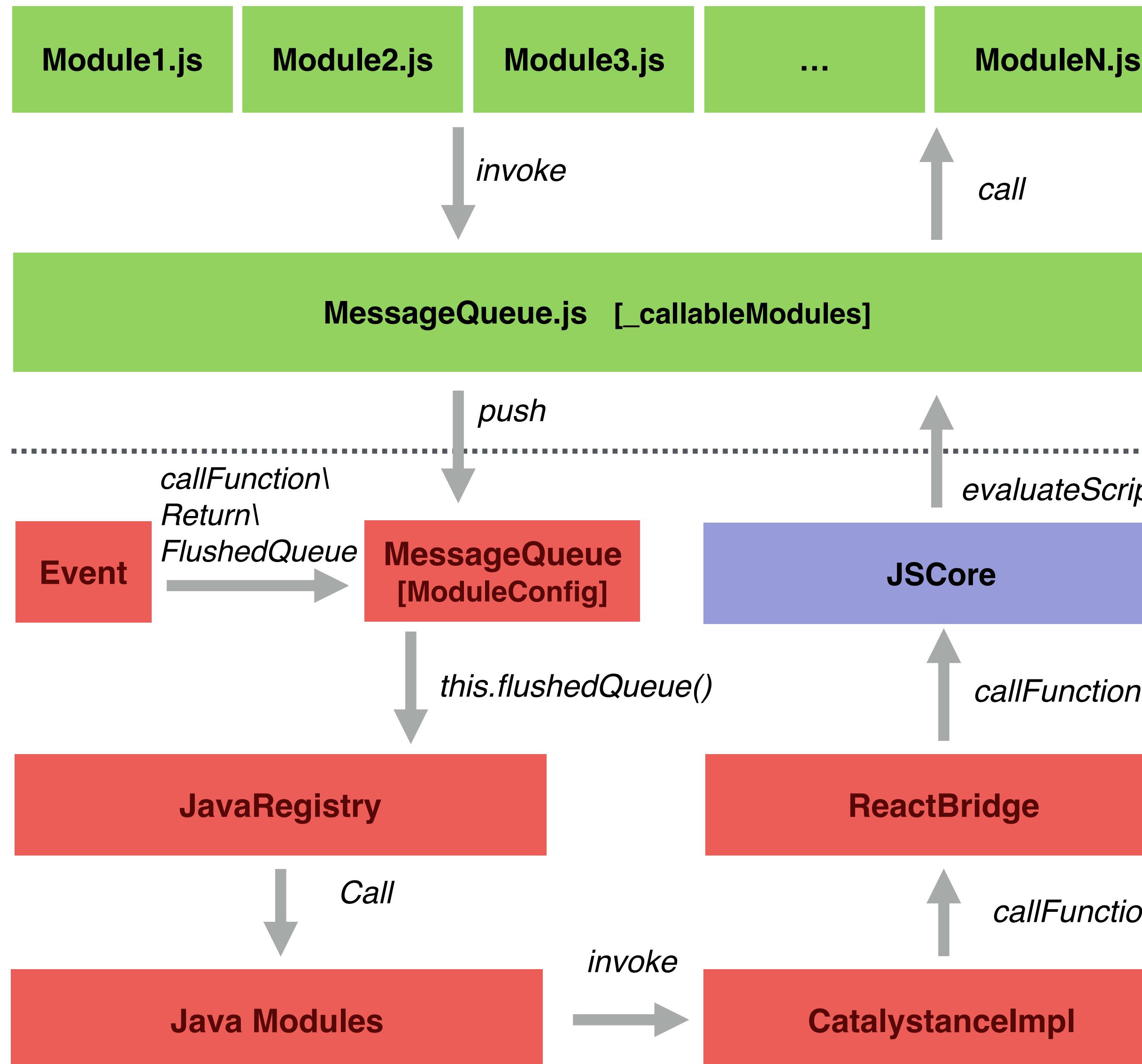
性能优化



React Native 通讯流程



React Native 通讯流程

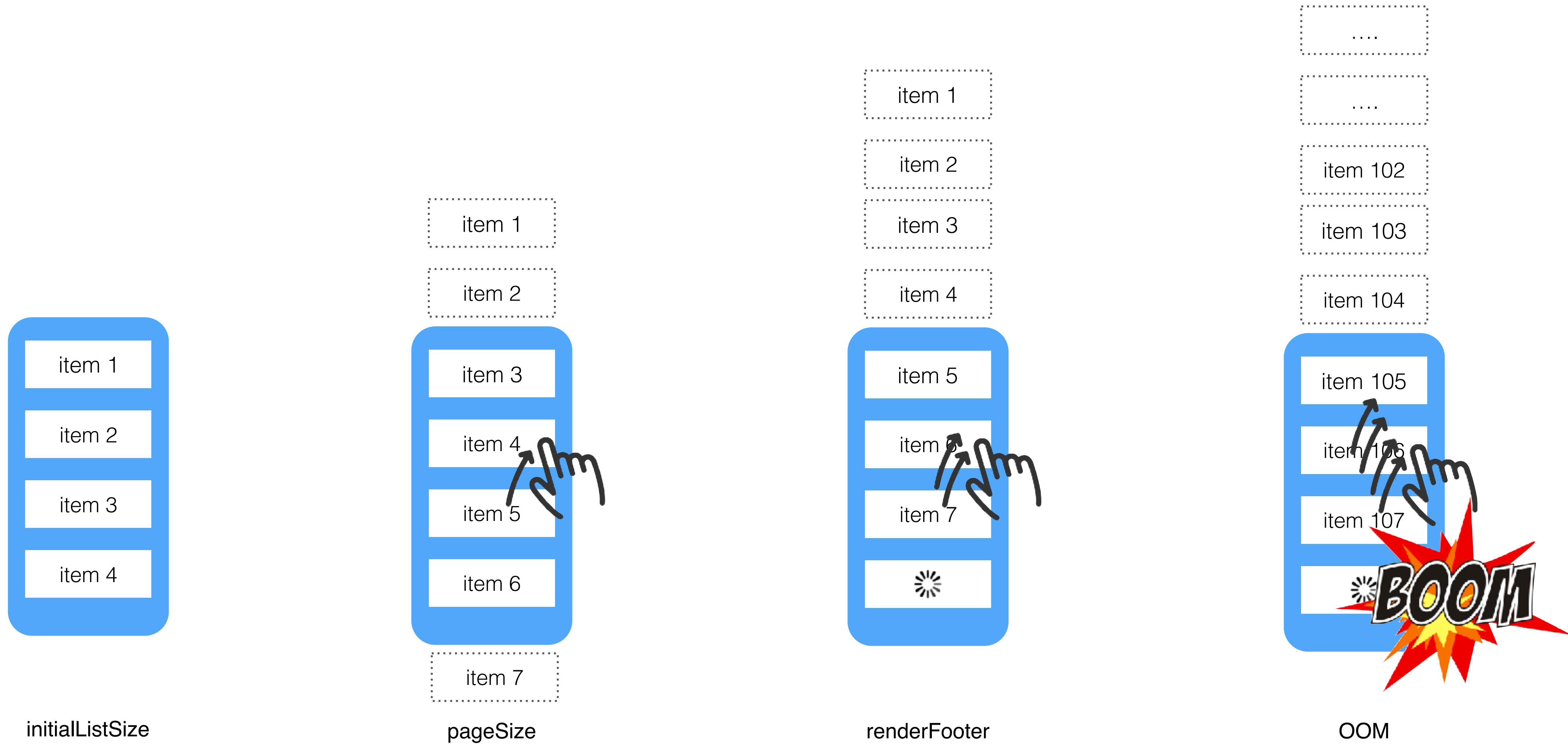


- 通讯频繁 by design
JS拥有足够的灵活性
- 易导致卡顿
 - 事件频率高
 - JS运行时间过长
 - UI频繁重绘
- 初始化成本较高
 - 生成模块配置表

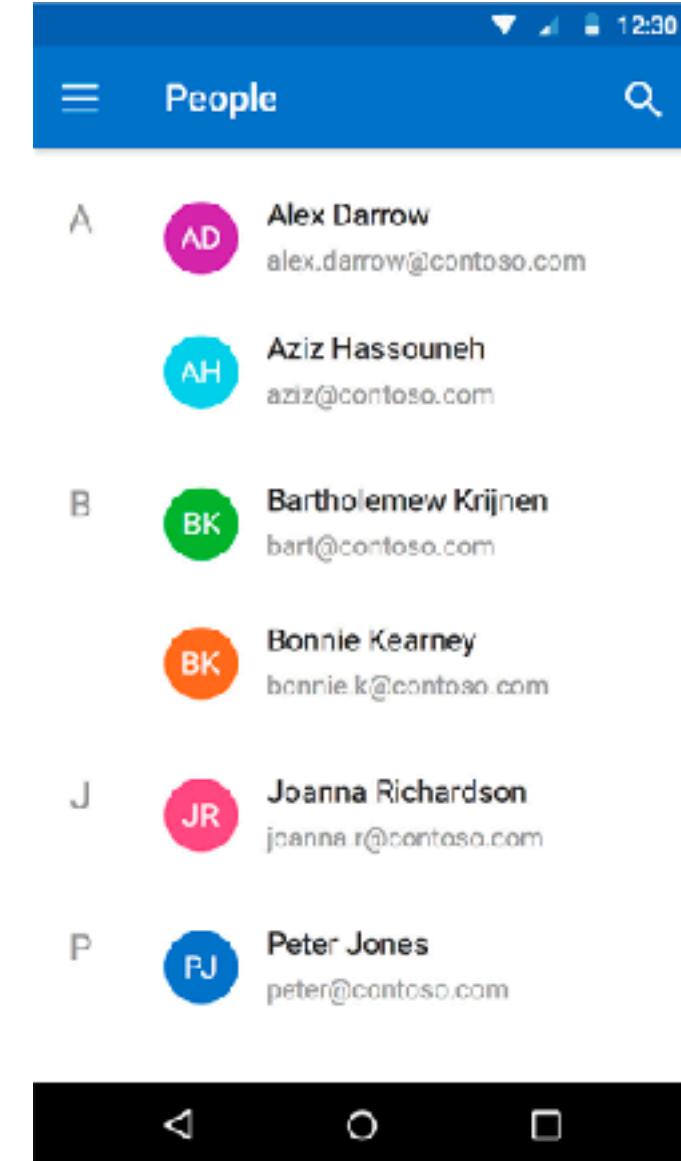
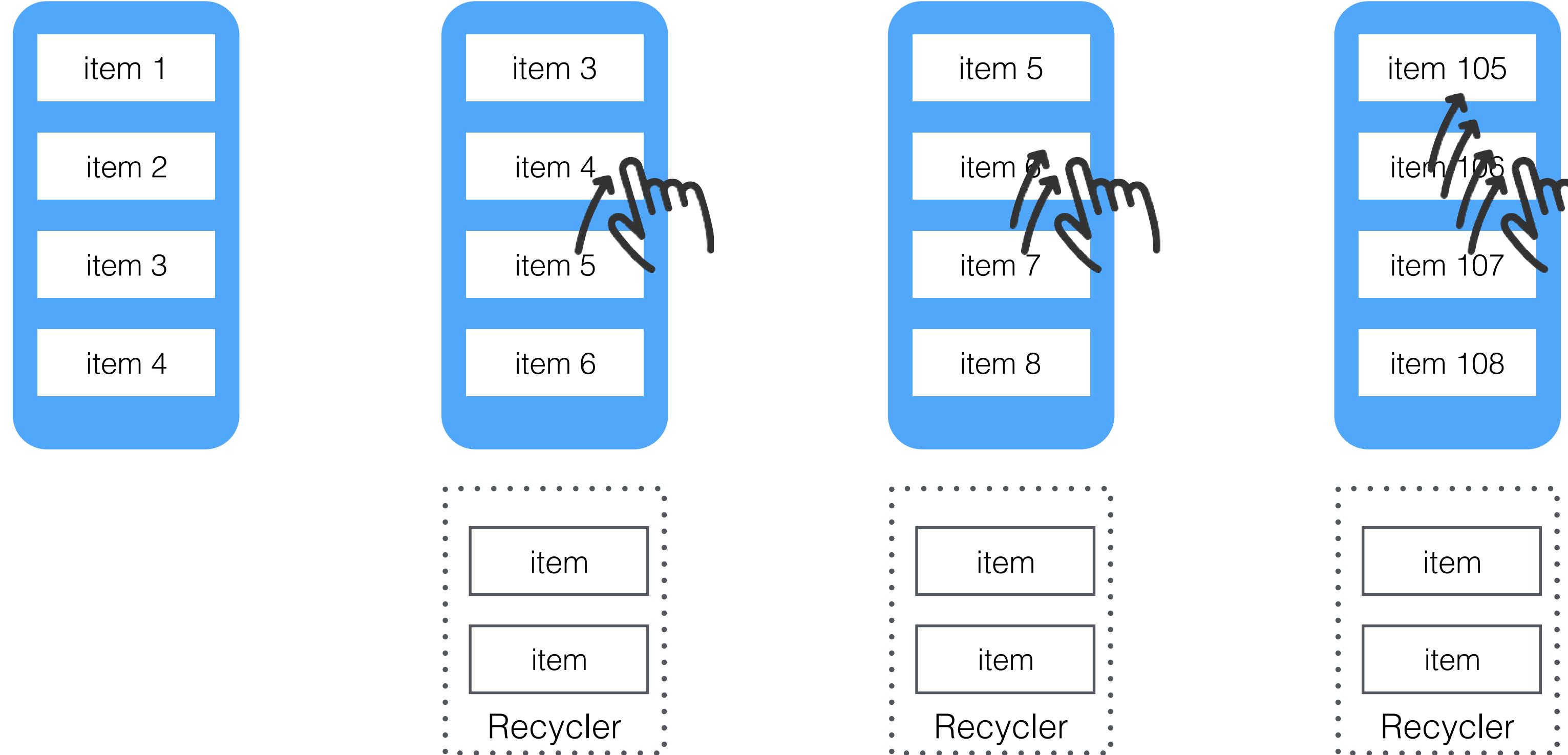
Listview优化



Listview @ React Native



Listview @ Native

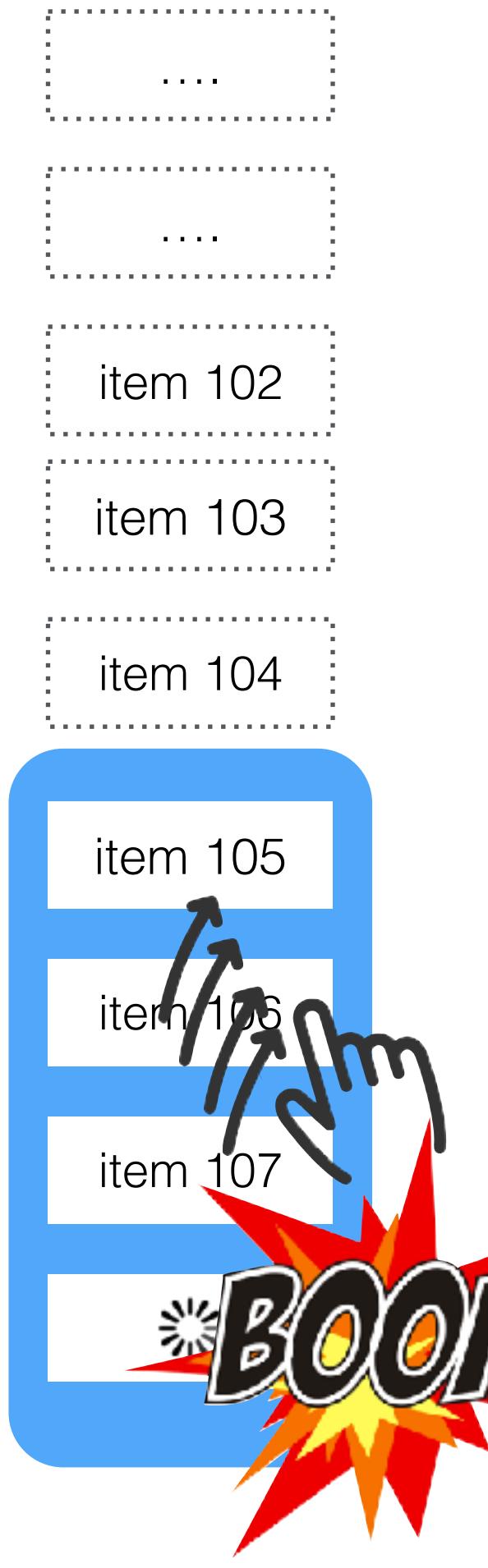


Anchor

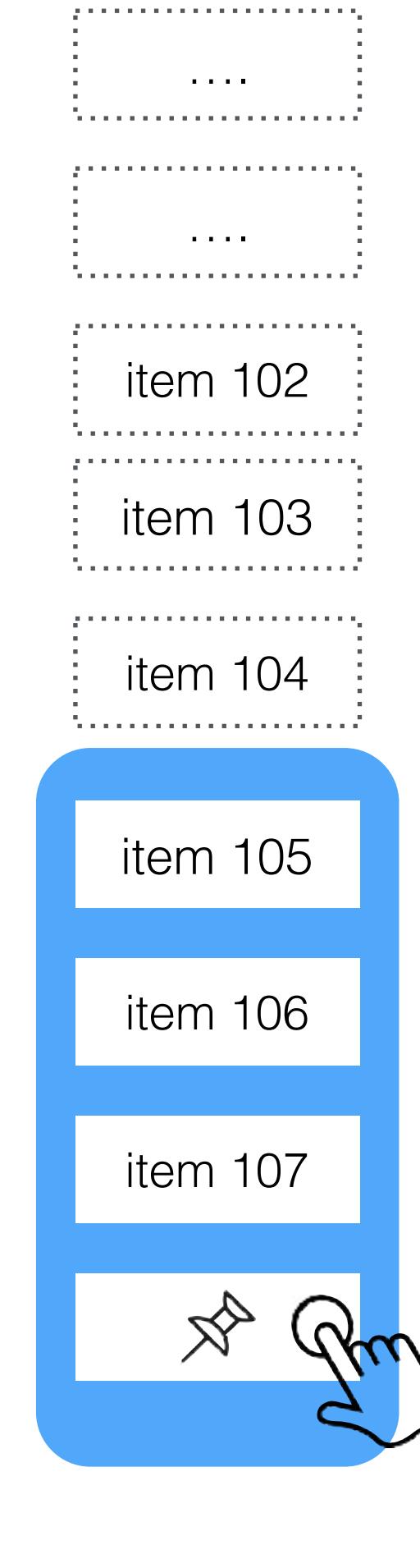
Listview @ React Native



Listview 优化方案



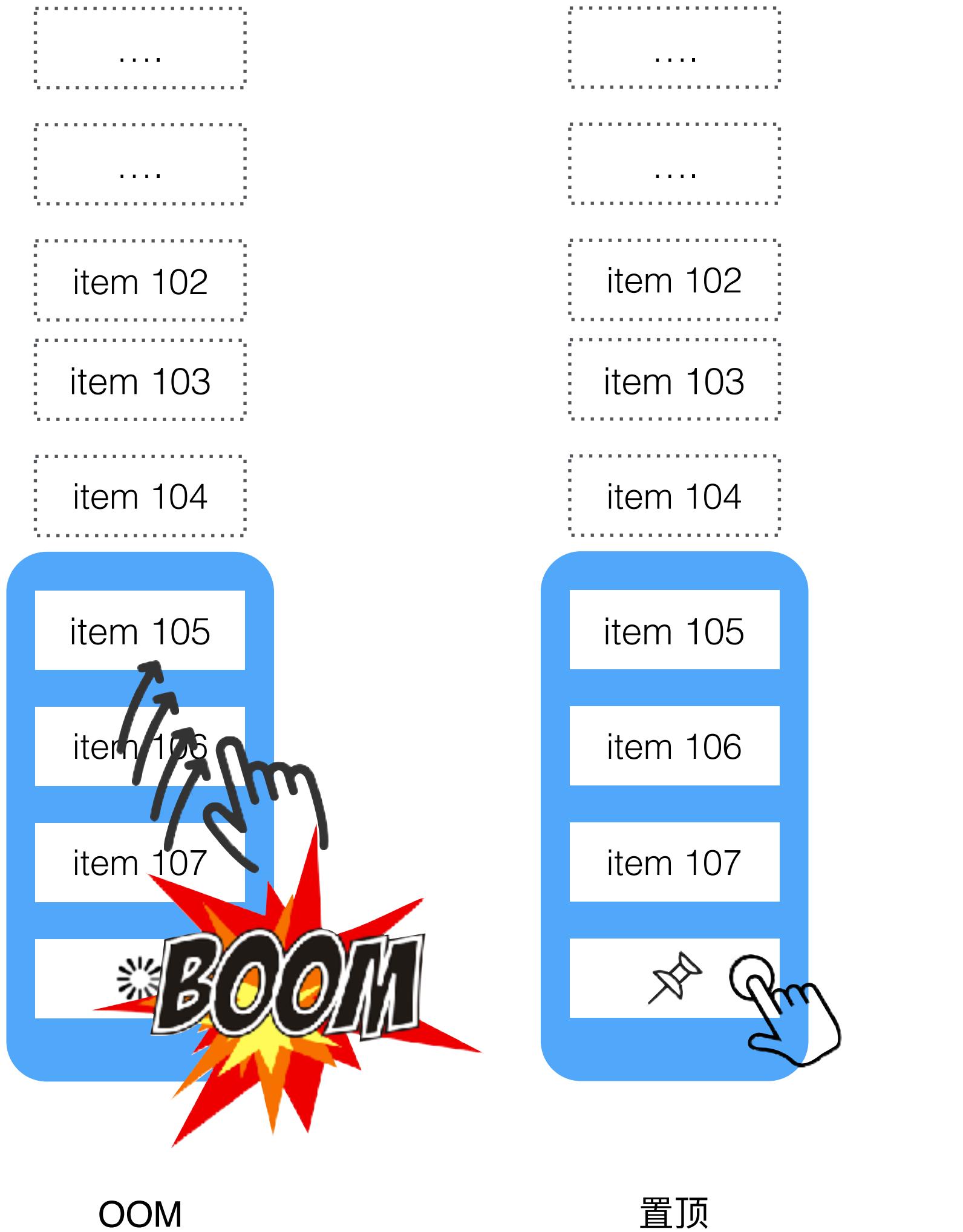
OOM



置顶

- 设计决定了View无法复用
 - 内存紧张
- DOM diff雪上加霜
 - 大量重新渲染
- 业务级优化
 - 预留空单元格
 - 需大批量刷新时，从头渲染

Listview 优化方案



删除非可视区view

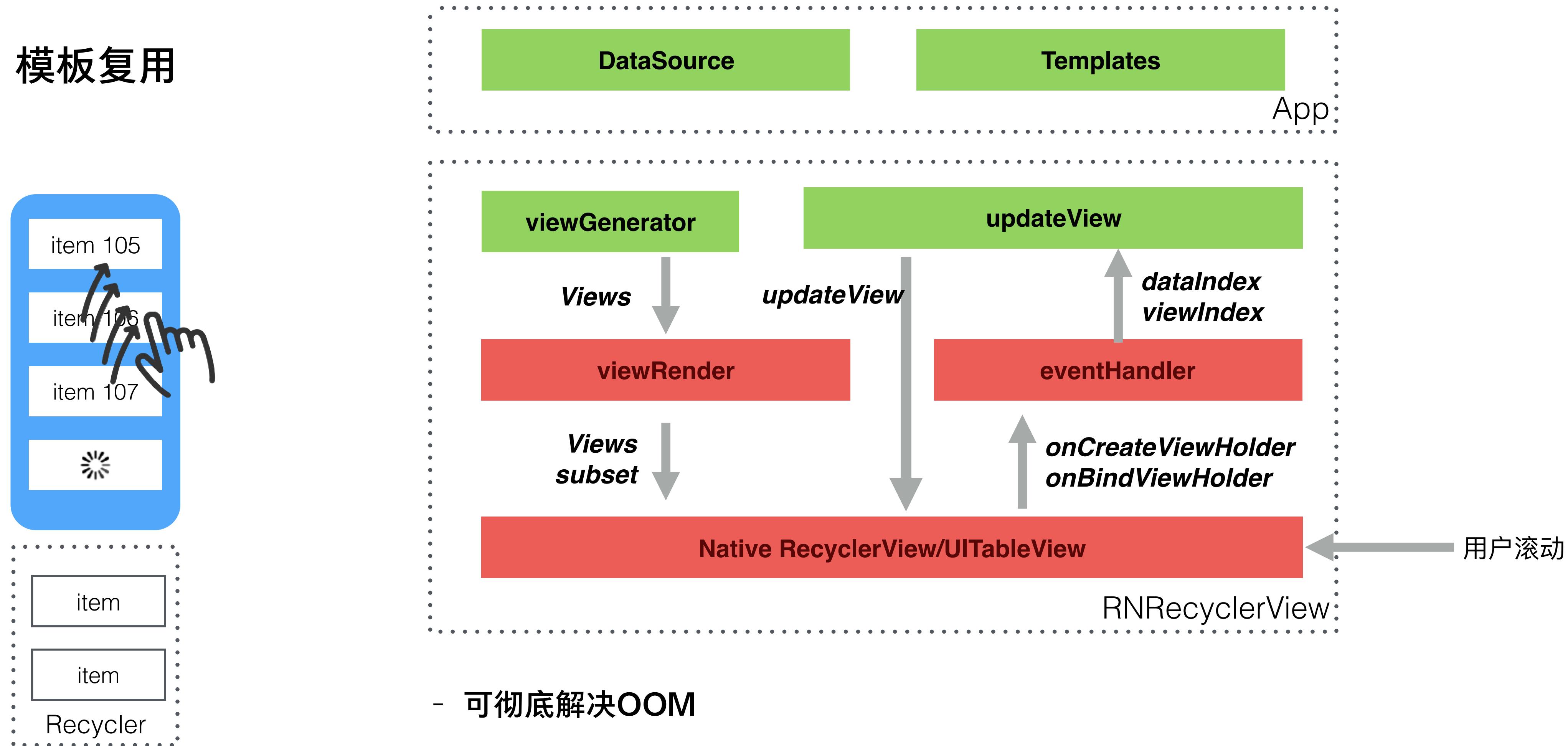


```
1 render() {  
2   return createElement(  
3     emptyView, {  
4       style: {  
5         width: this.viewProperties.width,  
6         height: this.viewProperties.height  
7       }  
8     }  
9   );
```

- 实现十分简单
- 适合渲染强度低的列表
- 滚动过快会闪烁

Listview 优化方案

模板复用

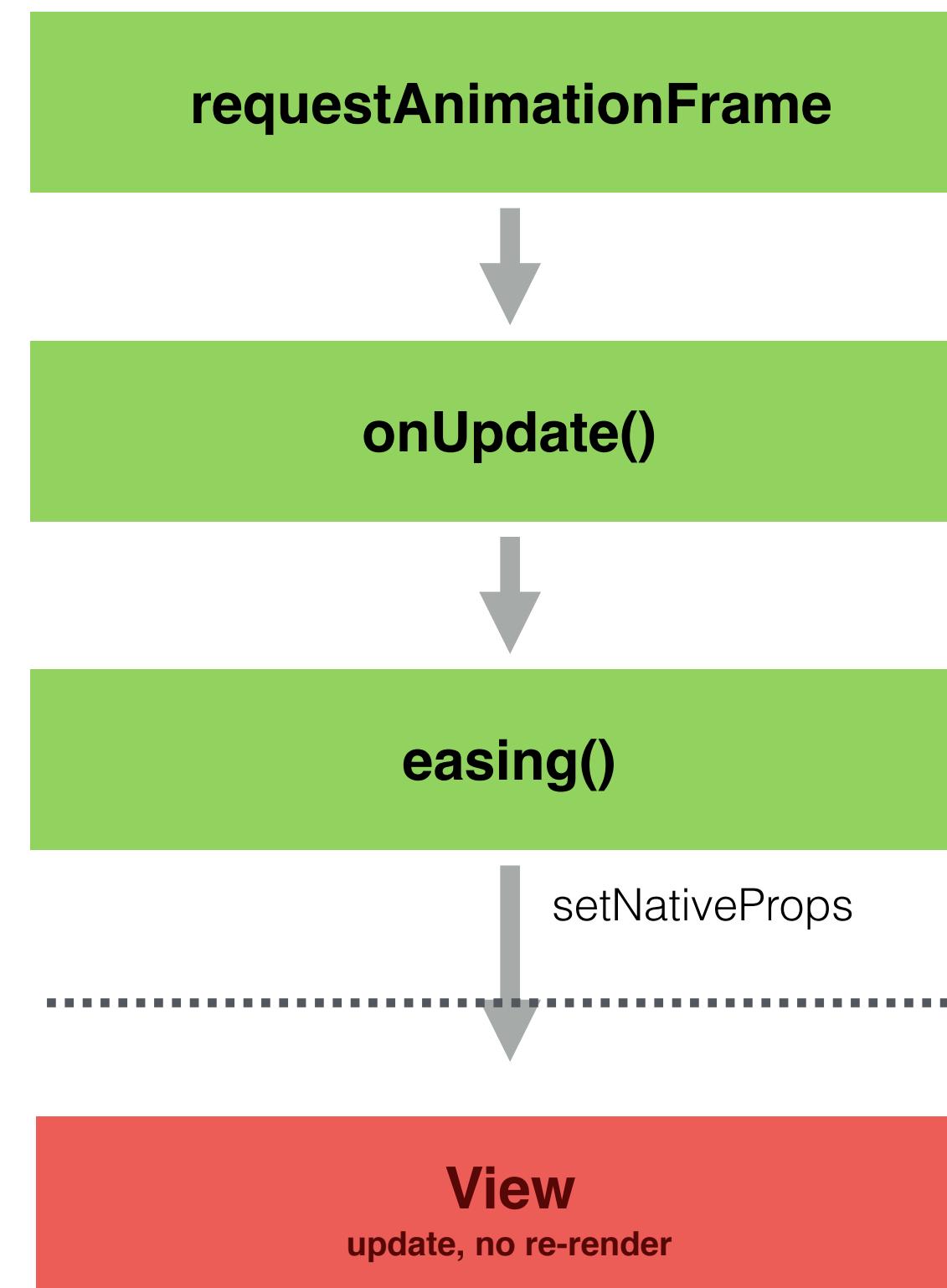


- 可彻底解决OOM
- 一定程度上违背了RN的设计原则
- item在滚动时可能会跳动、闪烁



动画优化

Animations @ React Native



RN默认实现

- 16ms {
 - Javascript 计算 Props
 - 通讯
 - View Update
- 易导致丢帧
- systrace.py

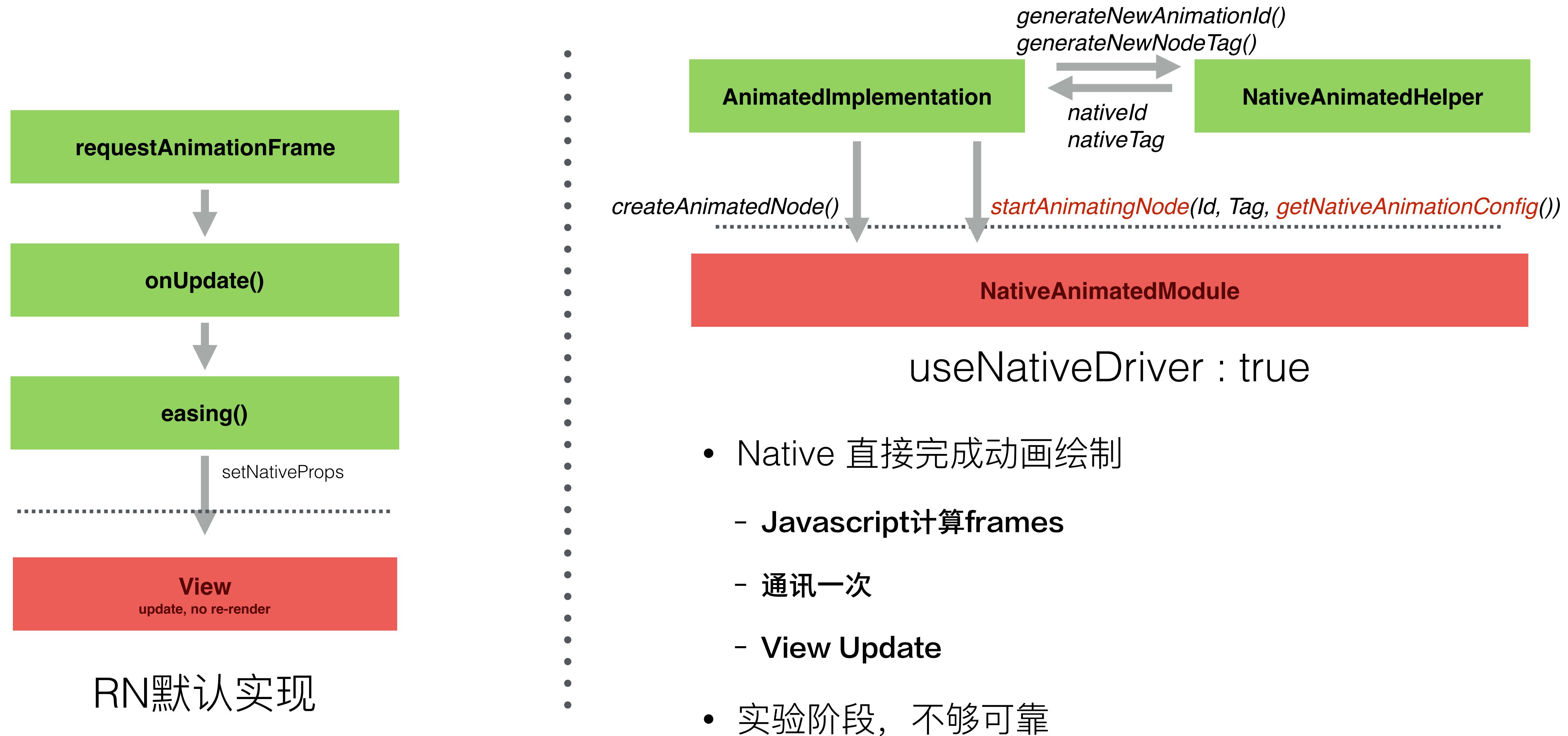


<https://facebook.github.io/react-native/docs/android-ui-performance.html>

<https://facebook.github.io/react-native/docs/animations.html>

<https://facebook.github.io/react-native/docs/direct-manipulation.html>

Animations @ React Native



Animations 优化

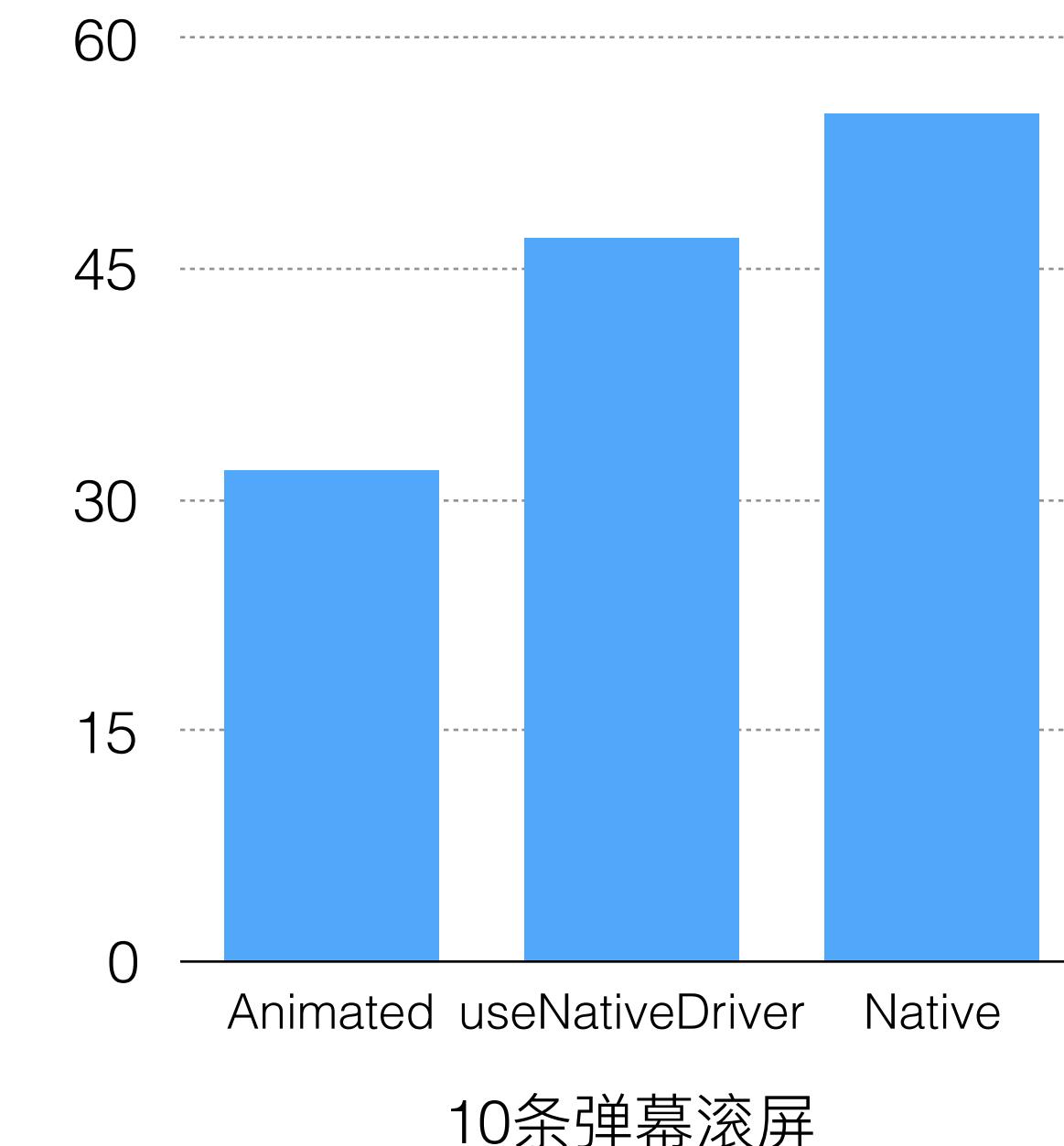
```
<AnimationView />
```

```
this.refs.view.  
setTranslate({from, to}).  
setOpacity(from, to).  
setEasing({type: "bounce"}).  
setDuration(1000).  
onStart(() => {}).  
start()
```

Pre-defined Animations

提供最常用的动画和easing实现

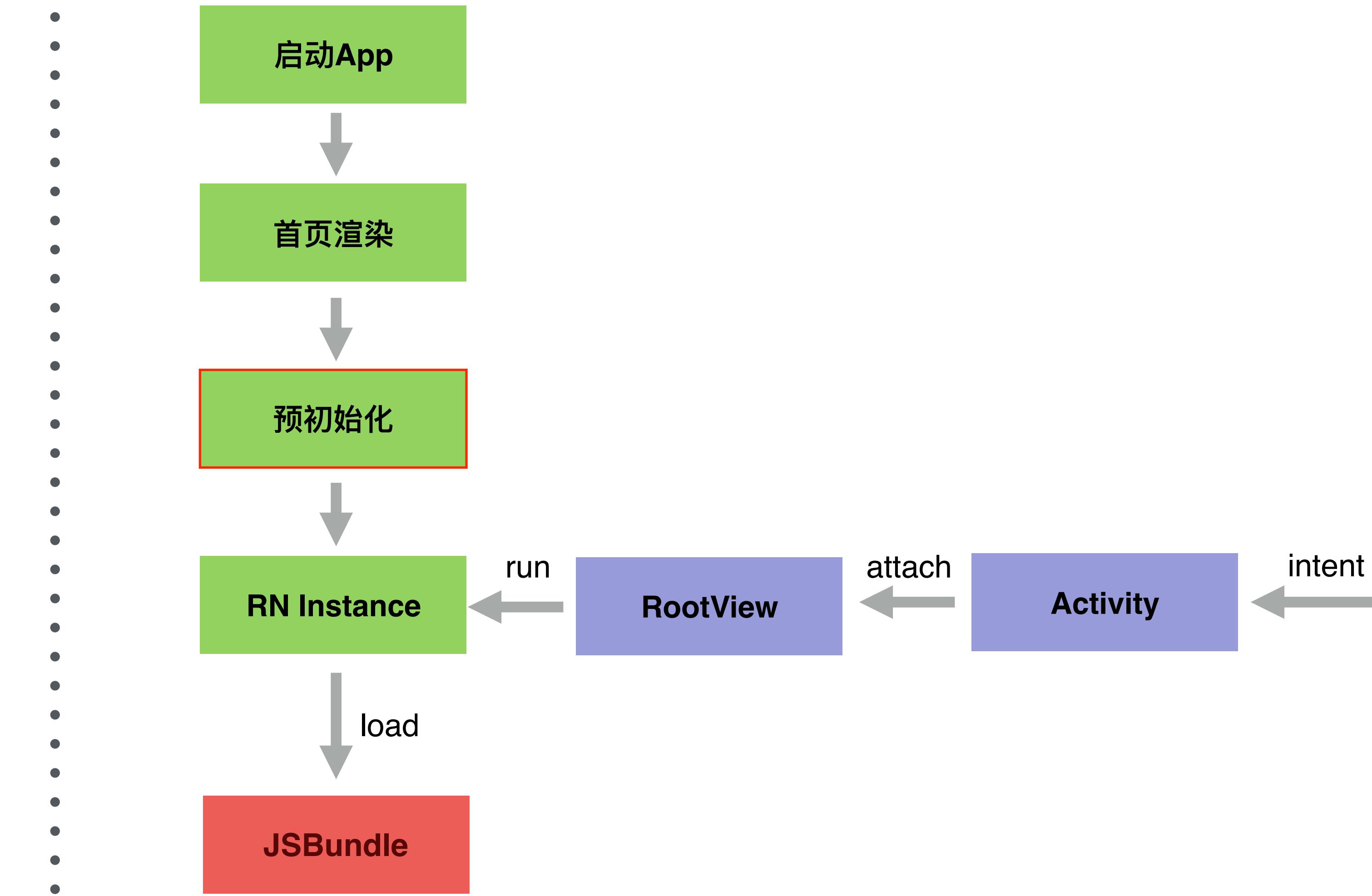
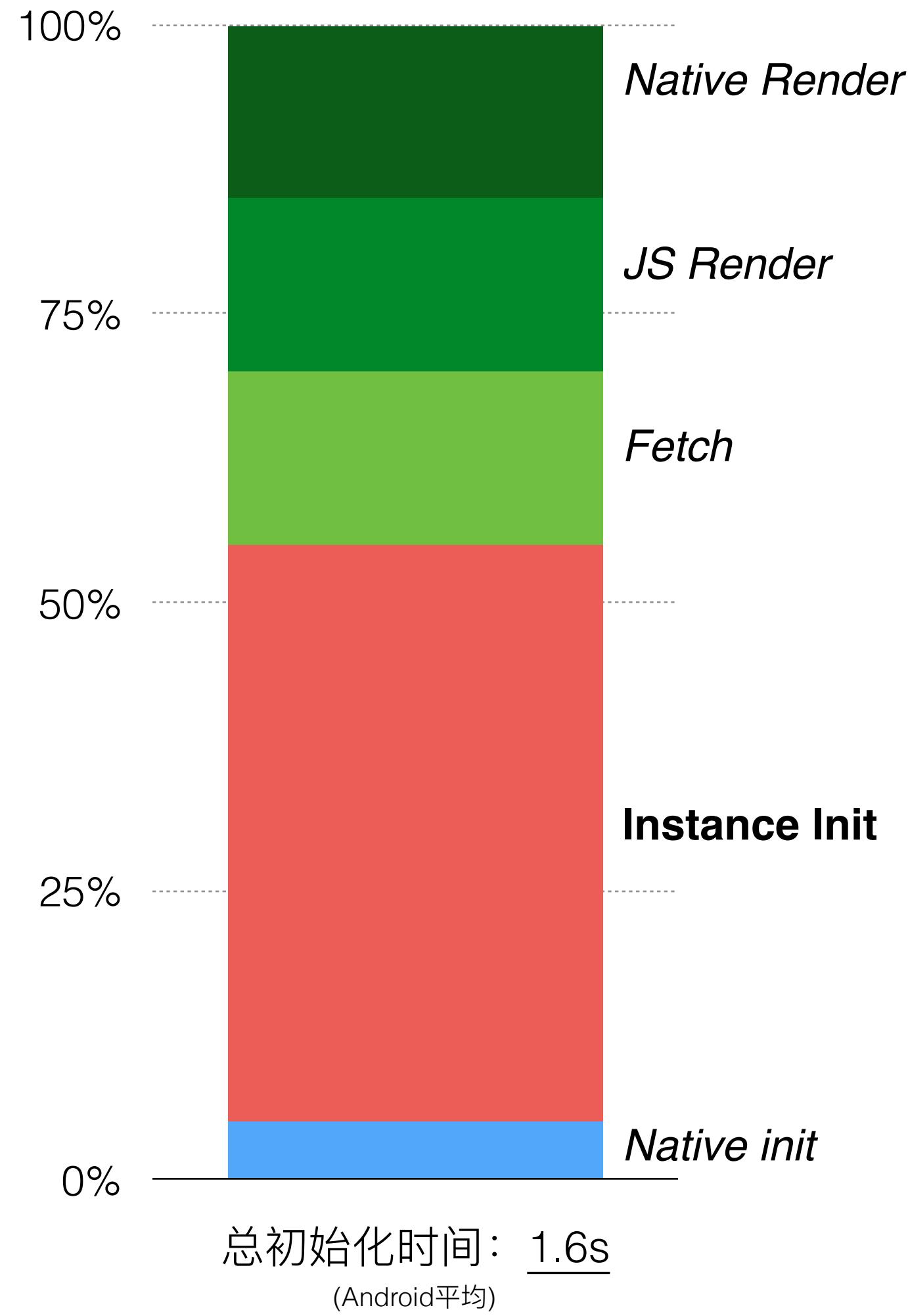
- 性能完全等价Native实现
- 在长动画下优势明显



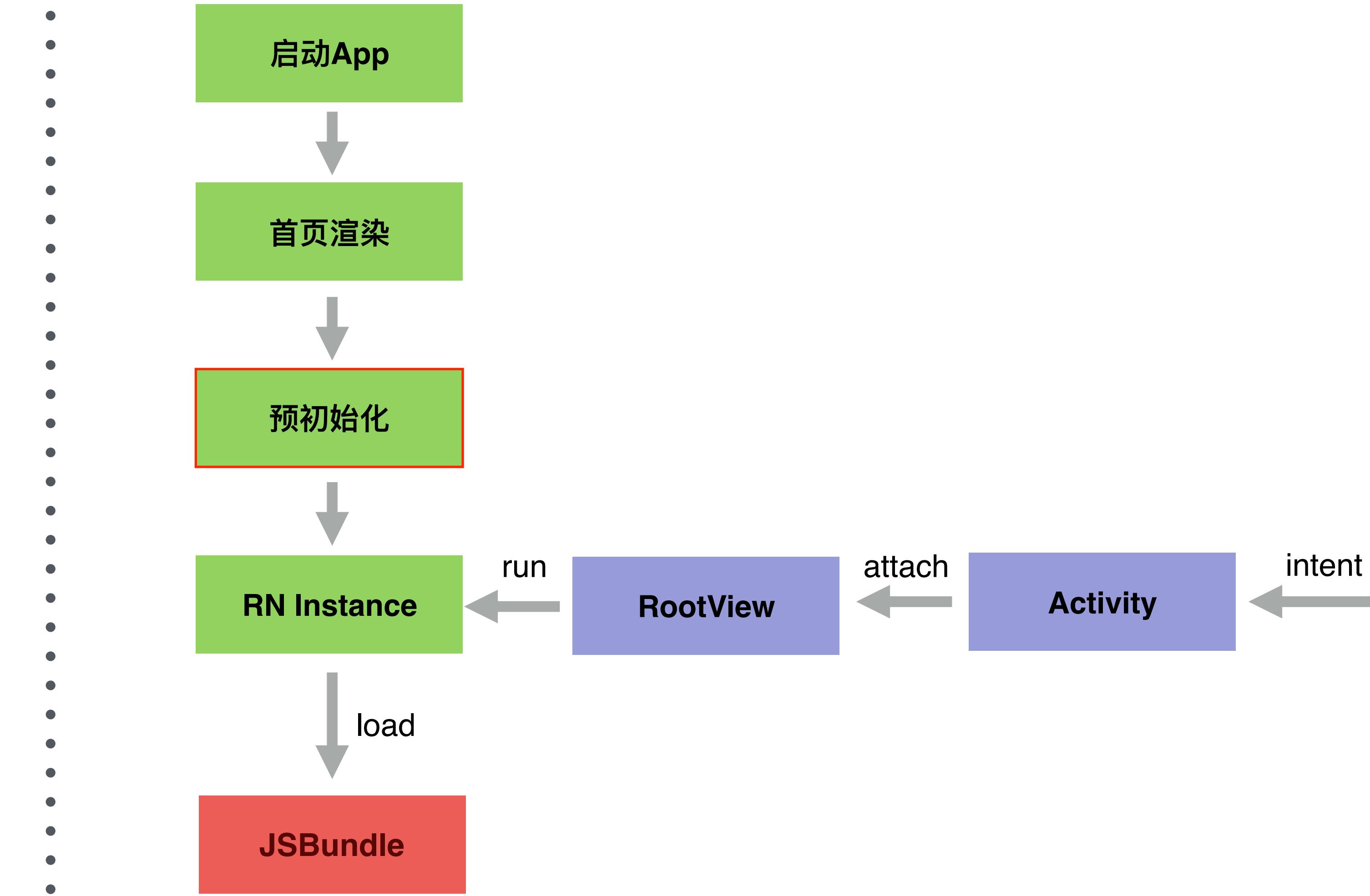
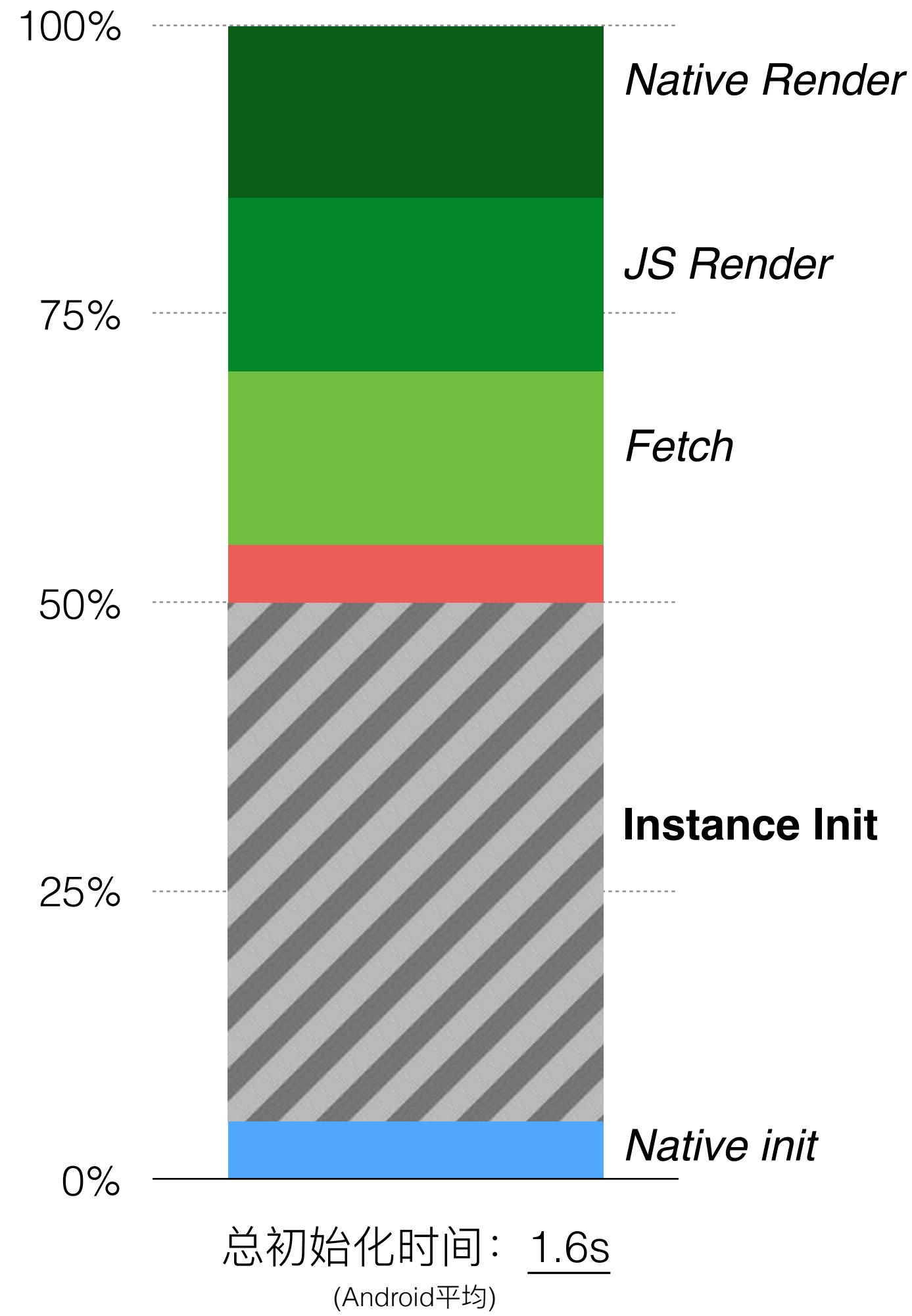
A dynamic, slightly blurred photograph capturing a group of people riding horses across a vast, sandy desert. In the foreground, two men are prominently featured on dark brown horses. The man on the left wears an orange long-sleeved shirt, dark pants, and a blue beanie; his horse has a vibrant, colorful saddle blanket with floral patterns. The man on the right wears a green and yellow horizontally striped shirt, dark pants, and a black beanie; his horse also has a patterned saddle blanket. Both men are holding reins and looking towards the right. In the background, another person is visible on a horse to the left, and more riders are blurred in the distance under a clear blue sky.

启动速度优化

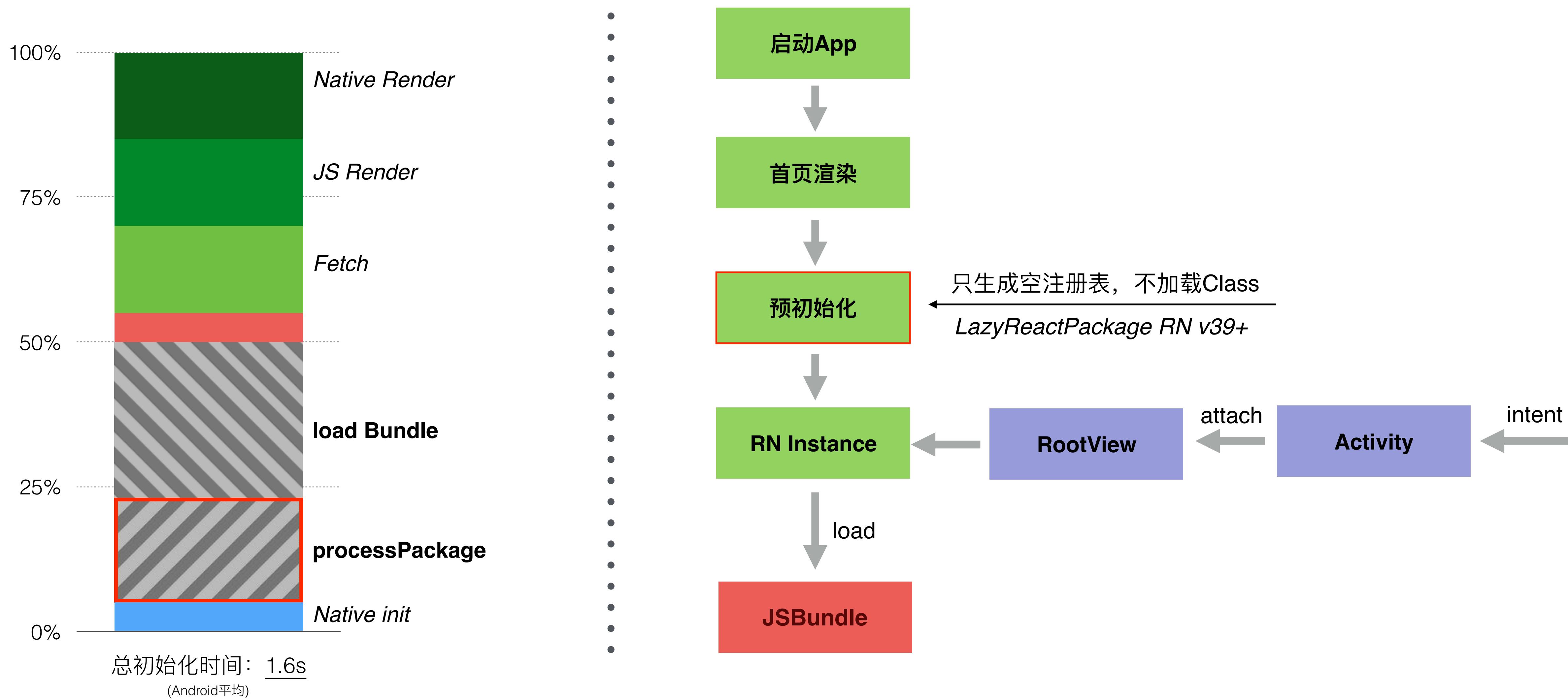
启动速度优化



启动速度优化 - 预初始化



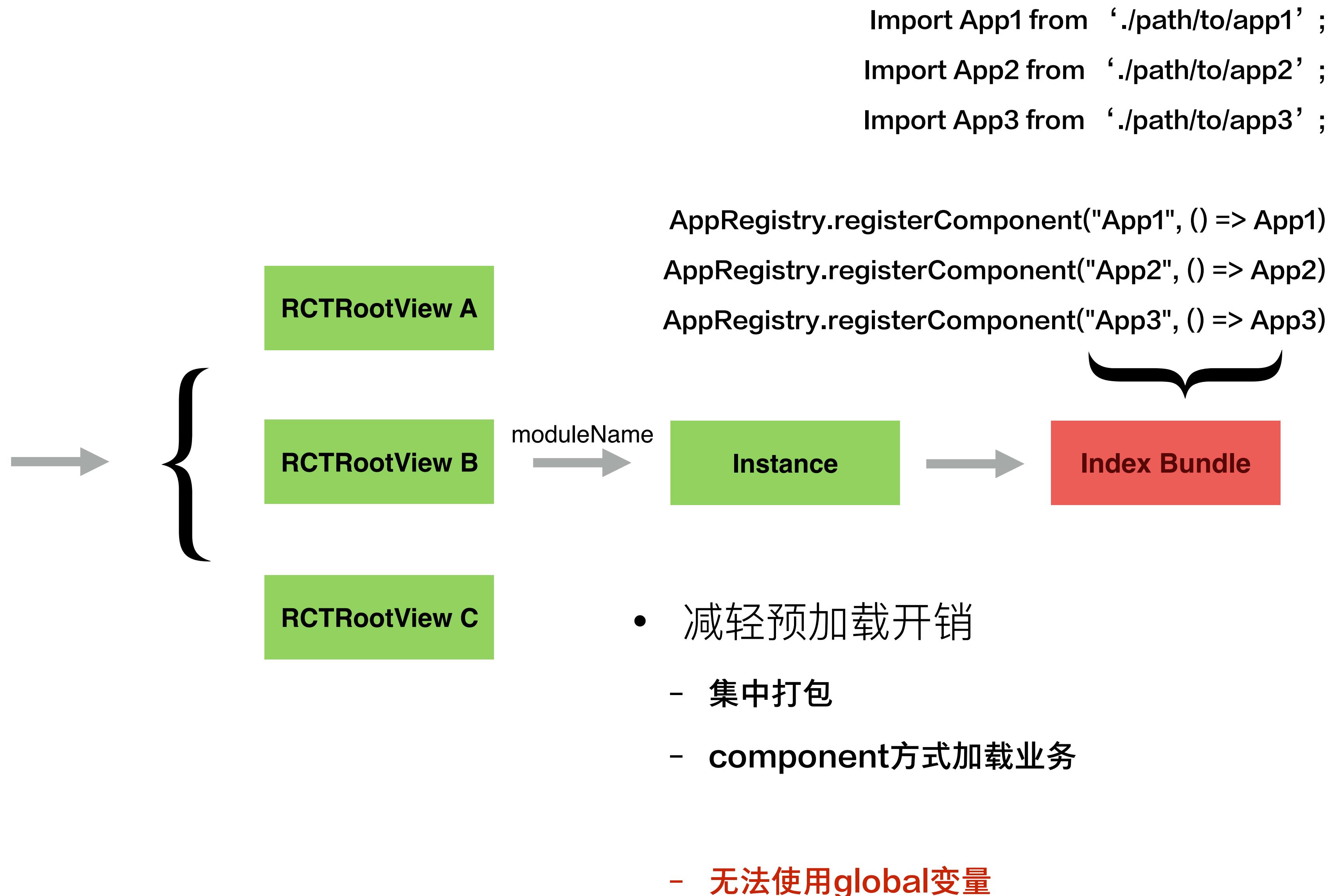
启动速度优化 - 延迟生成模块配置表



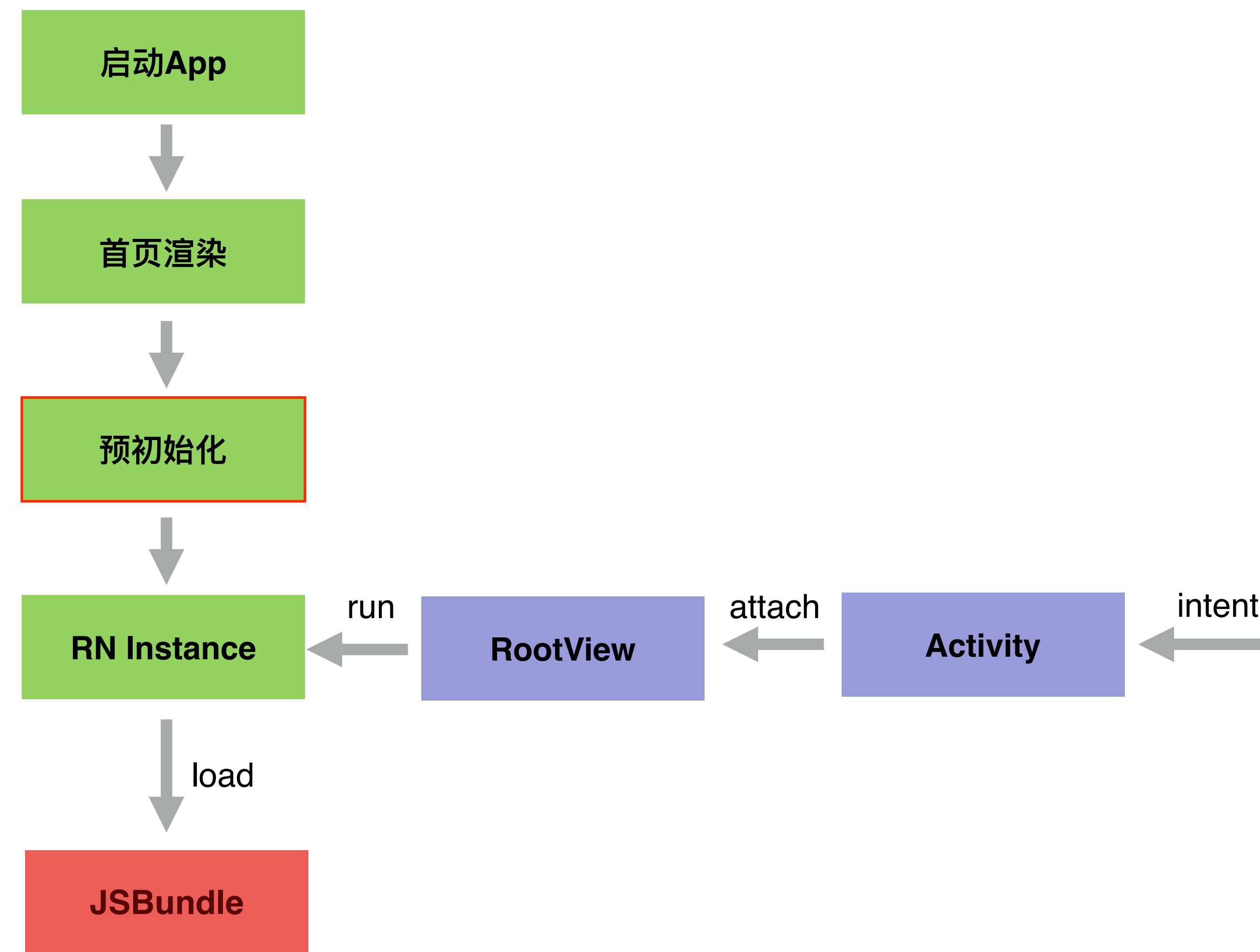
启动速度优化



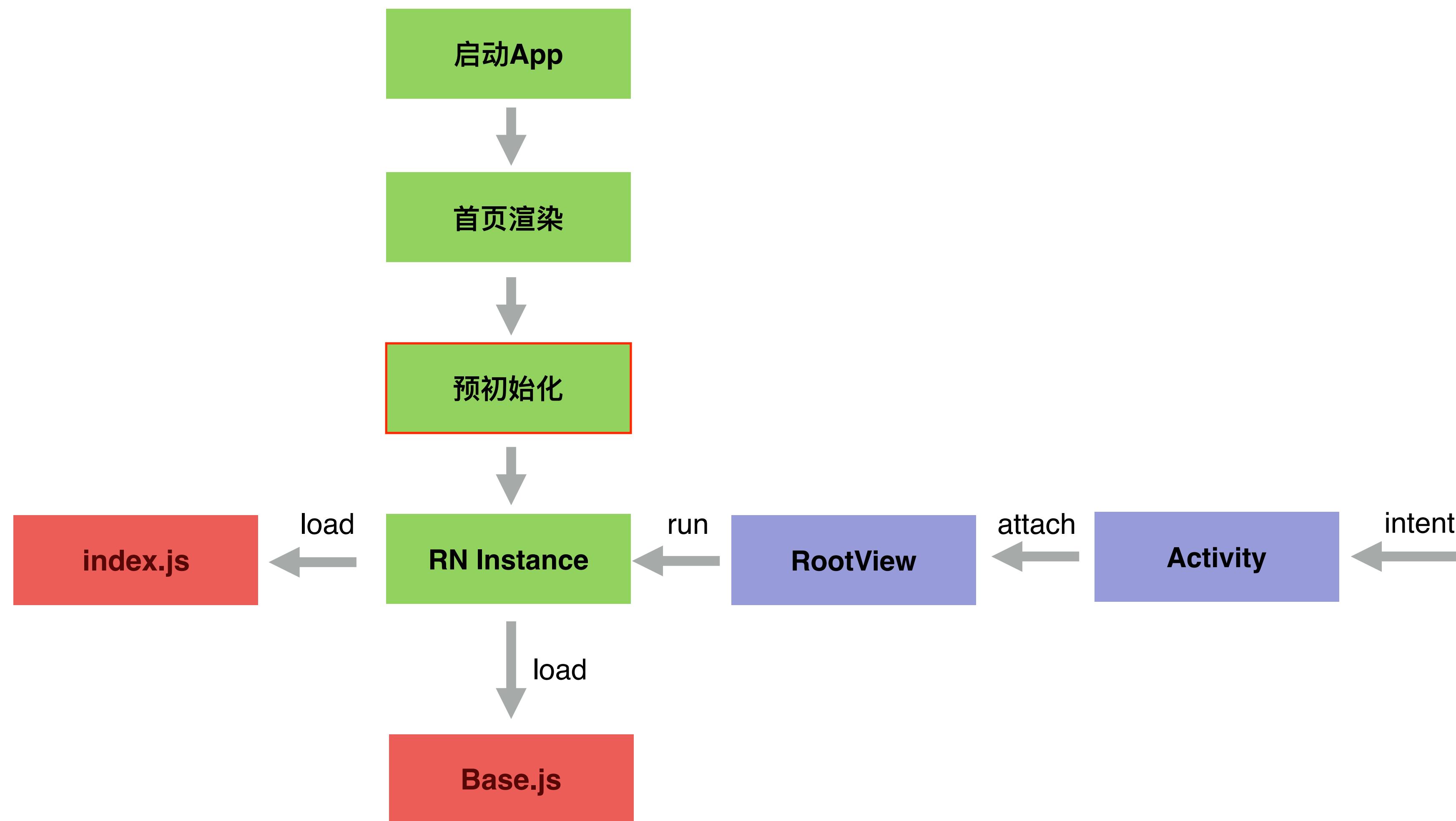
启动速度优化 - 单Instance多业务



启动速度优化 - 按需加载



启动速度优化 - 按需加载



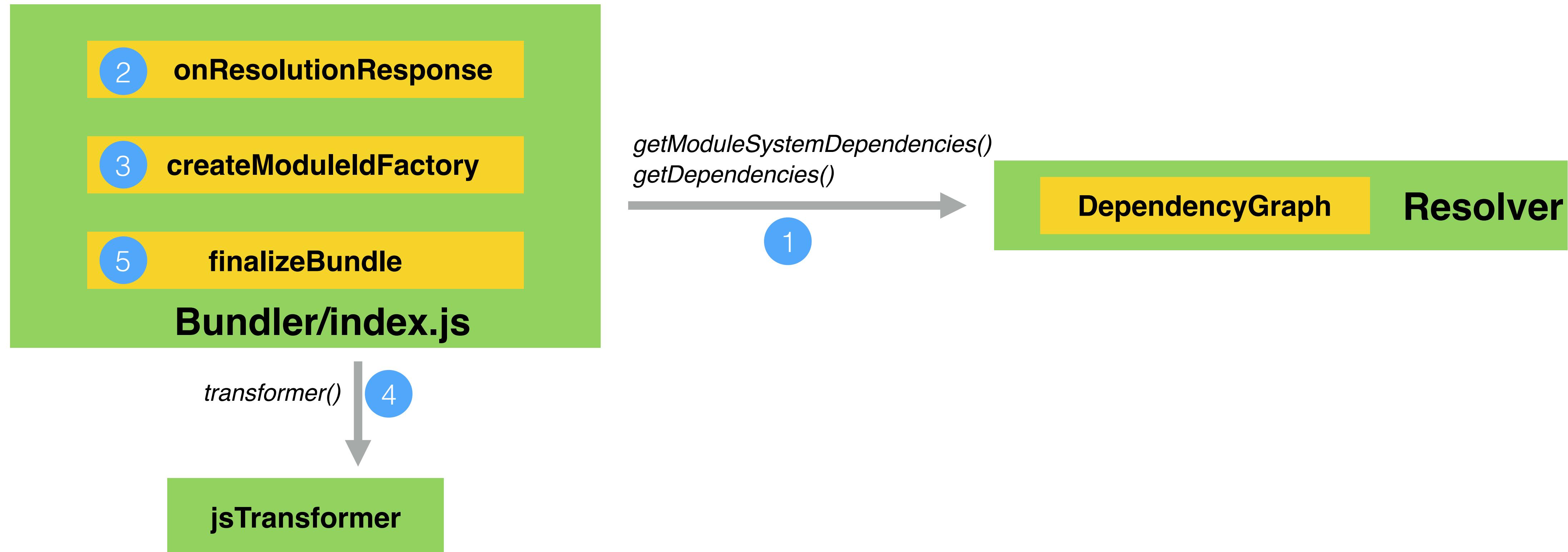
启动速度优化 - 按需加载

```
/*系统模块，全局定义，polyfill,babel*/
/*prelude.js*/!function(_){_.__DEV_=!1,_.__BUNDLE_START_TIME_=Date.now()}"undefined"!=typeof global?global:"undefined"
/*require.js*/!function(r){"use strict";function t(r,t){r in u||(u[r]={factory:t,hasError:!1,isInitialized:!1,exports:voi
/*polyfills.js*/!function(n){Object.assign=function(n,e){for(var f=1;f<arguments.length;f++){var l=arguments[f];if(null!=
/*console.js*/!function(n){function e(e){return function(){var t;t=1==arguments.length&&"string"==typeof a
/*error-guard.js*/!function(r){function n(){var m=function(r){throw r};r.ErrorUtils.setGlobalHandler(n)}var l={_inGuard:0
/*Number.es6.js*/!function(e){void 0==Number.EPSILON&&Object.defineProperty(Number,"EPSILON",{value:Math.pow(2,-52)}),vo
/*String.prototype.es6.js*/!function(t){String.prototype.startsWith||(String.prototype.startsWith=function(t){"use strict
/*Array.prototype.es6.js*/!function(e){function r(e,r){if(null==this)throw new TypeError("Array.prototype.findIndex calle
/*Array.es6.js*/!function(n){Array.from|||Array.from=function(n){if(null==n)throw new TypeError("Object is null or undefi
/*Object.es7.js*/!function(e){!function(){var e=Object.prototype.hasOwnProperty;"function"!=typeof Object.entries&&(Objec
/*babelHelpers.js*/!function(e){var r=e.babelHelpers={};r.createRawReactElement=function(){var e="function"==typeof Symb
/*入口模块*/
_d[0]/*index.js*/,function(e,t,r,n){var i=t(12),u=(babelHelpers.interopRequireDefault(i),t(41)),l=t(377),o=babelHelpers.i
/*react-native基础模块*/
_d[12]/*./node_modules/react/react.js*/,function(t,s,c,e){"use strict";c.exports=s(13)});
_d[13]/*./node_modules/react/lib/React.js*/,function(e,t,r,n>{"use strict";var a=t(14),o=t(15),c=t(27),l=t(30),s=t(31),i
_d[14]/*./node_modules/object-assign/index.js*/,function(r,e,t,n>{"use strict";function o(r){if(null==r||void 0==r)thr
_d[15]/*./node_modules/react/lib/ReactChildren.js*/,function(t,n,u,e>{"use strict";function r(t){return(""+t).replace(k,
_d[16]/*./node_modules/react/lib/PooledClass.js*/,function(n,o,e,t>{"use strict";var r=o(17),i=(o(18),function(n){var o=
...
_d[177]/*./node_modules/react-native/Libraries/JavaScriptAppEngine/Initialization/InitializeJavaScriptAppEngine.js*/,fun
...
_d[375],function(r,t,e,n>{"use strict";var i=t(17),a=t(15),o=t(19),u=t(22),f=(t(18),t(21),{create:function(r){if("object"
_d[376],function(r,o,n,i>{"use strict";function t(r){return Array.isArray(r)?r.concat():r&&"object"==typeof r?e(new r.con
/*业务模块*/
_d[377],function(e,t,r,l){Object.defineProperty(l,"__esModule",{value:!0});var a=t(12),n=babelHelpers.interopRequireDefau
_d[378],function(e,t,d,n>{"use strict";function o(e){return e&&e.__esModule?e:{default:e}}n.__esModule=!0,n.connect=n.Pro
_d[379],function(e,t,r,o>{"use strict";function n(e){return e&&e.__esModule?e:{default:e}}function i(e,t){if(!(e instance
_d[380],function(e,s,u,i>{"use strict";i.__esModule=!0;var p=s(12);i.default=p.PropTypes.shape({subscribe:p.PropTypes.fun
_d[381],function(o,e,n,r>{"use strict";function t(o){"undefined"!=typeof console&&"function"==typeof console.error&&conso
_d[382],function(t,e,r,o>{"use strict";function s(t){return t&&t.__esModule?t:{default:t}}function n(t,e){if(!(t instance
_d[383],function(e,t,r,n>{"use strict";function u(e,t){if(e==t)return!0;var r=Object.keys(e),n=Object.keys(t);if(r.length
_d[384],function(n,t,r,u>{"use strict";function e(n){return function(t){return(0,i.bindActionCreators)(n,t)}}u.__esModule
_d[385],function(e,t,d,o>{"use strict";function r(e){return e&&e.__esModule?e:{default:e}}o.__esModule=!0,o.compose=o.app
_d[386],function(e,t,n,r>{"use strict";function o(e){return e&&e.__esModule?e:{default:e}}function i(e,t,n){function r(){
_d[387],function(t,r,n,o){function c(t){if(!a(t)||e(t)!=i)return!1;var r=u(t);if(null==r) return!0;var n=s.call(r,"constr
_d[388],function(n,t,o,i){function e(n){return null==n?void 0==n?f:d:(n=Object(n),g&&g in n?r(n):u(n))}var c=t(389),r=t(
/*执行系统模块和运行系统模块*/
;require(177);/*InitializeJavaScriptAppEngine*/
;require(0);/*入口模块*/

```

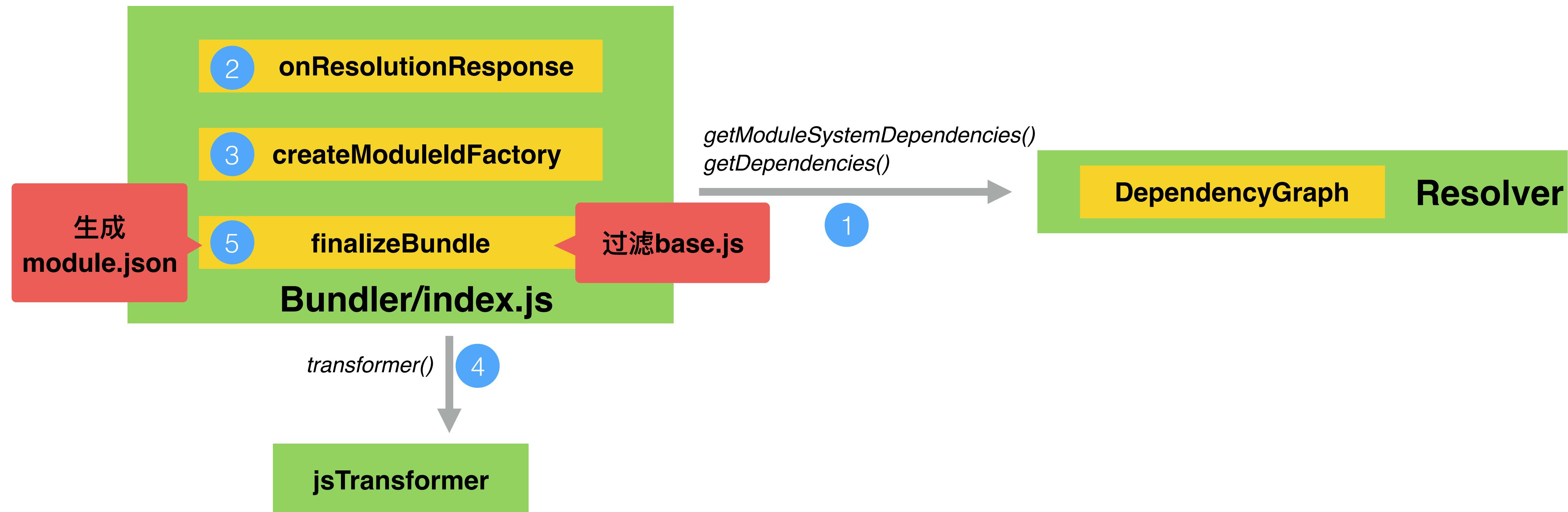
- bundle.js
 - 模块化加载每个module
 - 每行一个module
 - moduleId是自增数字

启动速度优化 - 按需加载



react-packager 打包流程

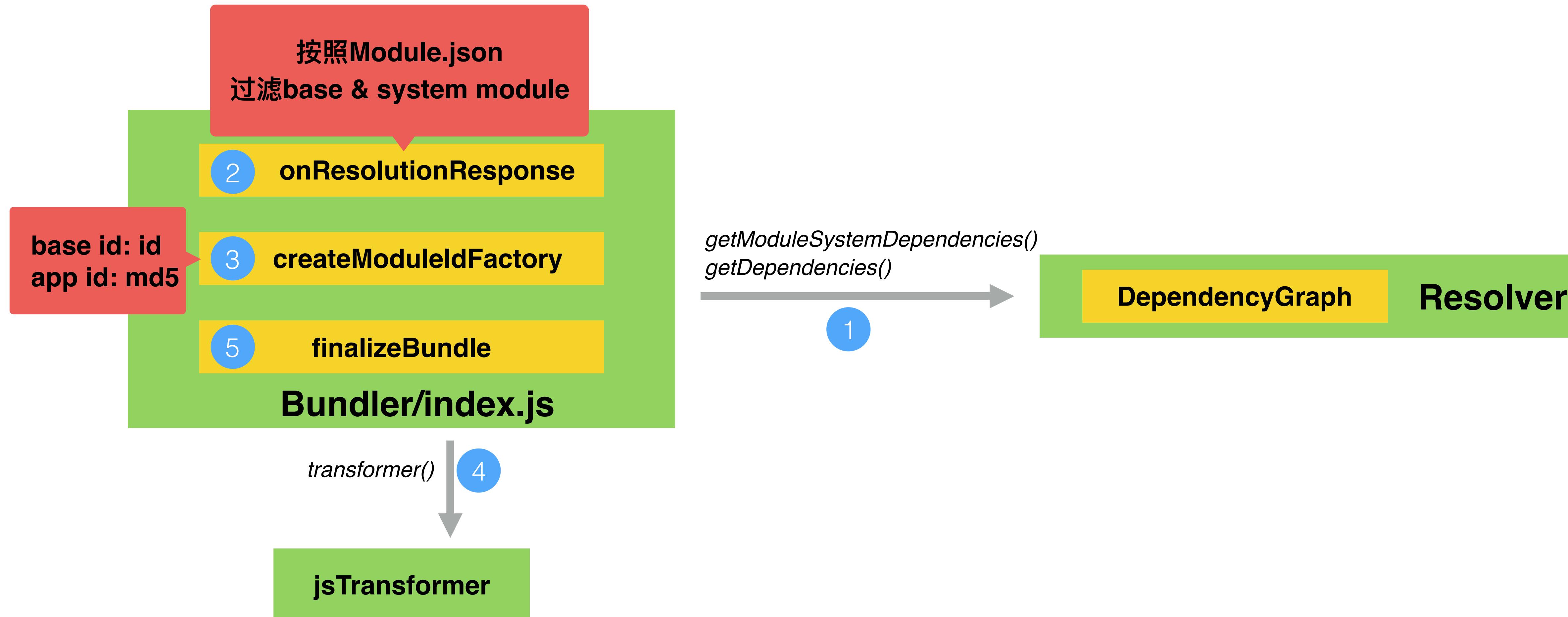
启动速度优化 - 按需加载



打包 base.bundle (修改后)

react-native —entry-file base.js —bundle-output ./base.bundle —module-output ./module.json

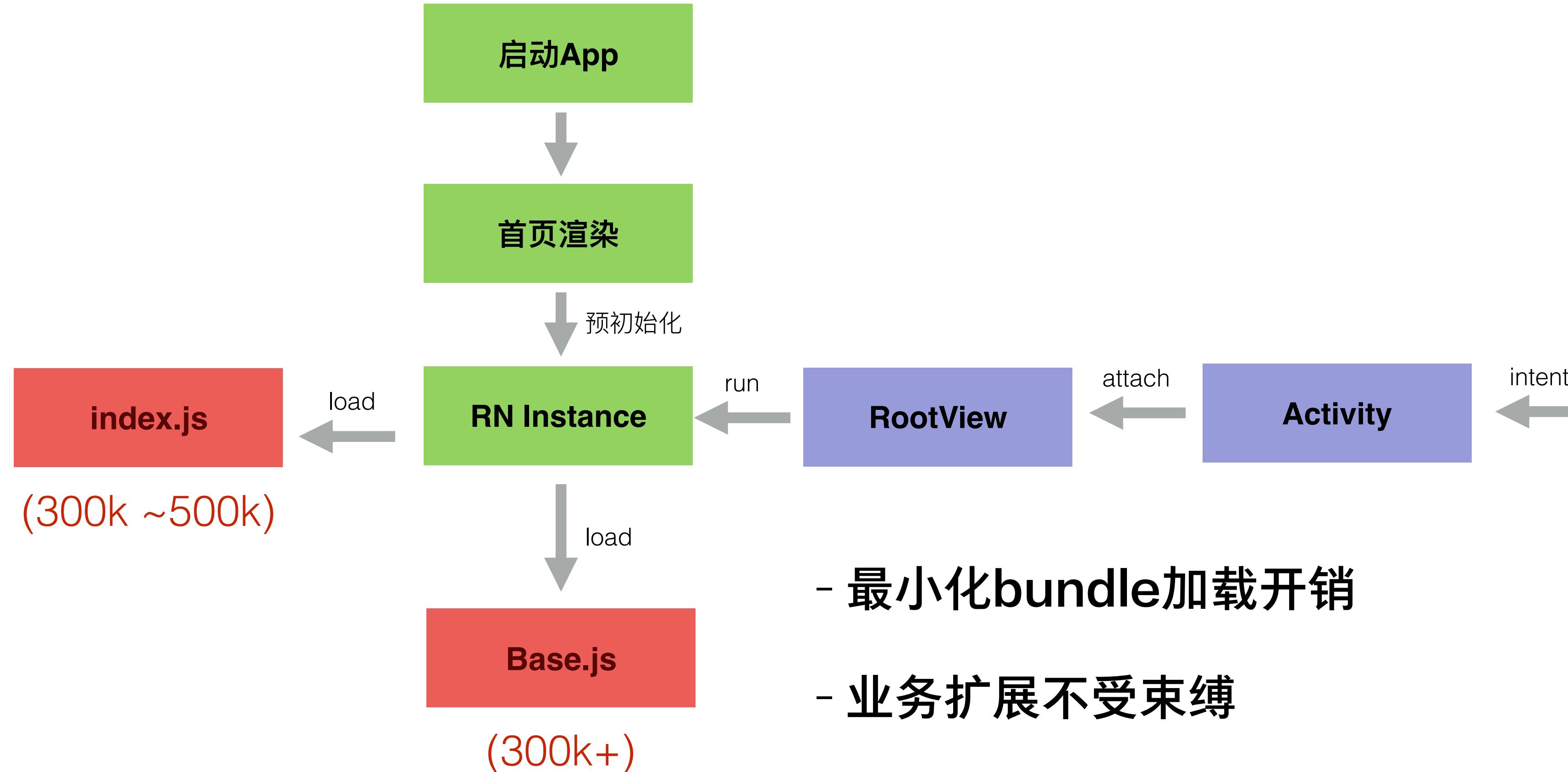
启动速度优化 - 按需加载



打包 app.bundle (修改后)

```
react-native —entry-file index.js —bundle-output ./index.bundle —module-input ./module.json
```

启动速度优化 - 按需加载



其他

- 延迟加载、渲染
- rowHasChanged/shouldComponentUpdate/pureRender
- requestAnimationFrame
- <https://facebook.github.io/react-native/docs/performance.html>
- <https://code.facebook.com/posts/895897210527114/dive-into-react-native-performance/>

React Native的工程价值



跨端方案对比

| | 优点/特点 | 缺点 | 适用场景 |
|--------------|---------------------------------------|-------------------------|--|
| APK插件 | 框架成本低 性能、体验一步到位 | 开发成本高 iOS依赖发版 | 对性能和体验要求高 同时 相对稳定 |
| Hybrid | 移植成本极低 通过端能力优化特定交互 业务随时发版 | 交互相对简陋 端能力依赖发版 | 快速迭代 或 短期运营 需要接入第三方 支持 自定义内容展示 |
| React Native | 流畅度近似原生应用 开发成本相对Native较低 业务随时发版 | 有学习和开发成本 要求稳定性和平台化程度 | 兼顾快速迭代和体验 平台级app |

SUMMARY

.....

- React Native 已能在超大规模的app中使用
 - 在发版周期、开发成本和使用体验之间找平衡
- 使用React Native是个系统性工程
 - 做到有机融入App
 - 确保全流程控制和质量保证
- 几个作用较大的性能优化点
 - Listview/动画/启动速度



thanks

@berg

