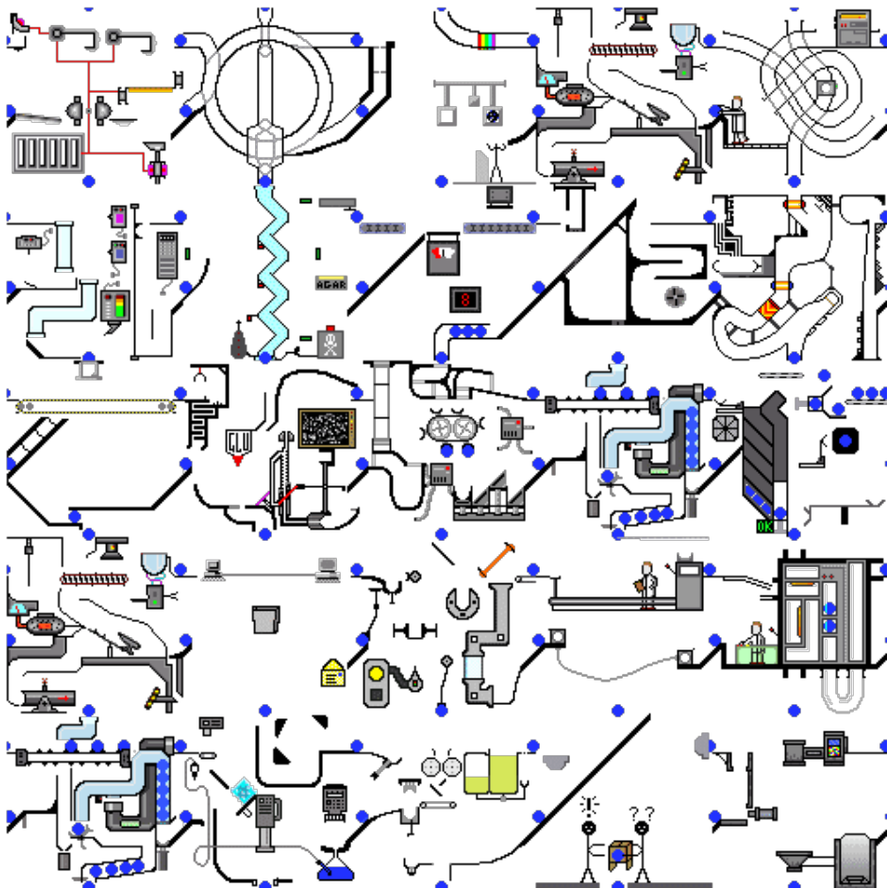
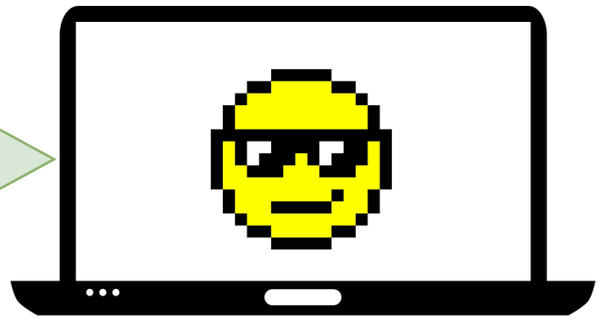
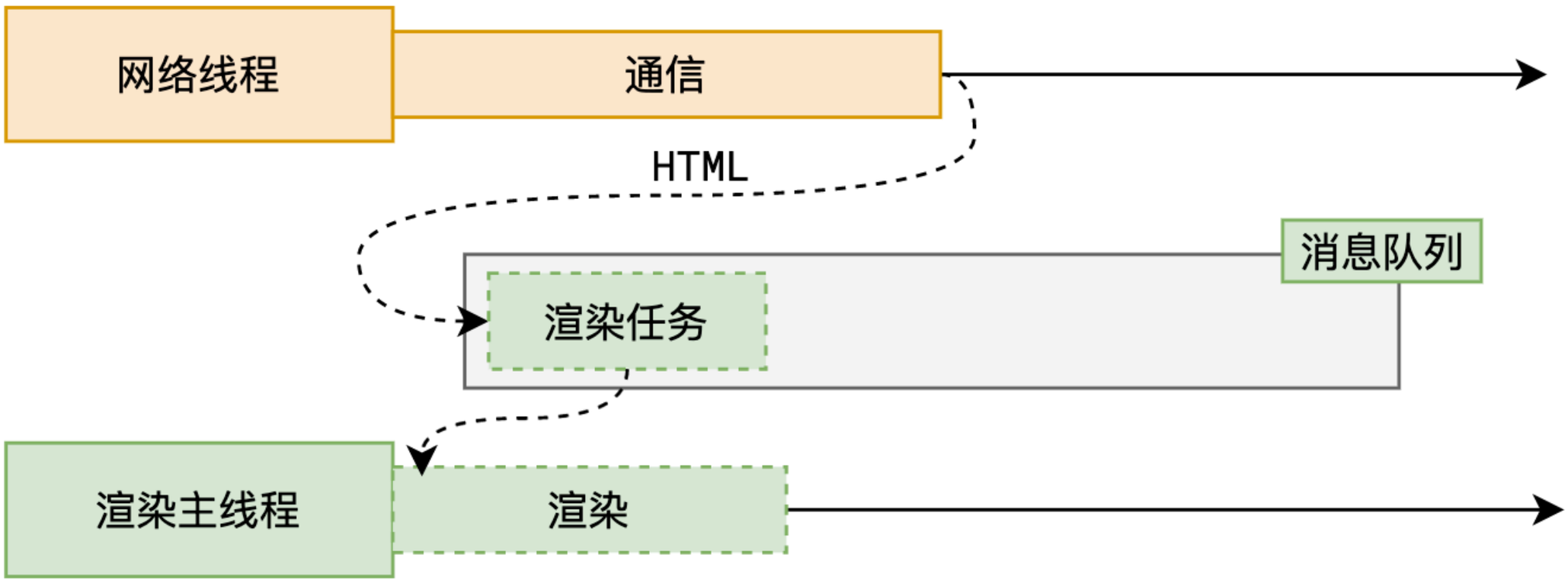
浏览器渲染原理


<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="u
<title>Page name</
<meta name="descri
<link href="assets/
<link rel="shortcut
</head>

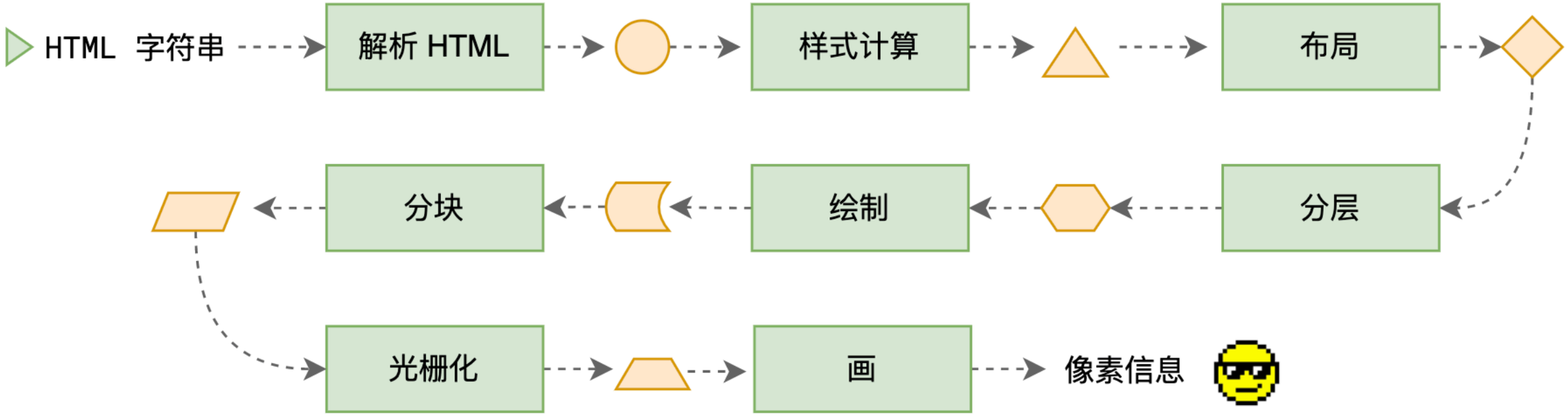




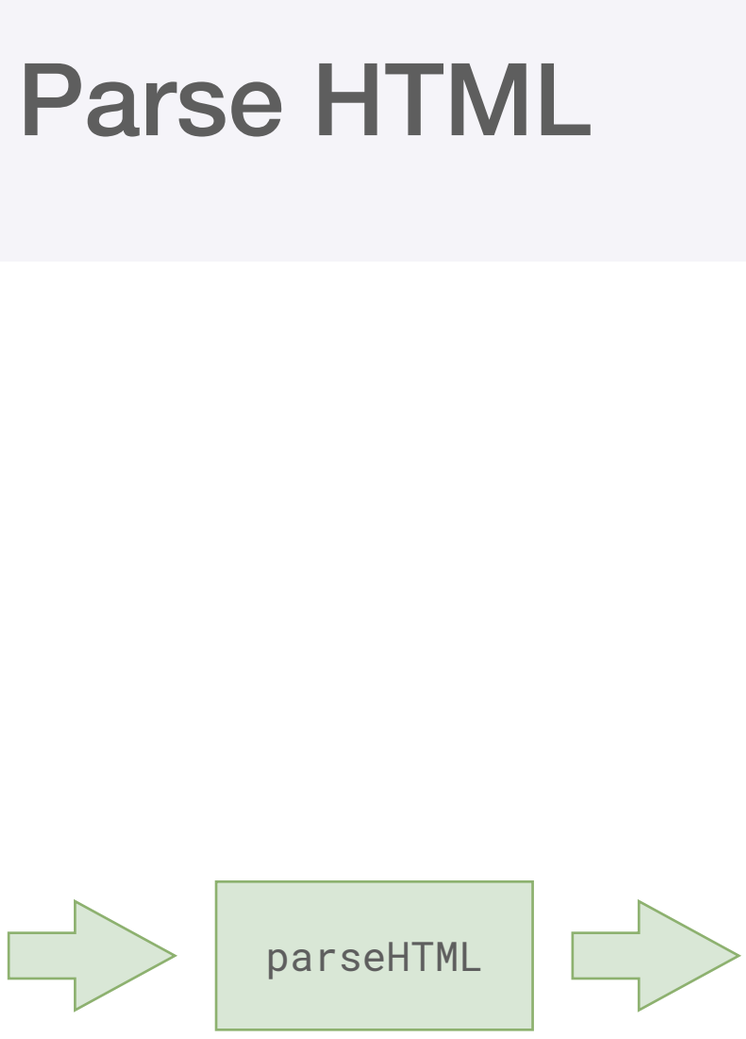
渲染时间点

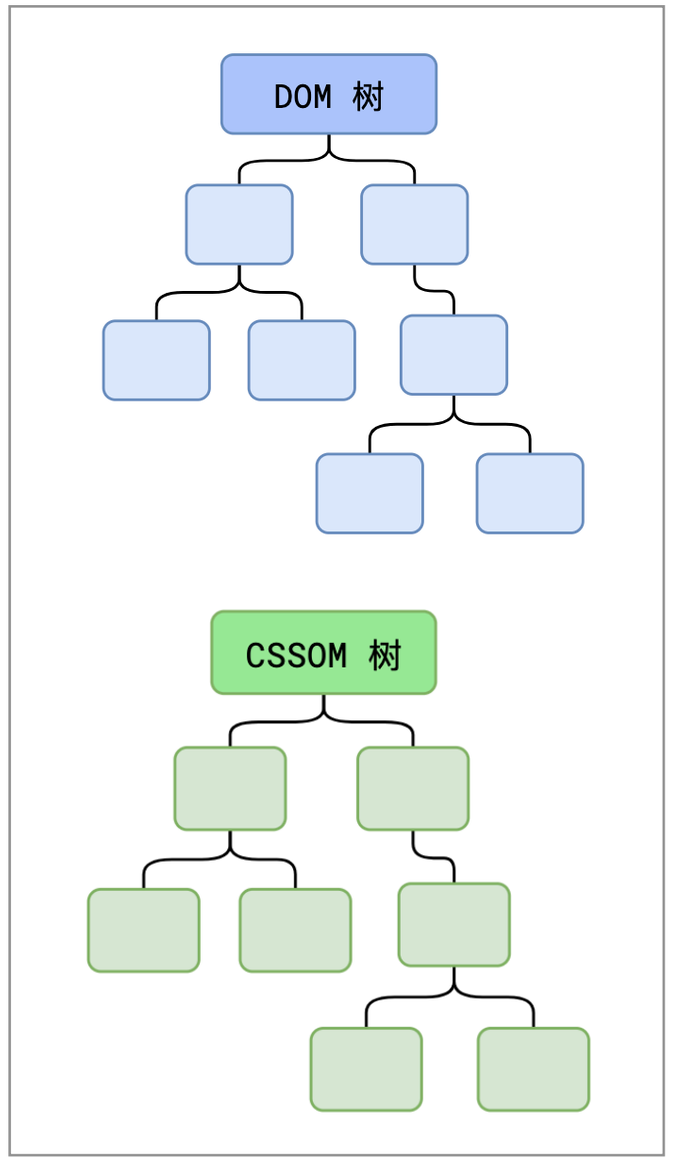


渲染流水线



1. 解析 HTML - Parse HTML

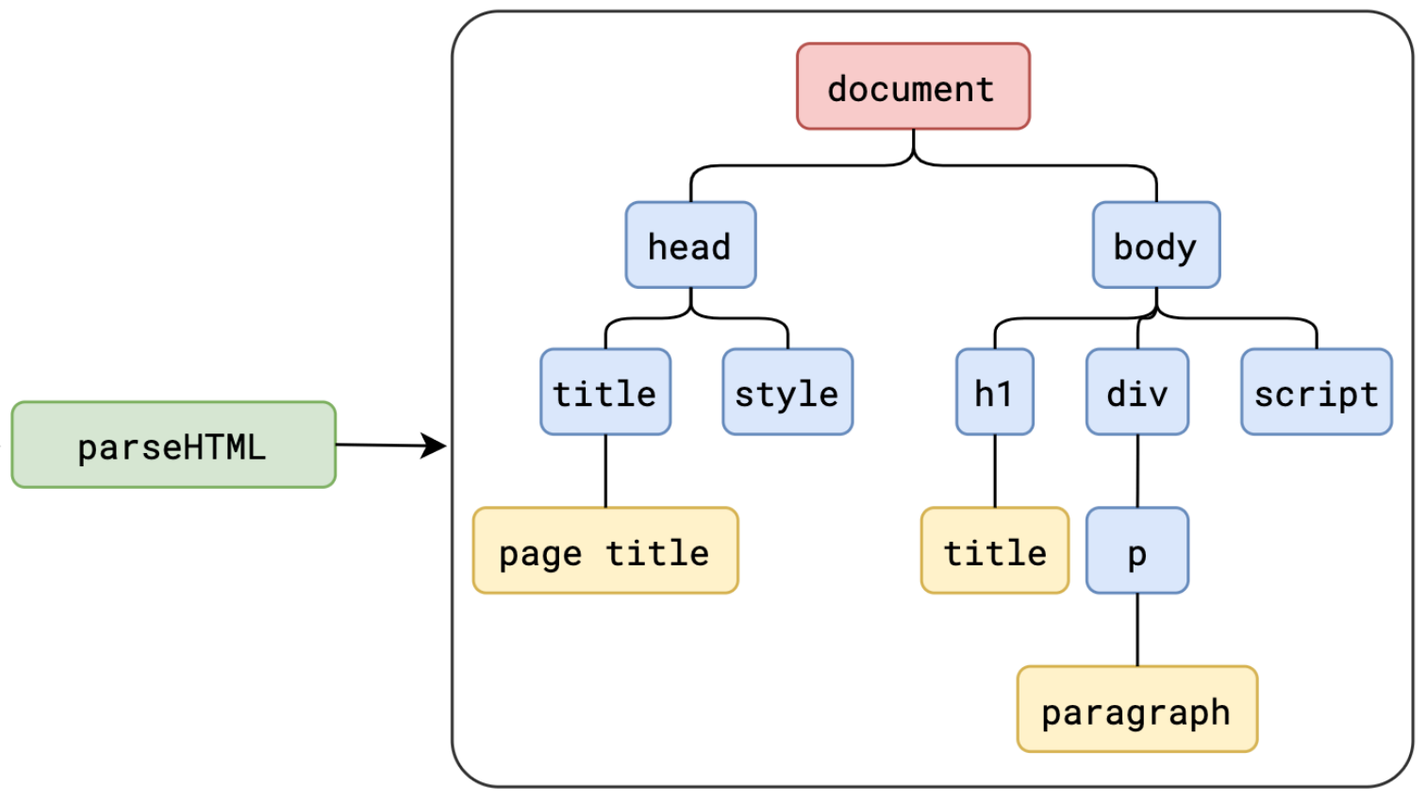




1. 解析 HTML - Parse HTML

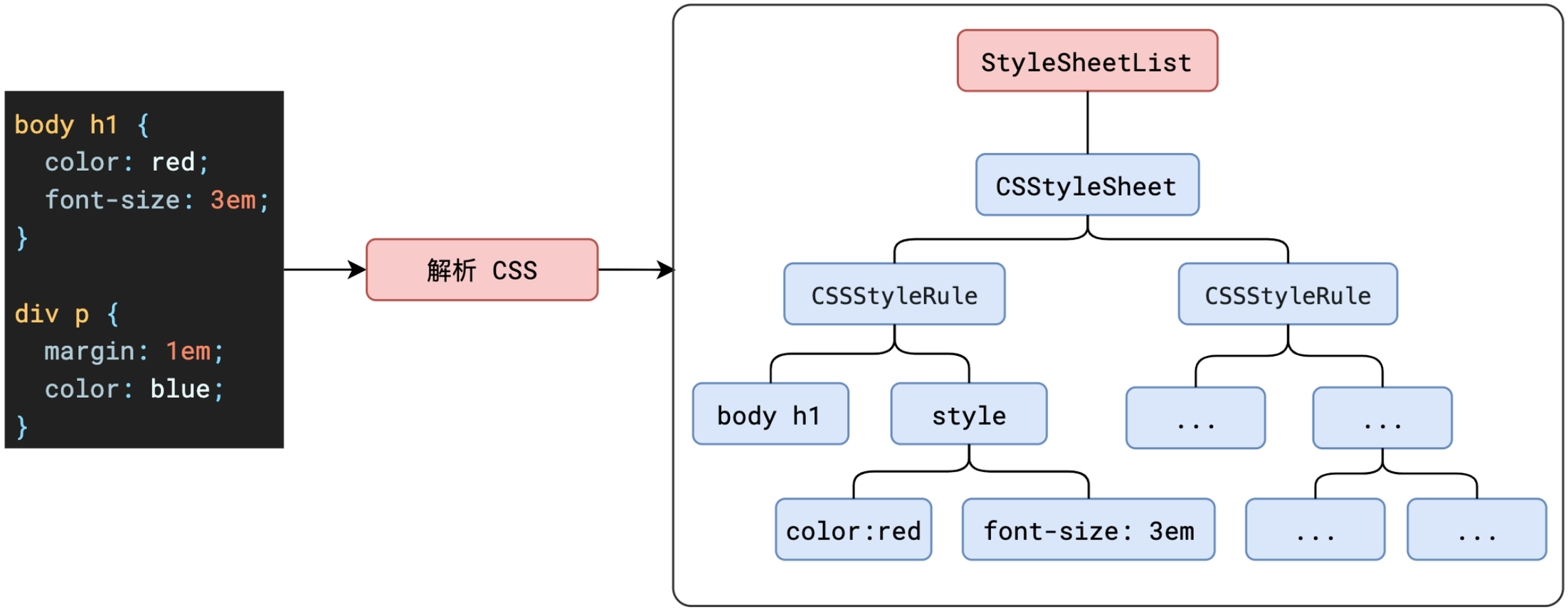
Document Object Model

```
<!DOCTYPE html>
<html>
<head>
  <title>page title</title>
  <style>
    /* ... */
  </style>
</head>
<body>
  <h1>title</h1>
  <div>
    <p>paragraph</p>
  </div>
  <script>
    console.log('hello world');
  </script>
</body>
</html>
```



1. 解析 HTML - Parse HTML

CSS Object Model

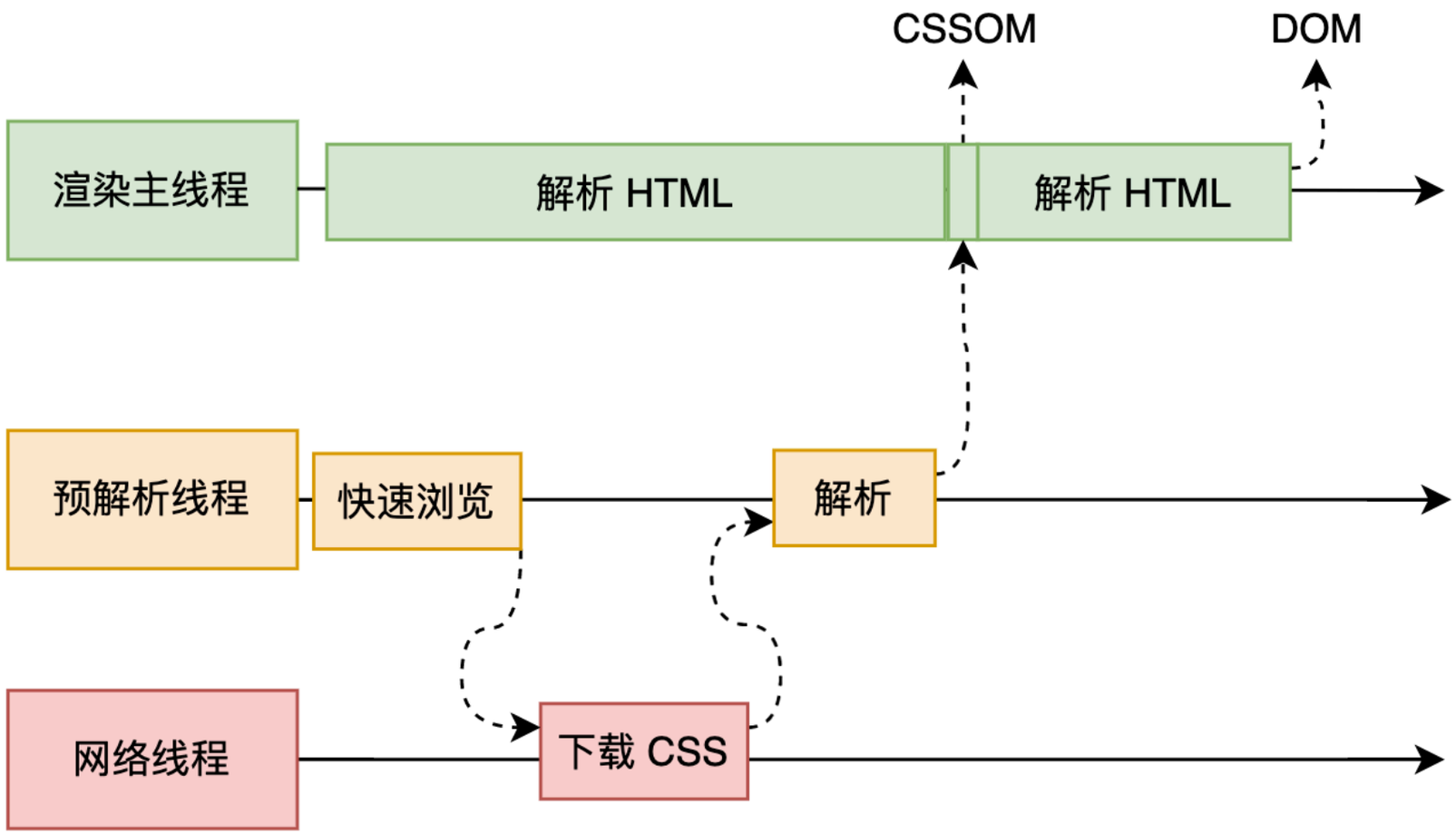


1. 解析 HTML - Parse HTML

常见问题

HTML 解析过程中遇到 CSS 代码怎么办?

为了提高解析效率，浏览器会启动一个预解析器率先下载和解析 CSS



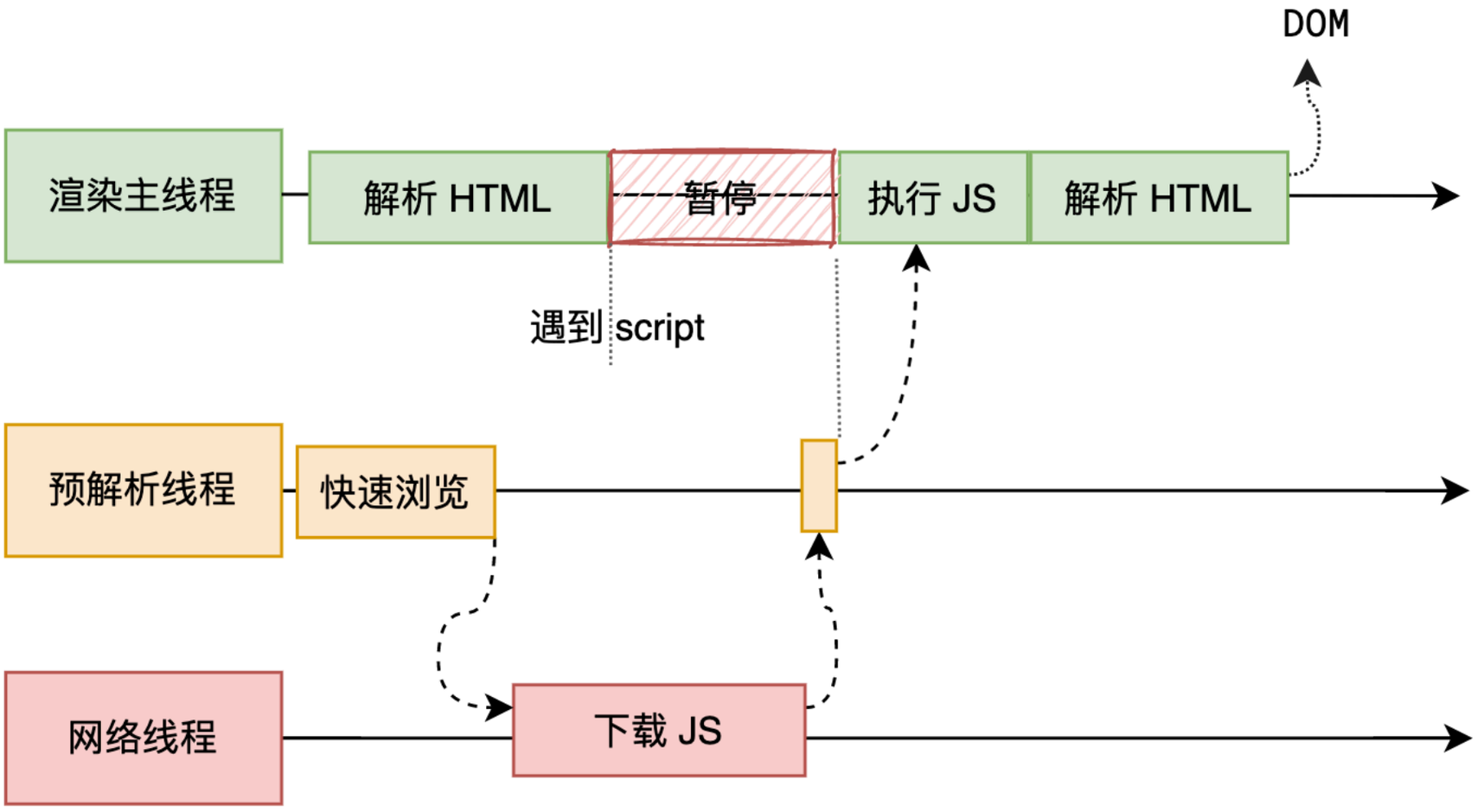
1. 解析 HTML - Parse HTML

常见问题

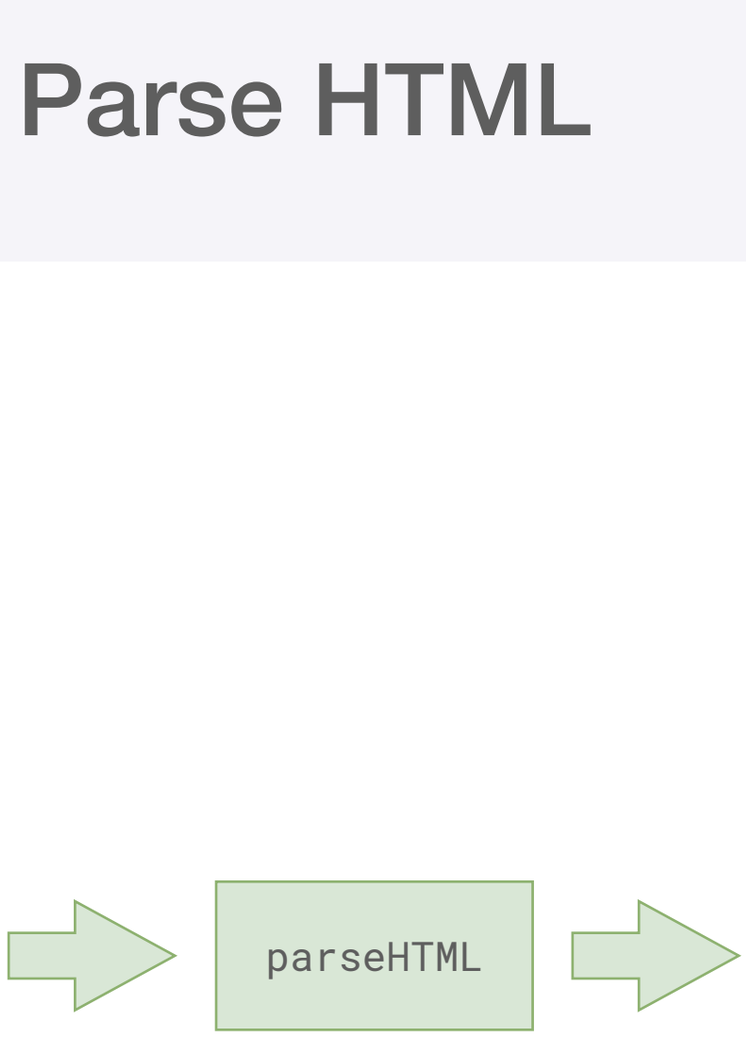
HTML 解析过程中遇到 JS 代码怎么办?

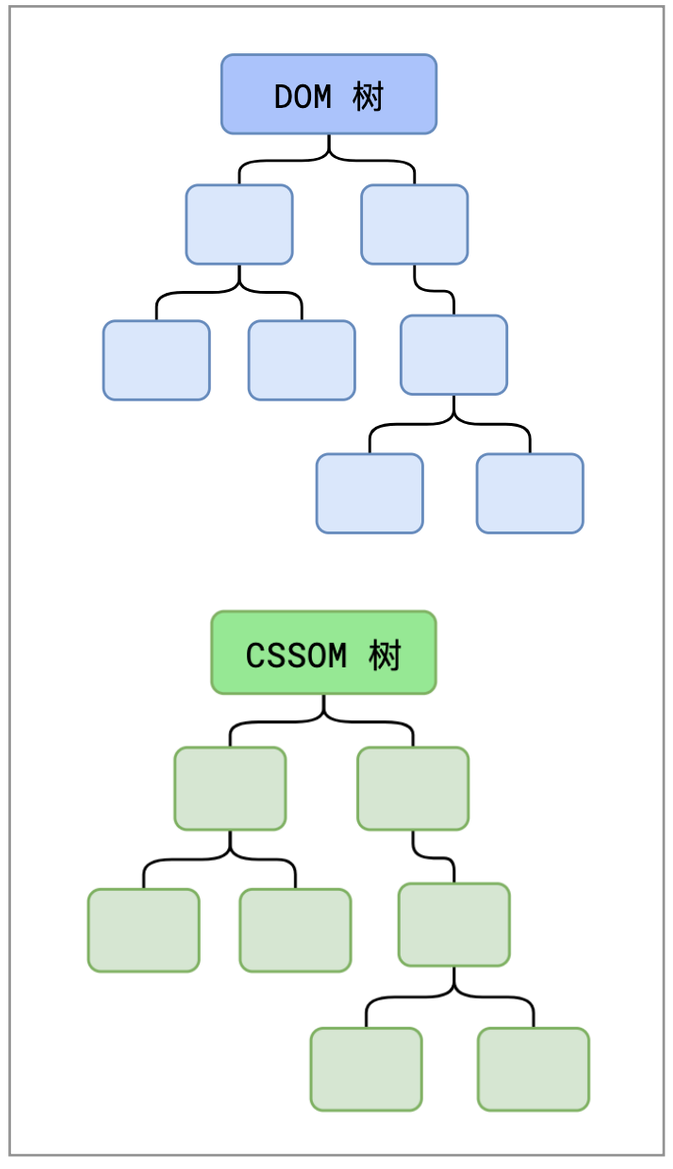
渲染主线程遇到 JS 时必须暂停一切行为，等待下载执行完后才能继续

预解析线程可以分担一点下载 JS 的任务

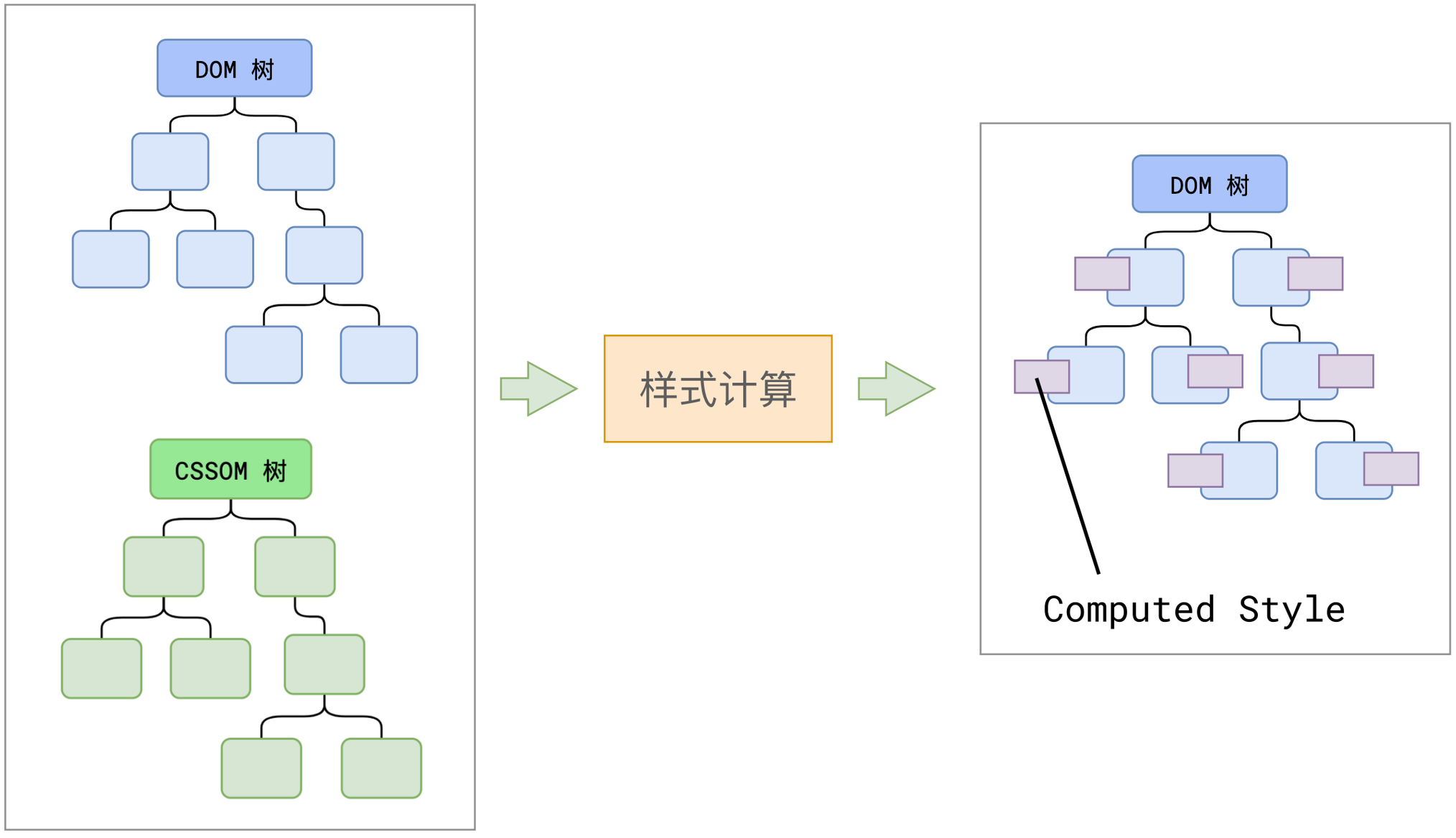


1. 解析 HTML - Parse HTML

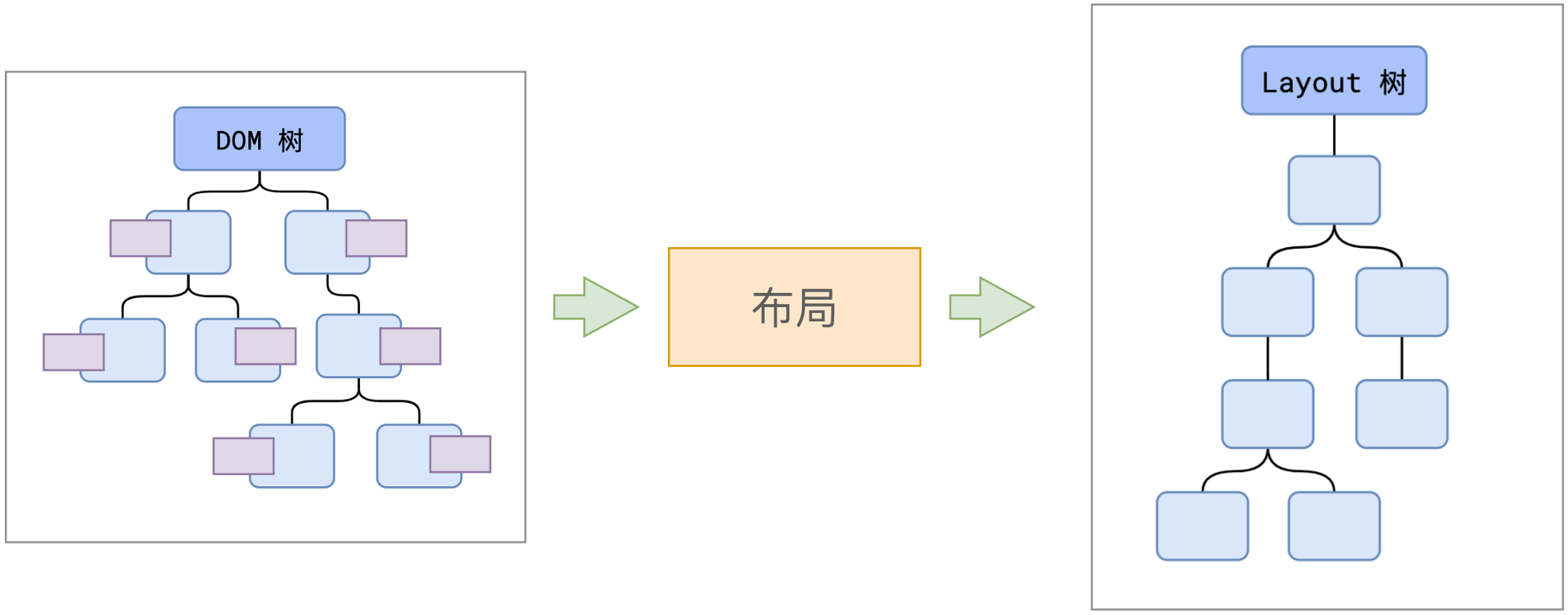




2. 样式计算 - Recalculate Style

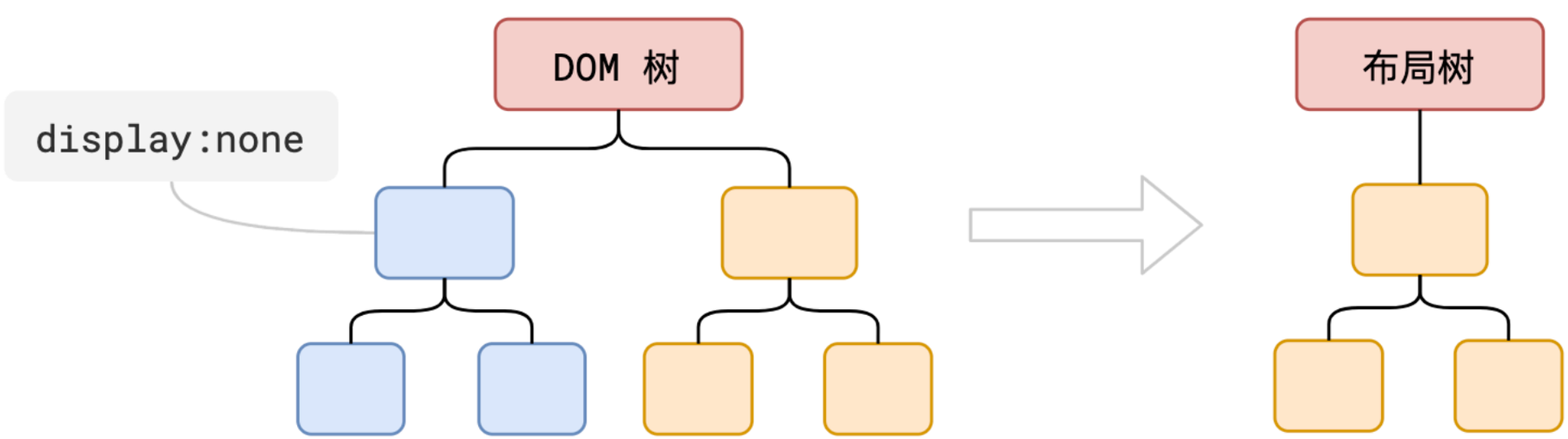


3. 布局 - Layout



3. 布局 - Layout

DOM 树 和 Layout 树不一定是一一对应的



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DOM 树 和 Layout 树

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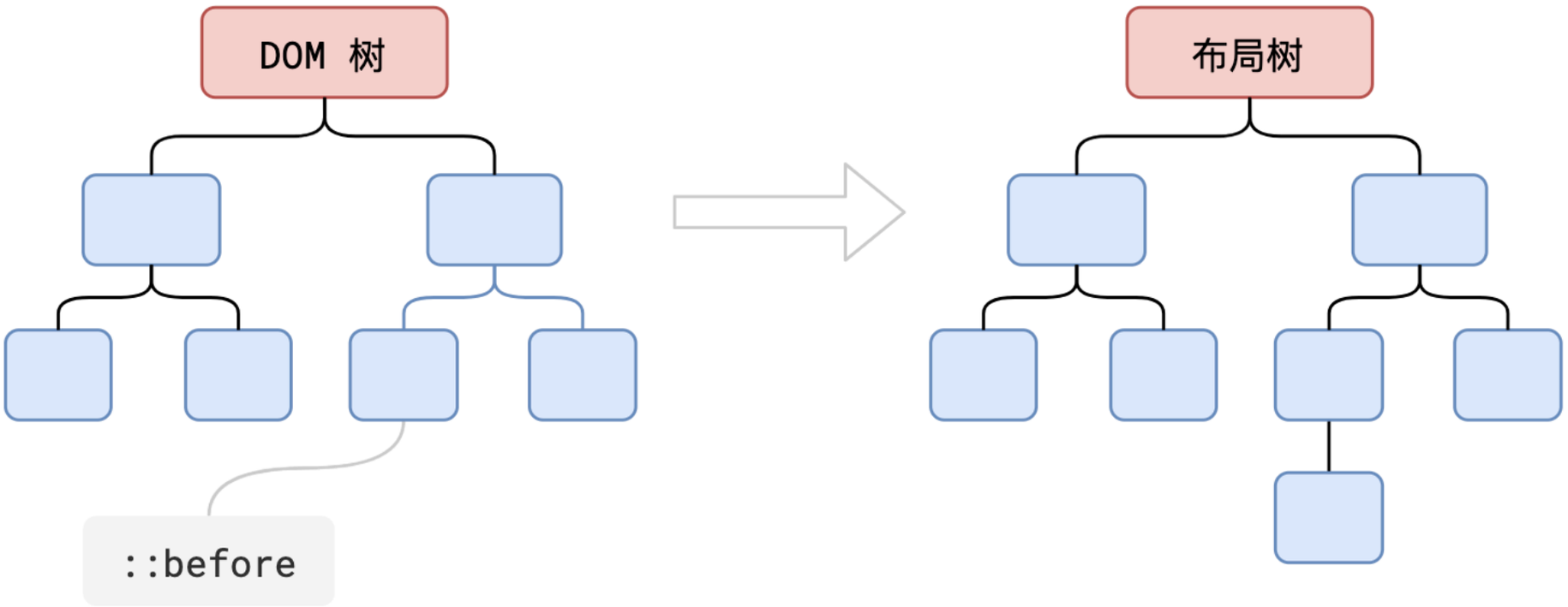
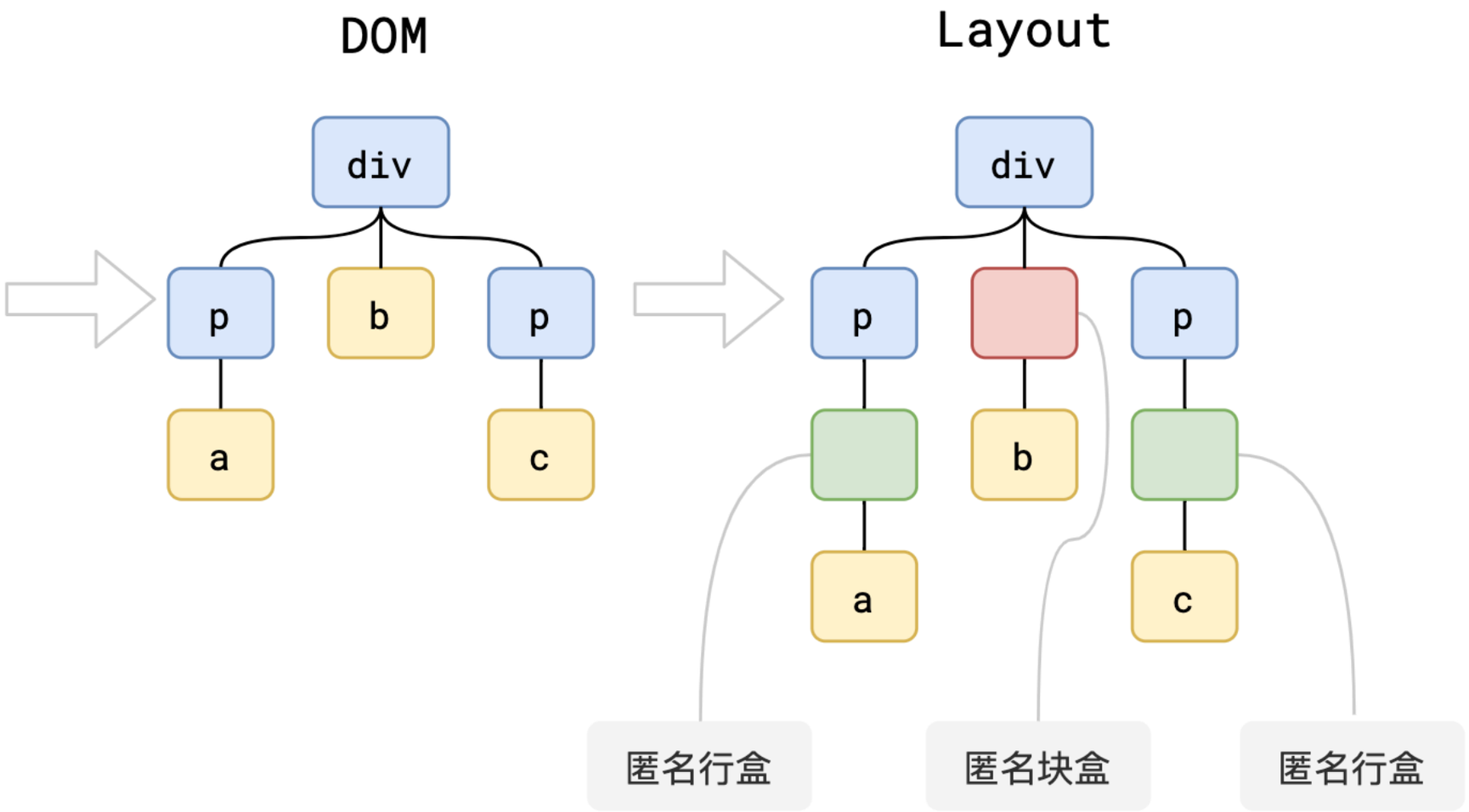


3. 布局 - Layout

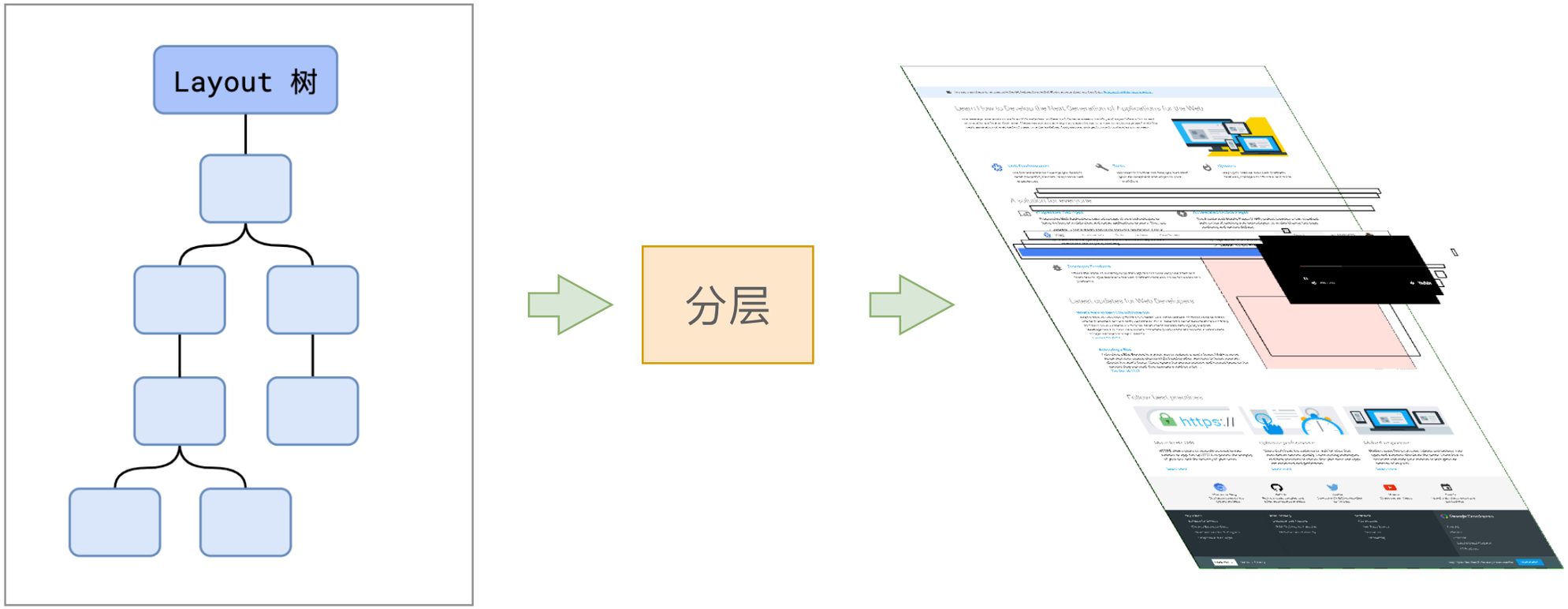
DOM 树 和 Layout 树

DOM 树 和 Layout 树不一定是一一对应的

```
<div>
  <p>a</p>
  b
  <p>c</p>
</div>
```

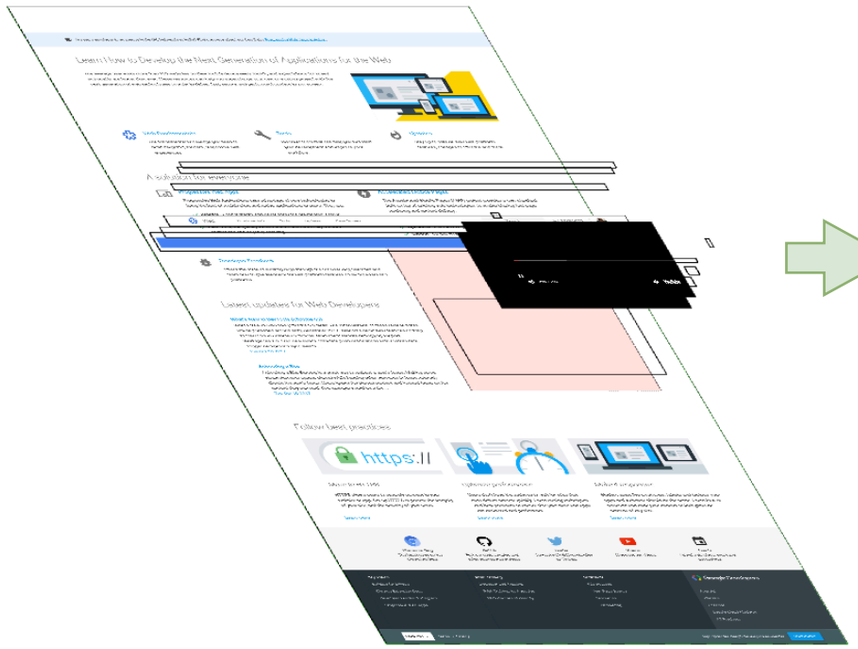


4. 分层 - Layer

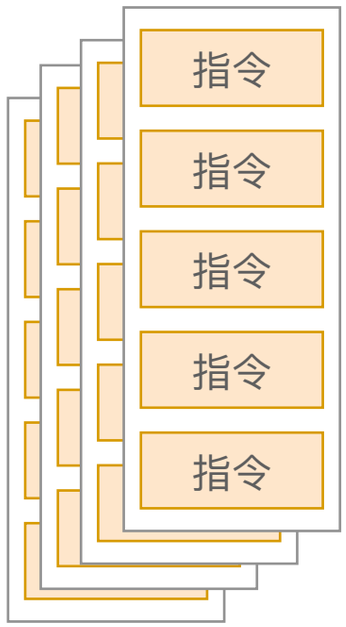


5. 绘制 - Paint

这里的绘制，是为每一层生成如何绘制的指令

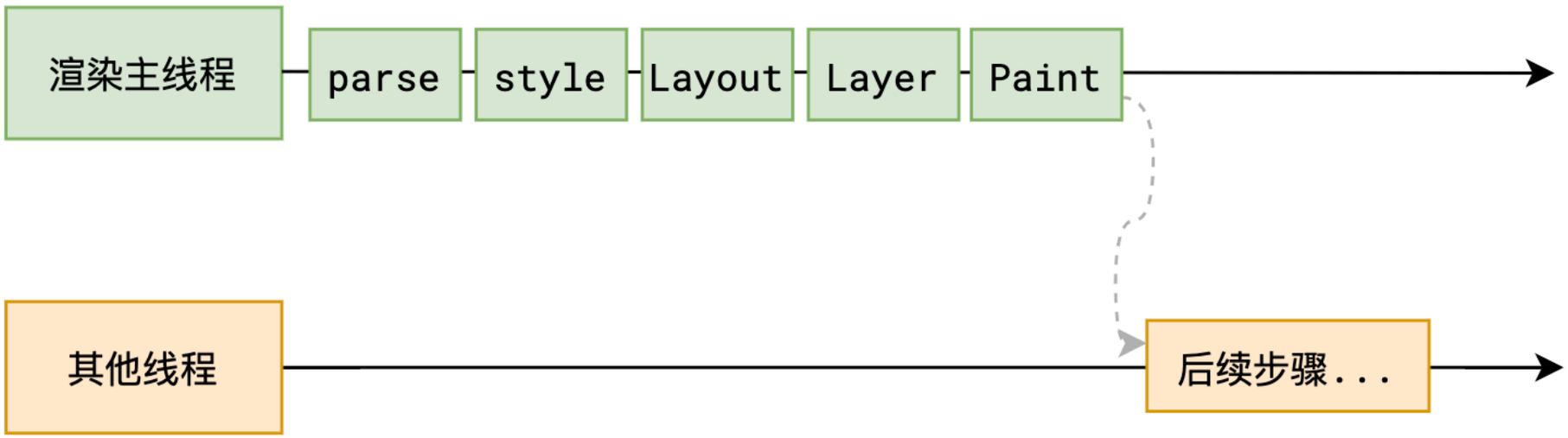


绘制



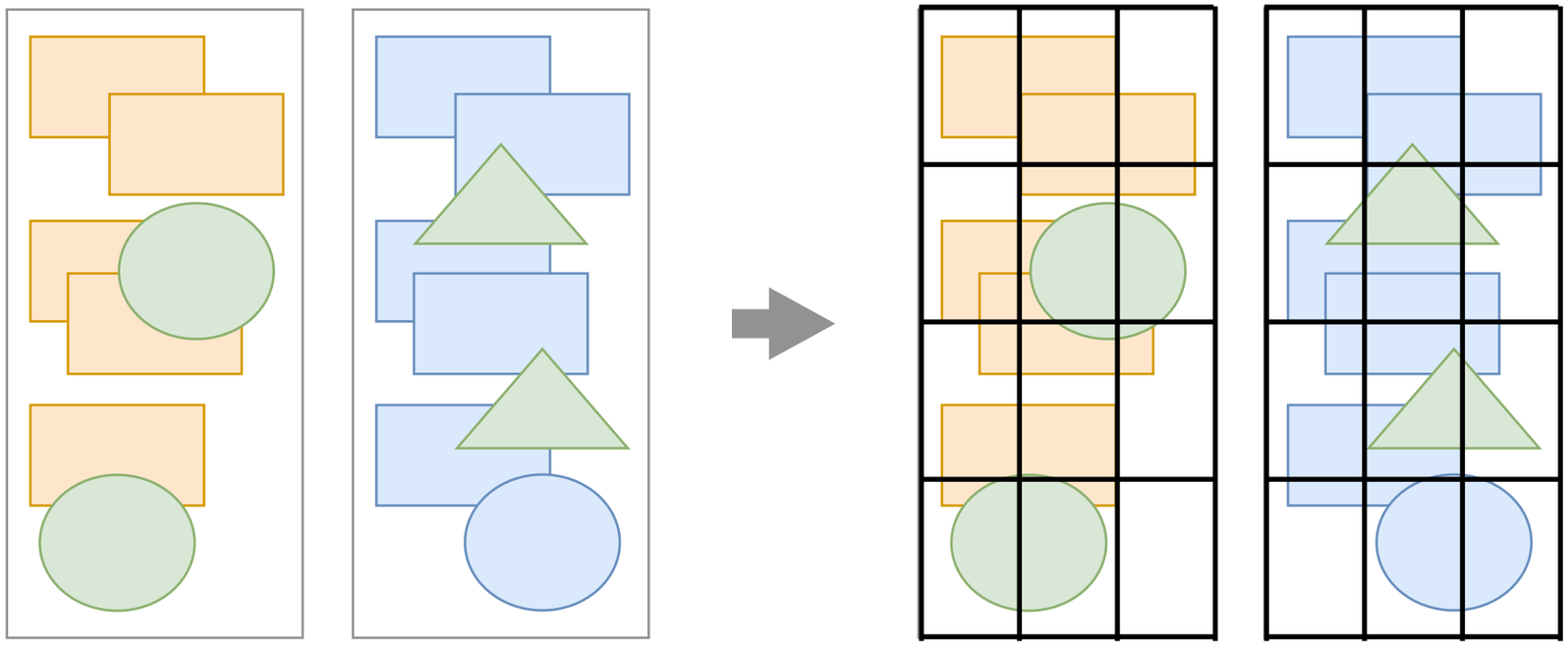
5. 绘制 - Paint

渲染主线程的工作到此为止，剩余步骤交给其他线程完成



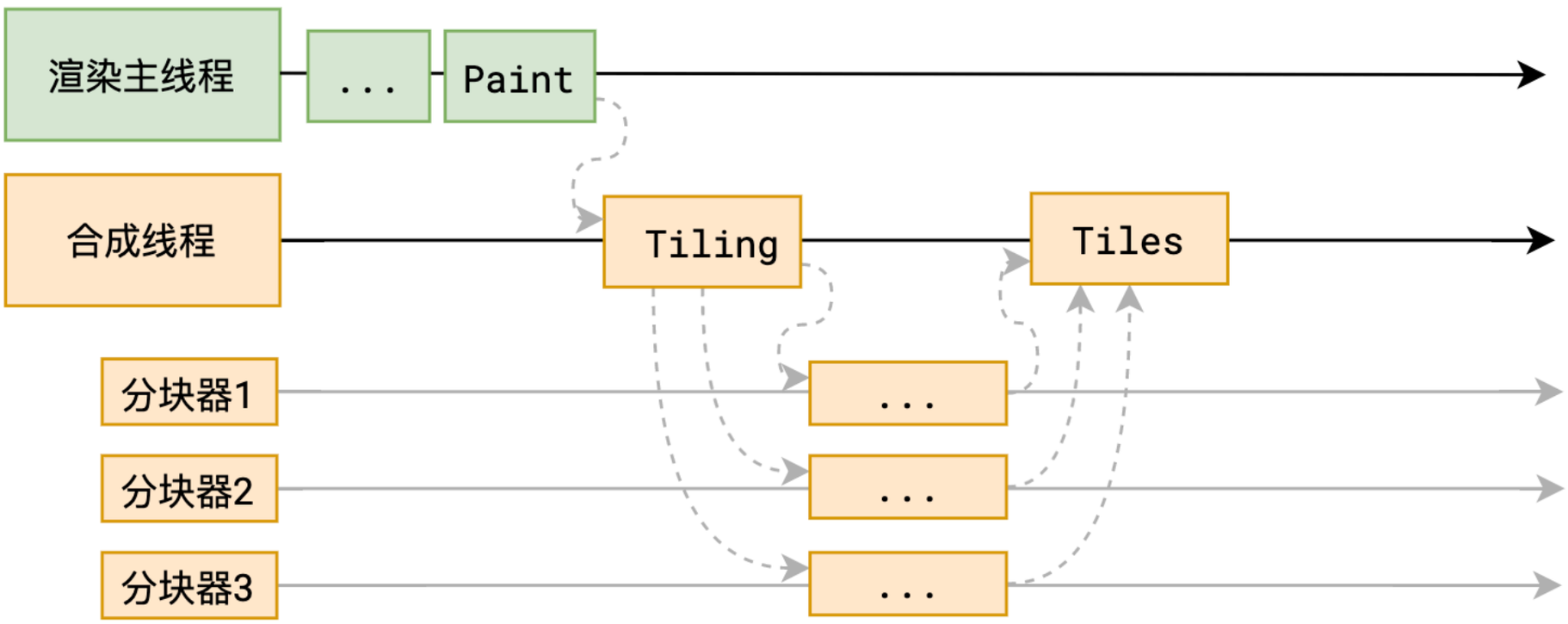
6. 分块 - Tiling

分块会将每一层分为多个小的区域



6. 分块 - Tiling

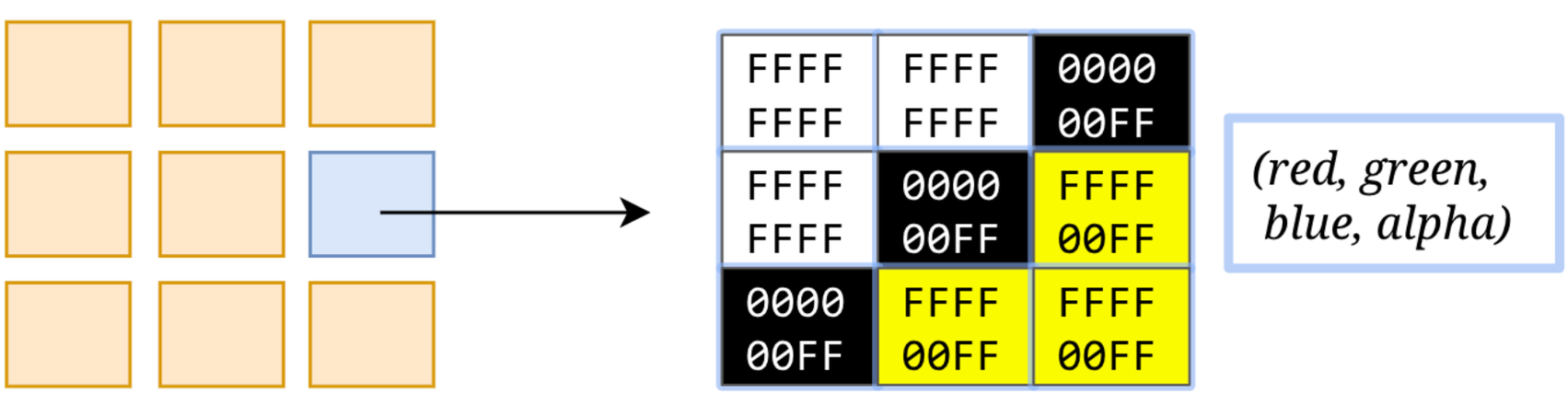
分块的工作是交给多个线程同时进行的



7. 光栅化 - Raster

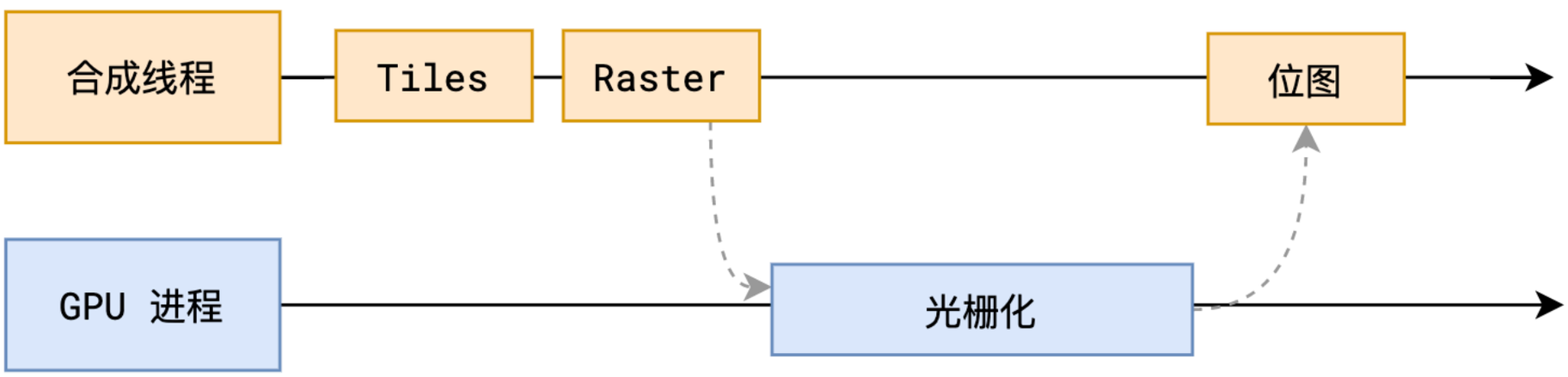
光栅化是将每个块变成位图

优先处理靠近视口的块



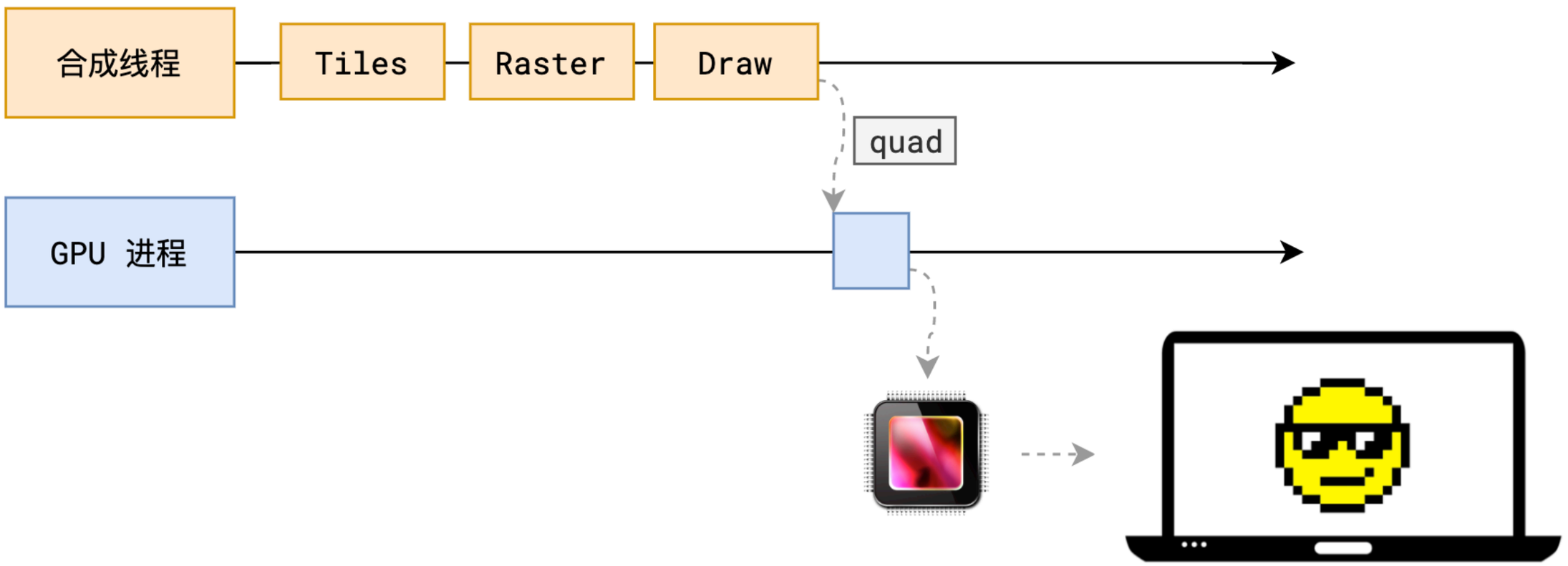
7. 光栅化 - Raster

此过程会用到 GPU 加速

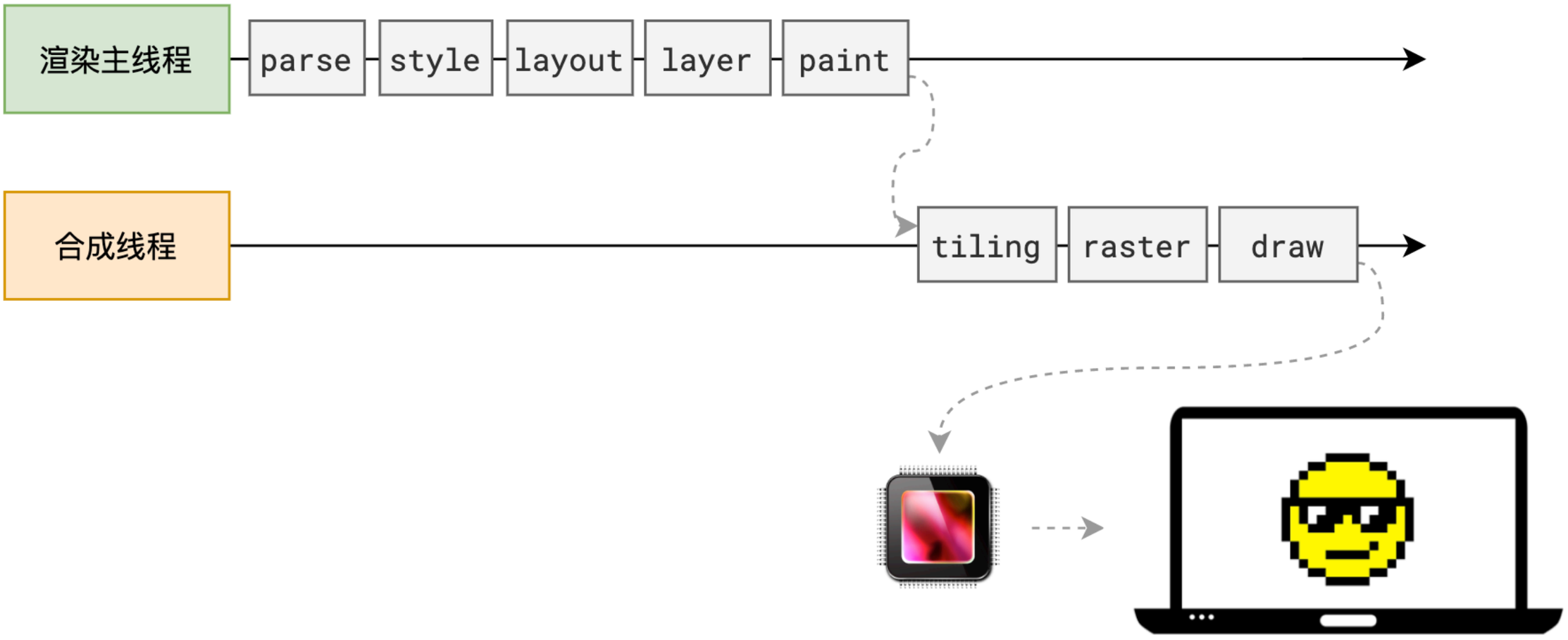


8. 画 - Draw

合成线程计算出每个位图在屏幕上的位置，交给 GPU 进行最终呈现

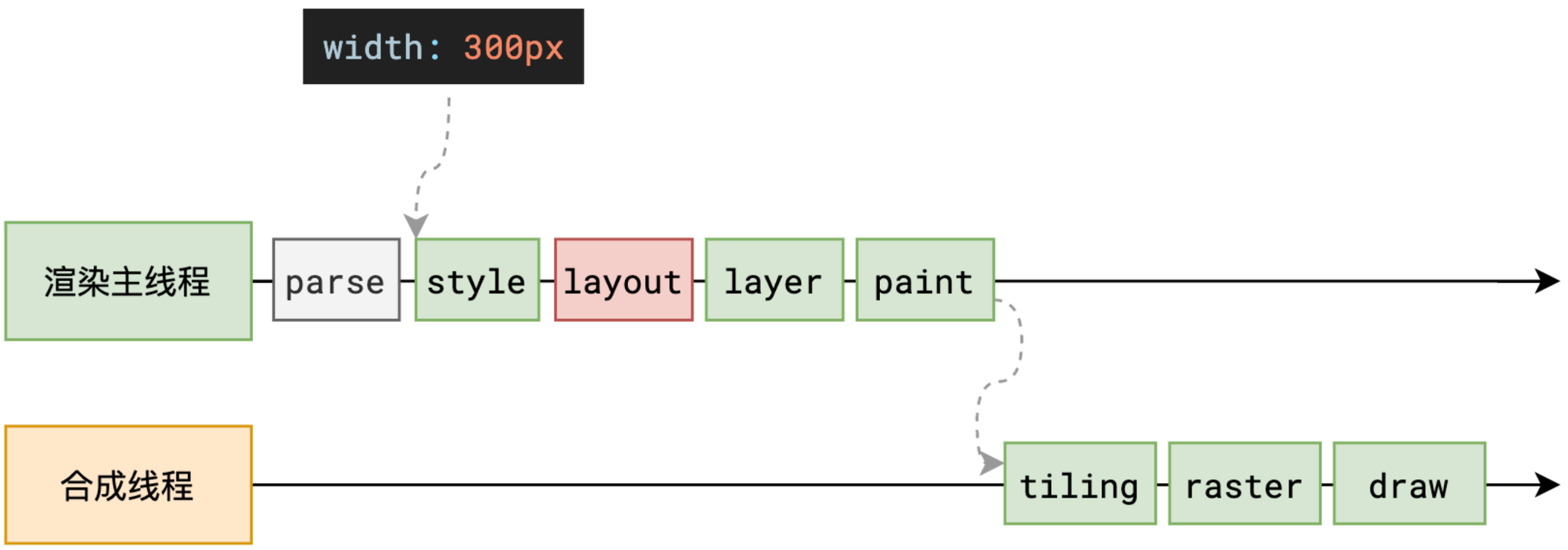


完整过程


渲染主线程
parse
style
layout
layer
paint
合成线程
tiling
raster
draw

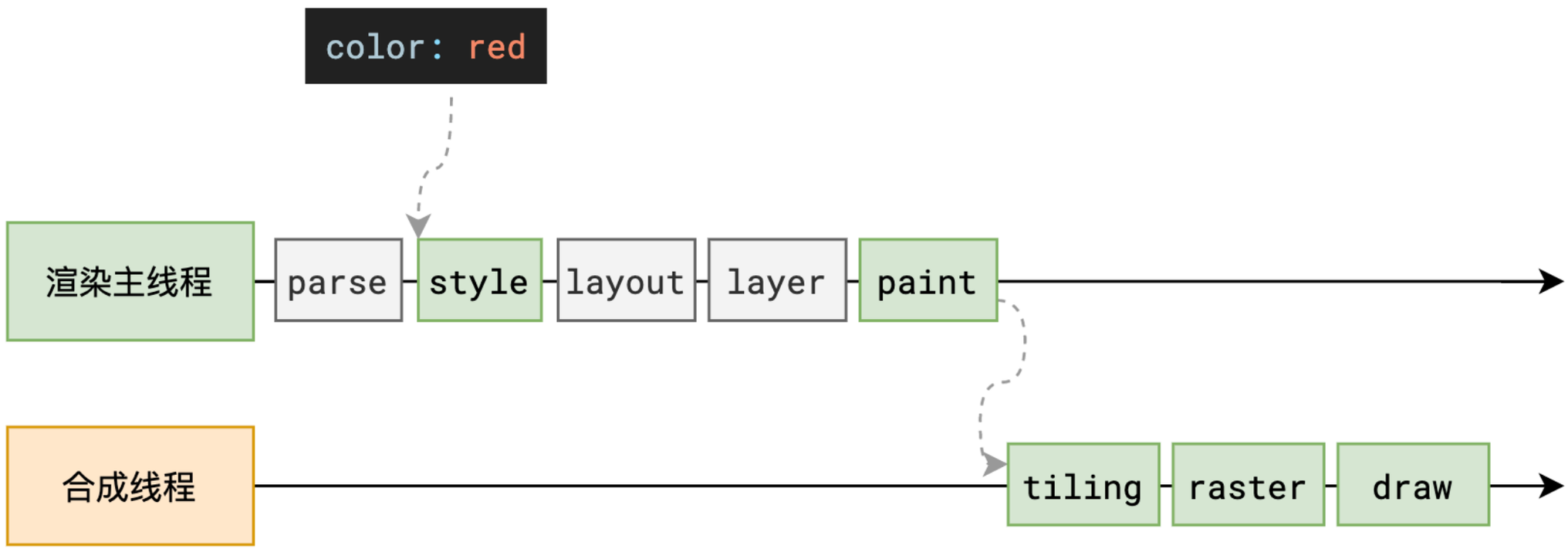
常见面试题

什么是 reflow ？



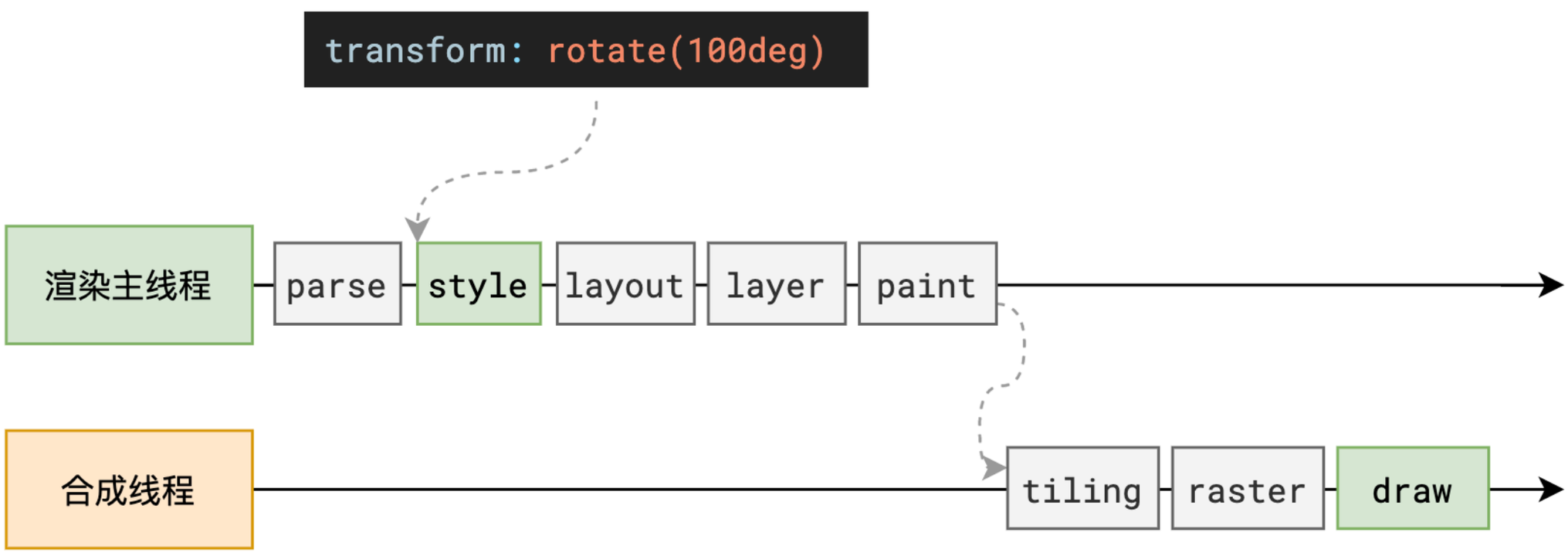
常见面试题

什么是 repaint ？



常见面试题

为什么 transform 效率高?



常见面试题

为什么 transform 效率高?