

실전으로 배우는  
웹 성능 최적화 for React

Lecture #2

# 실습내용

- 애니메이션 최적화 (Reflow, Repaint)
- 컴포넌트 Lazy Loading (Code Splitting)
- 컴포넌트 Preloading
- 이미지 Preloading

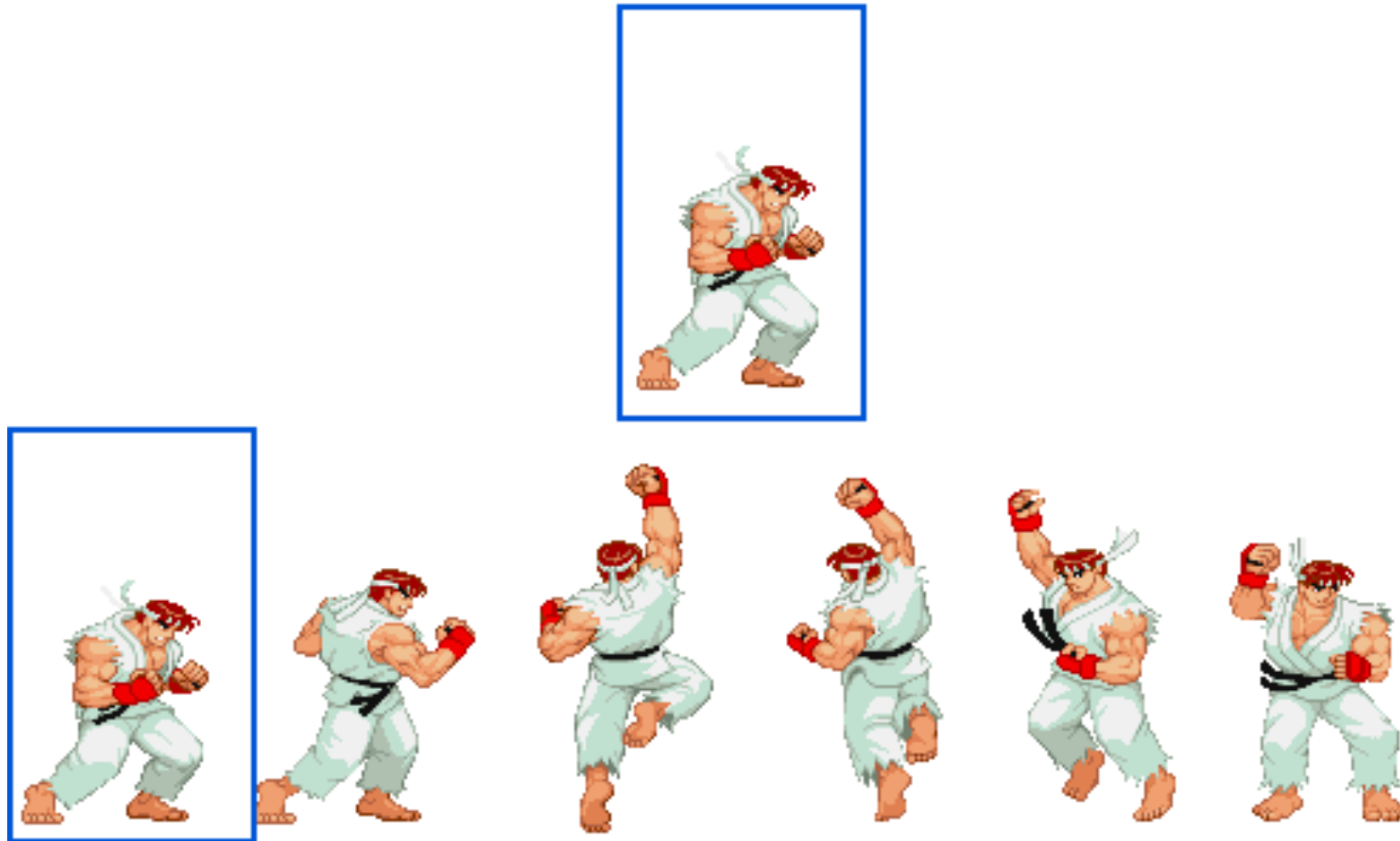
# 실습내용

- 애니메이션 최적화 (Reflow, Repaint) — 렌더링 성능 최적화
  - 컴포넌트 Lazy Loading (Code Splitting)
  - 컴포넌트 Preloading
  - 이미지 Preloading
- 로딩 성능 최적화

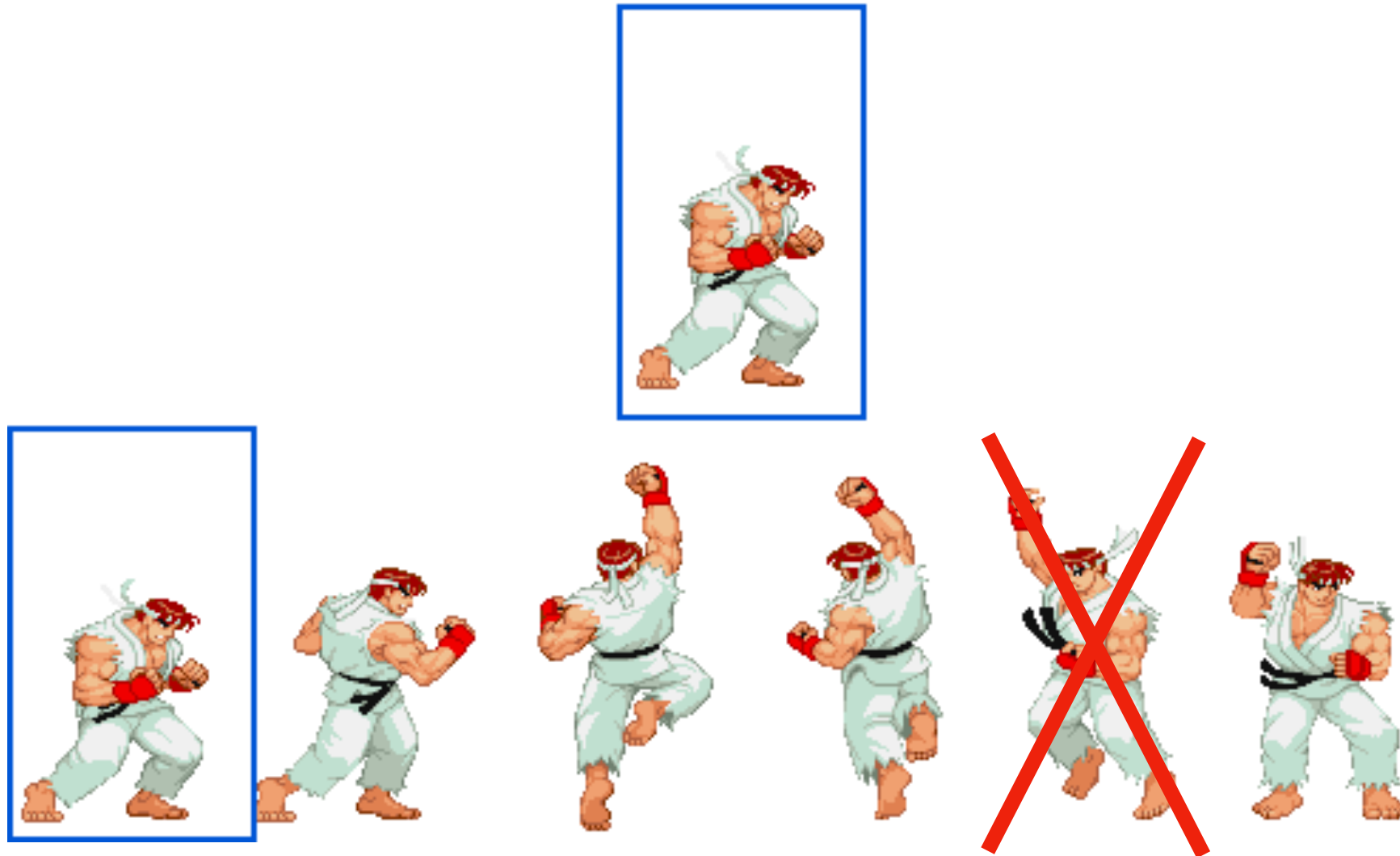
# 분석 툴

- 크롬 Network 탭
- 크롬 Performance 탭
- webpack-bundle-analyzer

# 애니메이션 원리



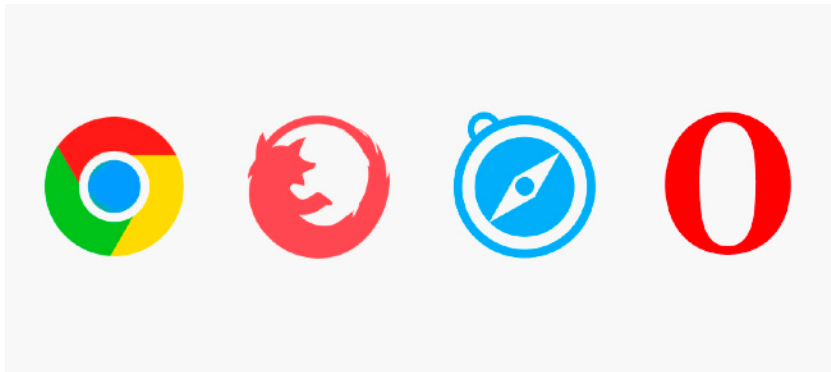
# 애니메이션 원리



# 잼크 현상



=> 초당 60 Frame (60FPS)

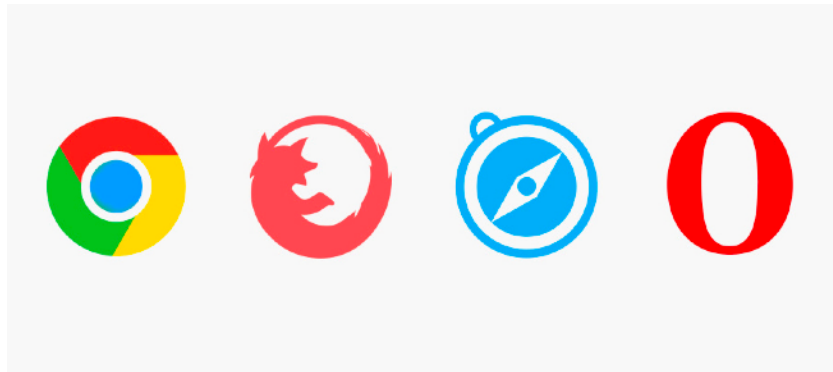


=> 초당 60 Frame (60FPS)

# 잼크 현상



=> 초당 60 Frame (60FPS)



=> 초당 60 Frame (60FPS)

초당 30 Frame

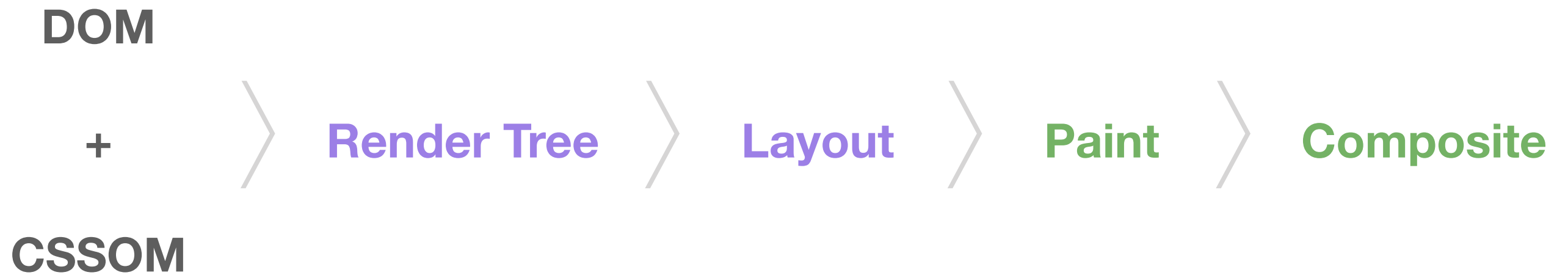
초당 20 Frame



잼크 발생  
(애니메이션이 버벅이는 현상)



# 브라우저 렌더링 과정



# 브라우저 렌더링 과정

DOM + CSSOM

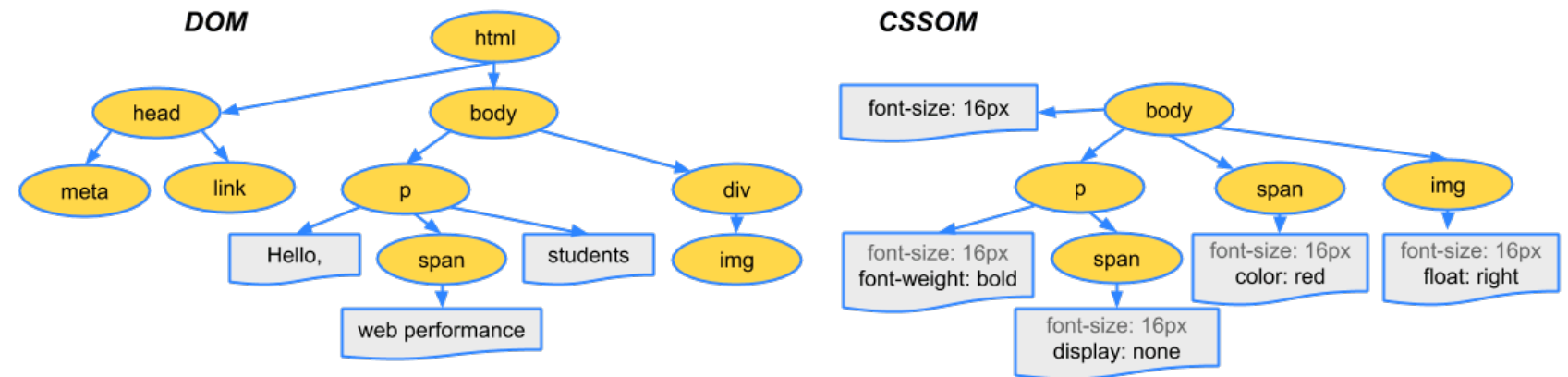
HTML, CSS 가공

Render Tree

Layout

Paint

Composite



# 브라우저 렌더링 과정

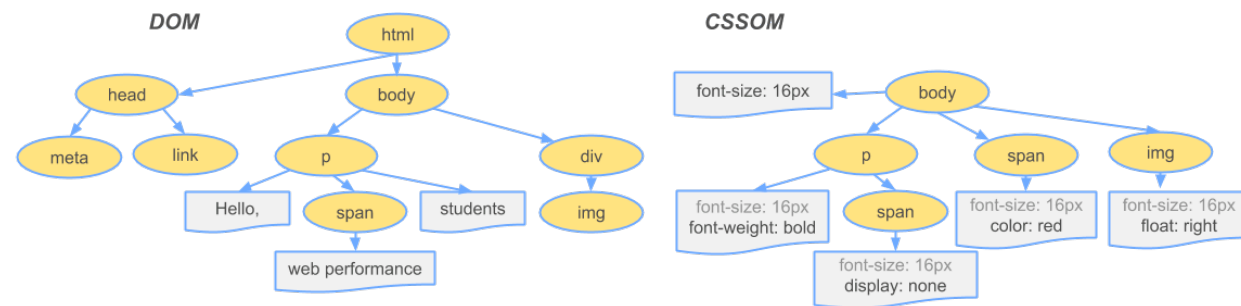
DOM + CSSOM

Render Tree

Layout

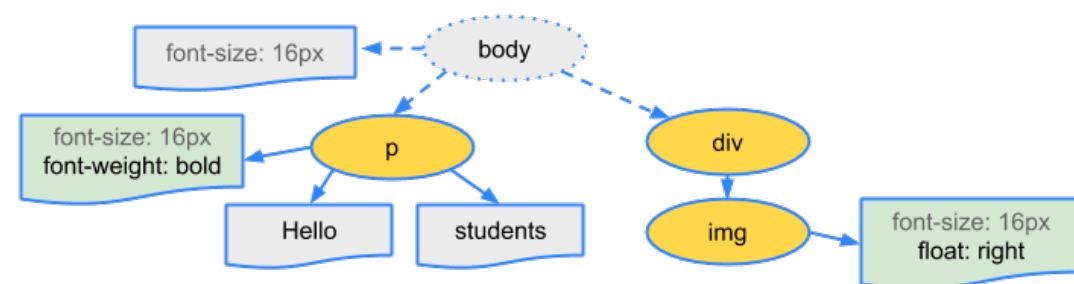
Paint

Composite



조합

Render Tree



# 브라우저 렌더링 과정

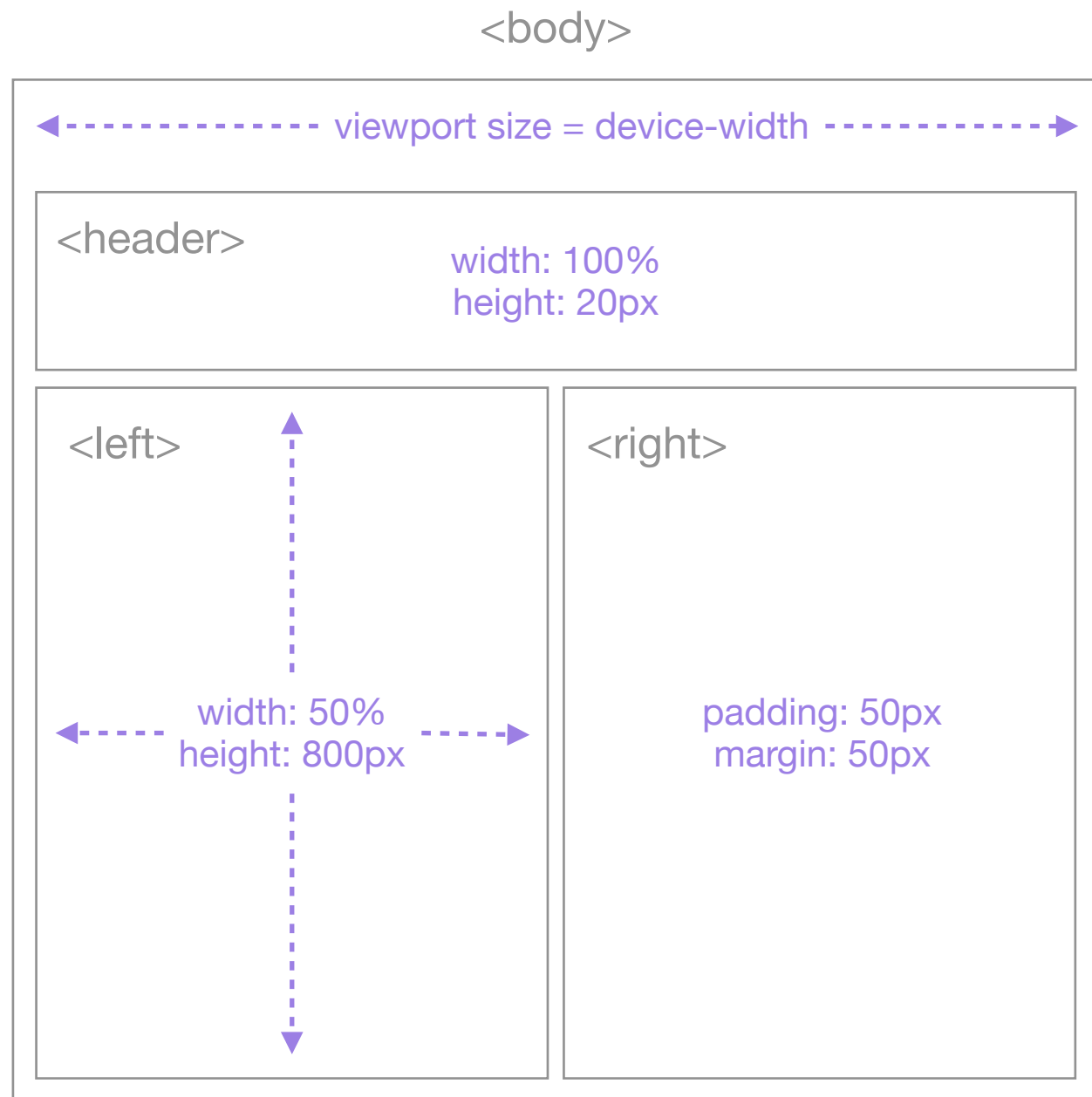
DOM + CSSOM

Render Tree

Layout

Paint

Composite



위치, 크기 계산

# 브라우저 렌더링 과정

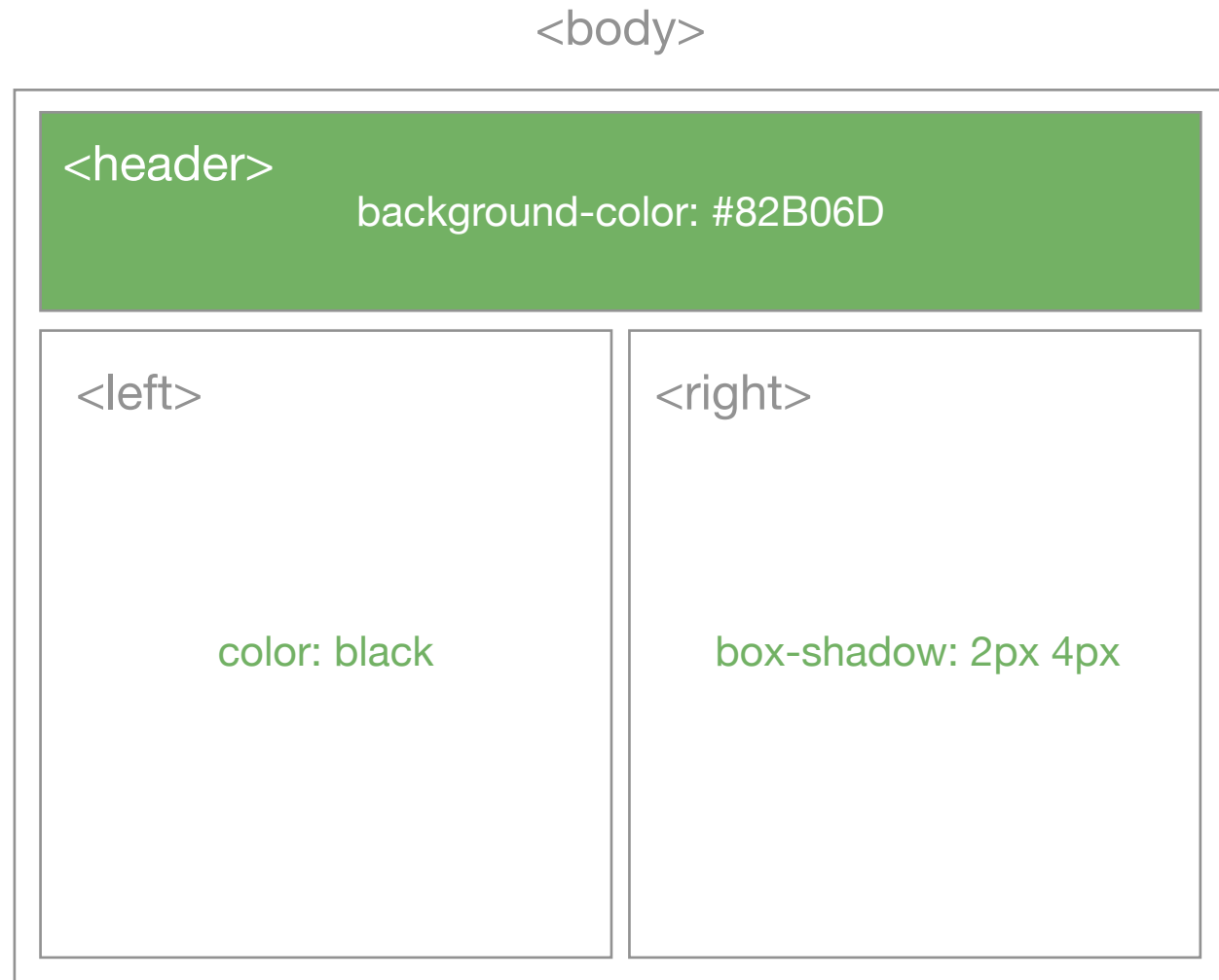
DOM + CSSOM

Render Tree

Layout

Paint

Composite



색 채워 넣기

# 브라우저 렌더링 과정

DOM + CSSOM

Render Tree

Layout

Paint

Composite



각 레이어 합성

# 브라우저 렌더링 과정

DOM + CSSOM

Render Tree

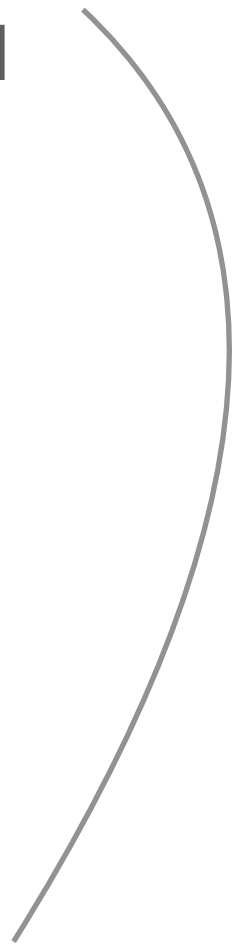
Layout

Paint

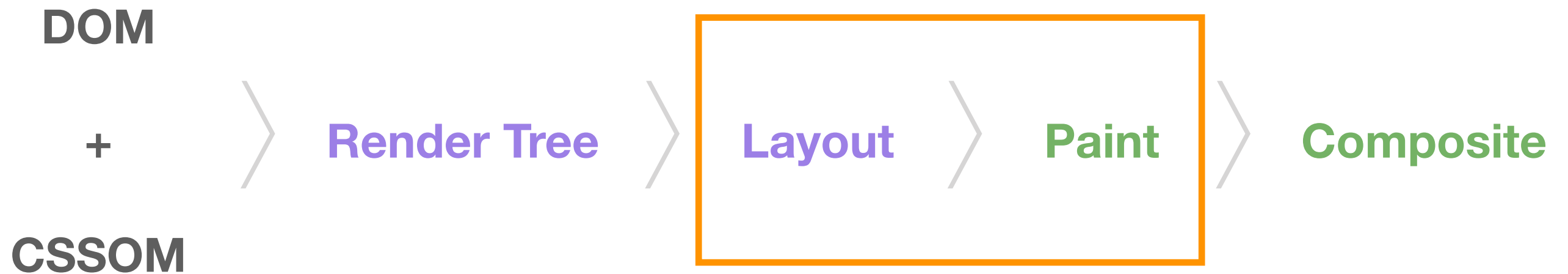
Composite

Critical Rendering Path

Pixel Pipeline



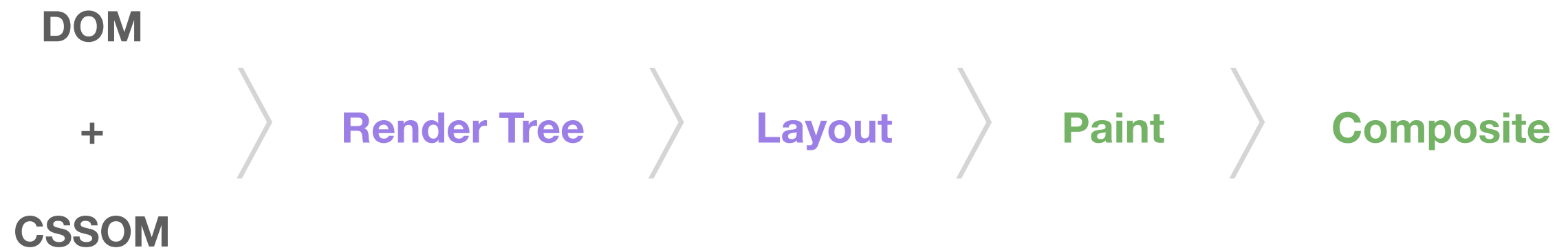
# 브라우저 렌더링 과정





# Reflow

width, height(위치나 크기) 변경



모두 재실행

# Repaint

color, background-color(색깔) 변경



**DOM**

+

**CSSOM**



**Render Tree**



**Layout**



**Paint**



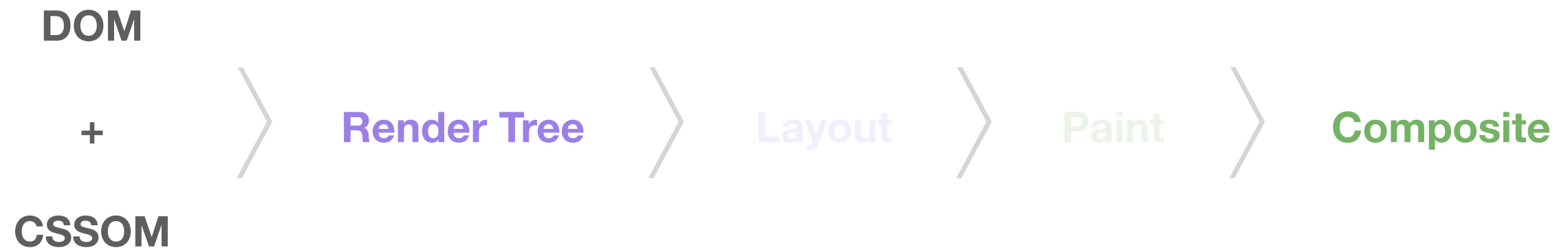
**Composite**

Layout 생략

# Reflow, Repaint 피하기

(GPU 도움받기)

transform, opacity(GPU가 관여할 수 있는 속성) 변경



Layout, Paint 생략

# 각 속성에 대한 영향도

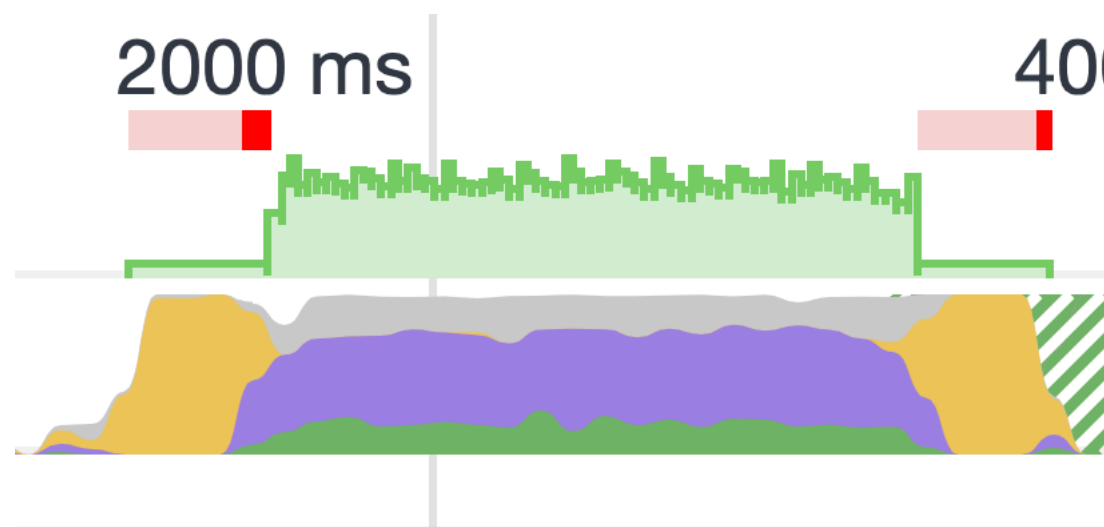
|              |                |                     |                 |           |
|--------------|----------------|---------------------|-----------------|-----------|
| position     | display        | background          | color           |           |
| width        | float          | background-image    | line-style      |           |
| height       | font-family    | background-position | outline         |           |
| left         | font-size      | background-repeat   | outline-color   | transform |
| top          | font-weight    | background-size     | outline-style   | opacity   |
| right        | line-height    | border-radius       | outline-width   |           |
| bottom       | min-height     | border-style        | text-decoration |           |
| margin       | overflow       | border-shadow       | ...             |           |
| padding      | text-align     |                     |                 |           |
| border       | vertical-align |                     |                 |           |
| border-width | ...            |                     |                 |           |

Reflow 발생

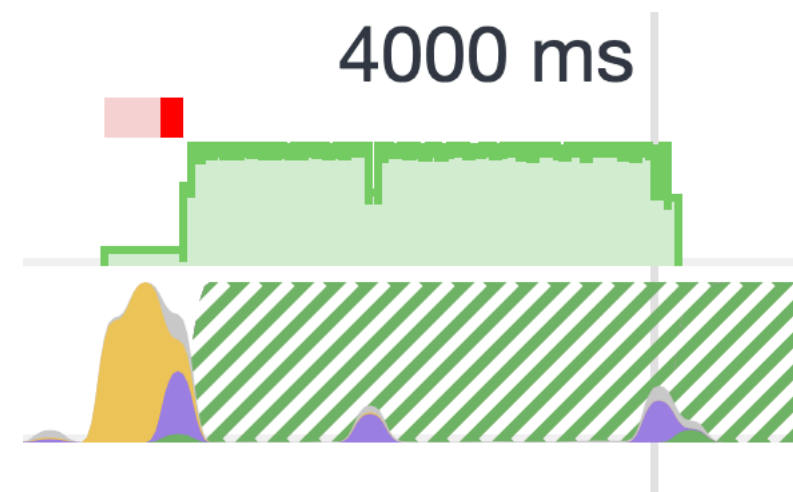
Repaint 발생

Reflow, Repaint 생략

# 애니메이션 수정 전, 후 비교

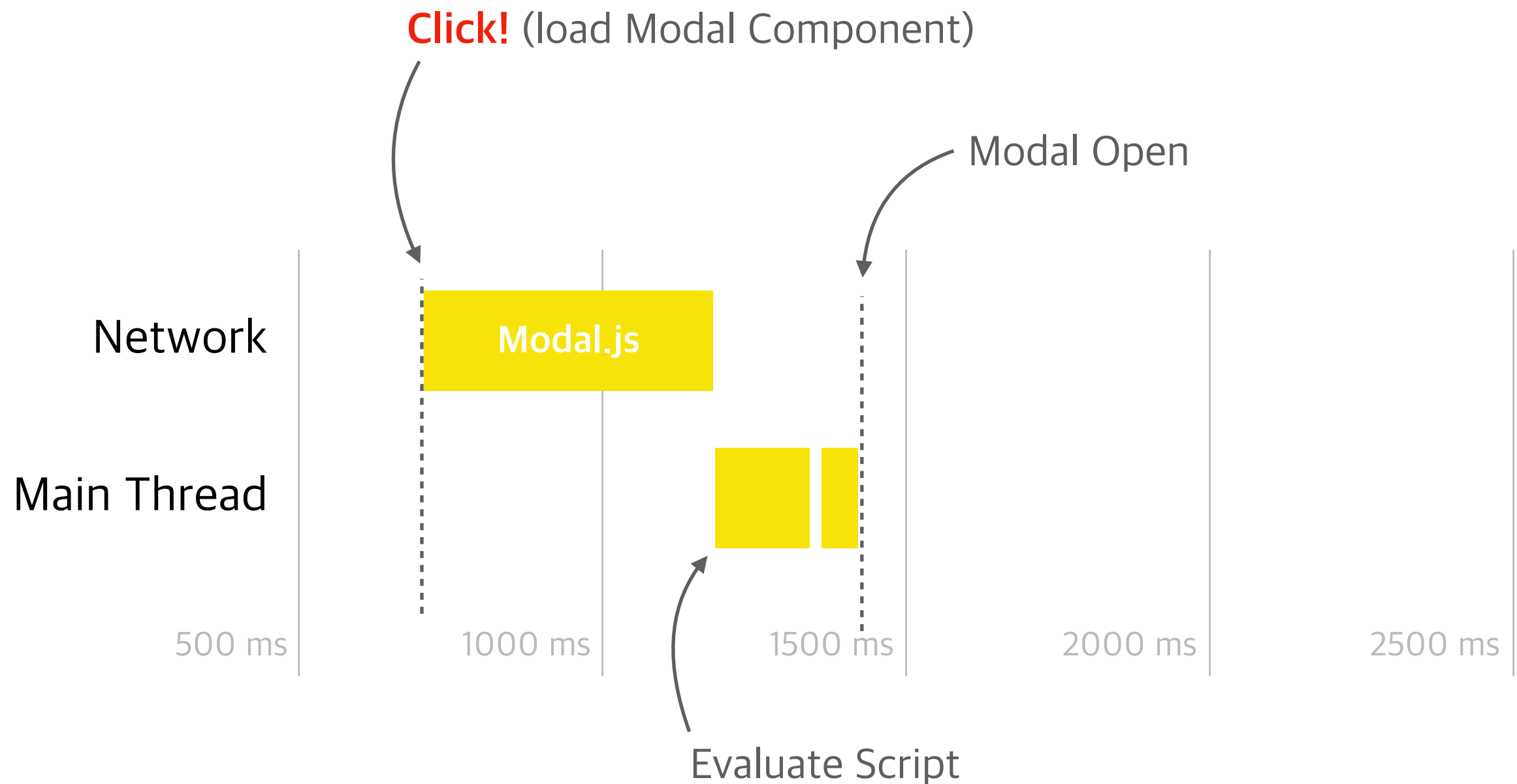


width로 애니메이션

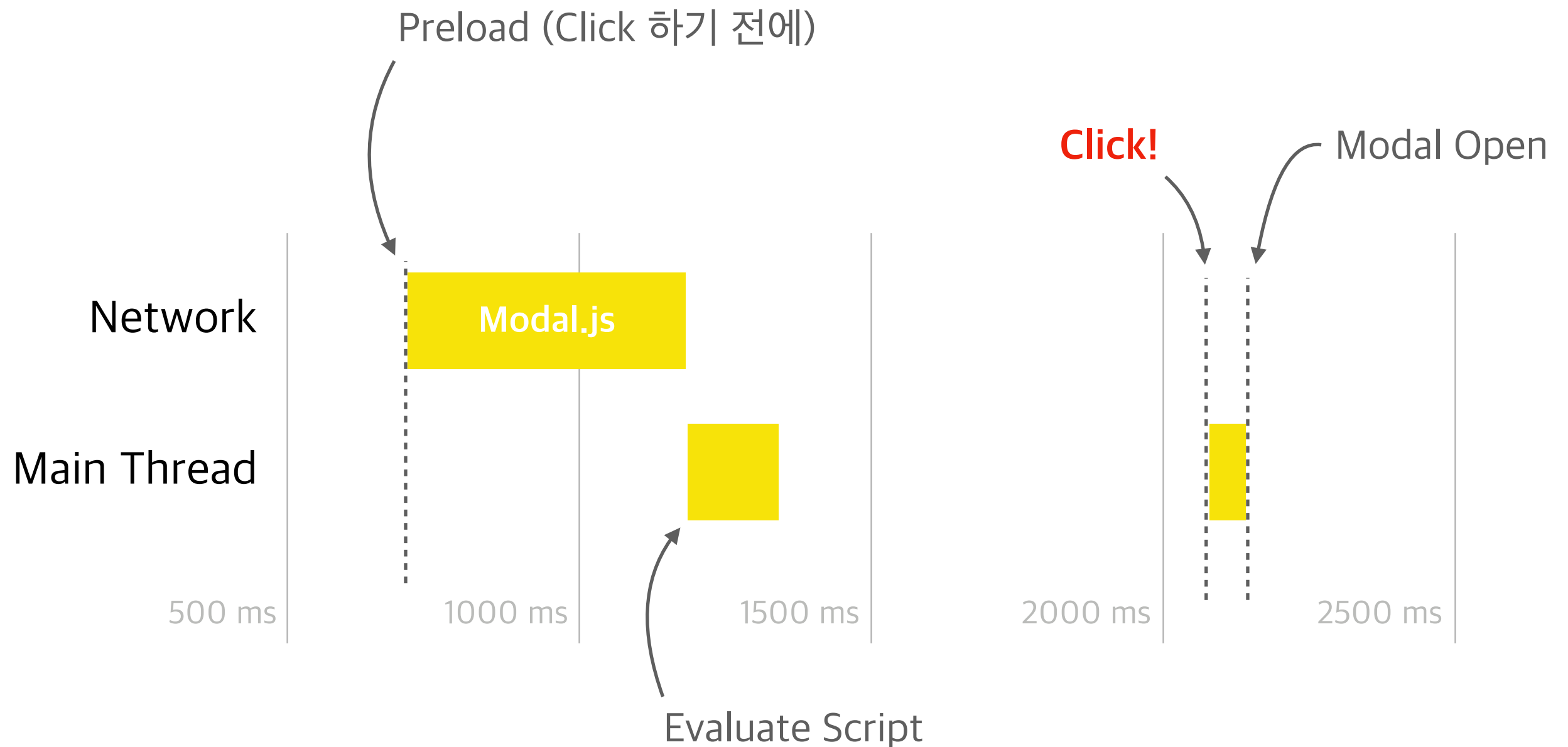


transform으로 애니메이션

# Lazy Loading의 단점



# 컴포넌트 Preload



# 컴포넌트 Preload 타이밍

1. 버튼 위에 마우스를 올려 봤을 때
2. 최초 페이지 로드가 되고,  
모든 컴포넌트의 마운트가 끝났을 때



# 정리

애니메이션 최적화  
(reflow, repaint)



컴포넌트 **Lazy Loading**  
(Code Splitting)



컴포넌트 **Preloading**



이미지 **Preloading**

# 정리

애니메이션 최적화  
(reflow, repaint)



컴포넌트 Lazy Loading  
(Code Splitting)



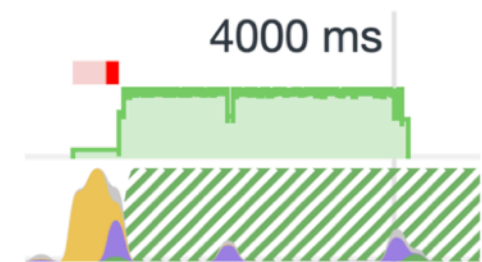
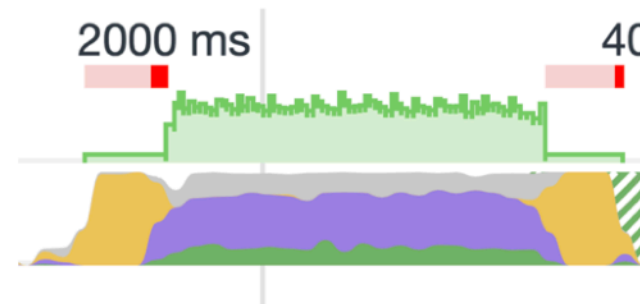
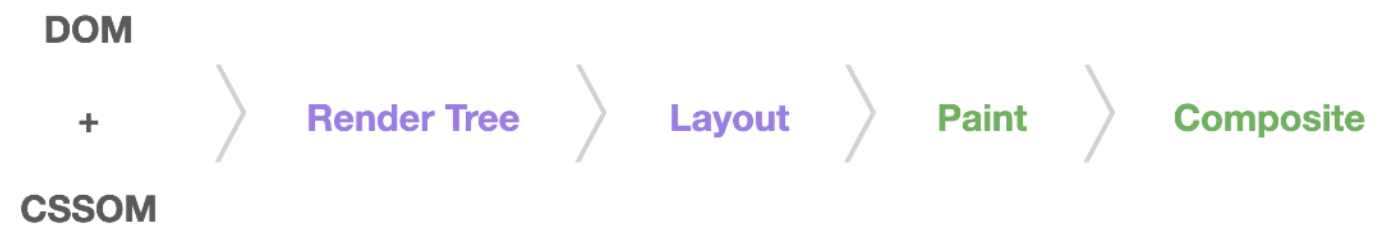
컴포넌트 Preloading



이미지 Preloading

Q2. 어떤 올림픽이 더 재밌었나요?

|        |        |      |
|--------|--------|------|
| 100.0% | 리오 올림픽 | 1049 |
| 0%     | 런던 올림픽 |      |



# 정리

애니메이션 최적화  
(reflow, repaint)



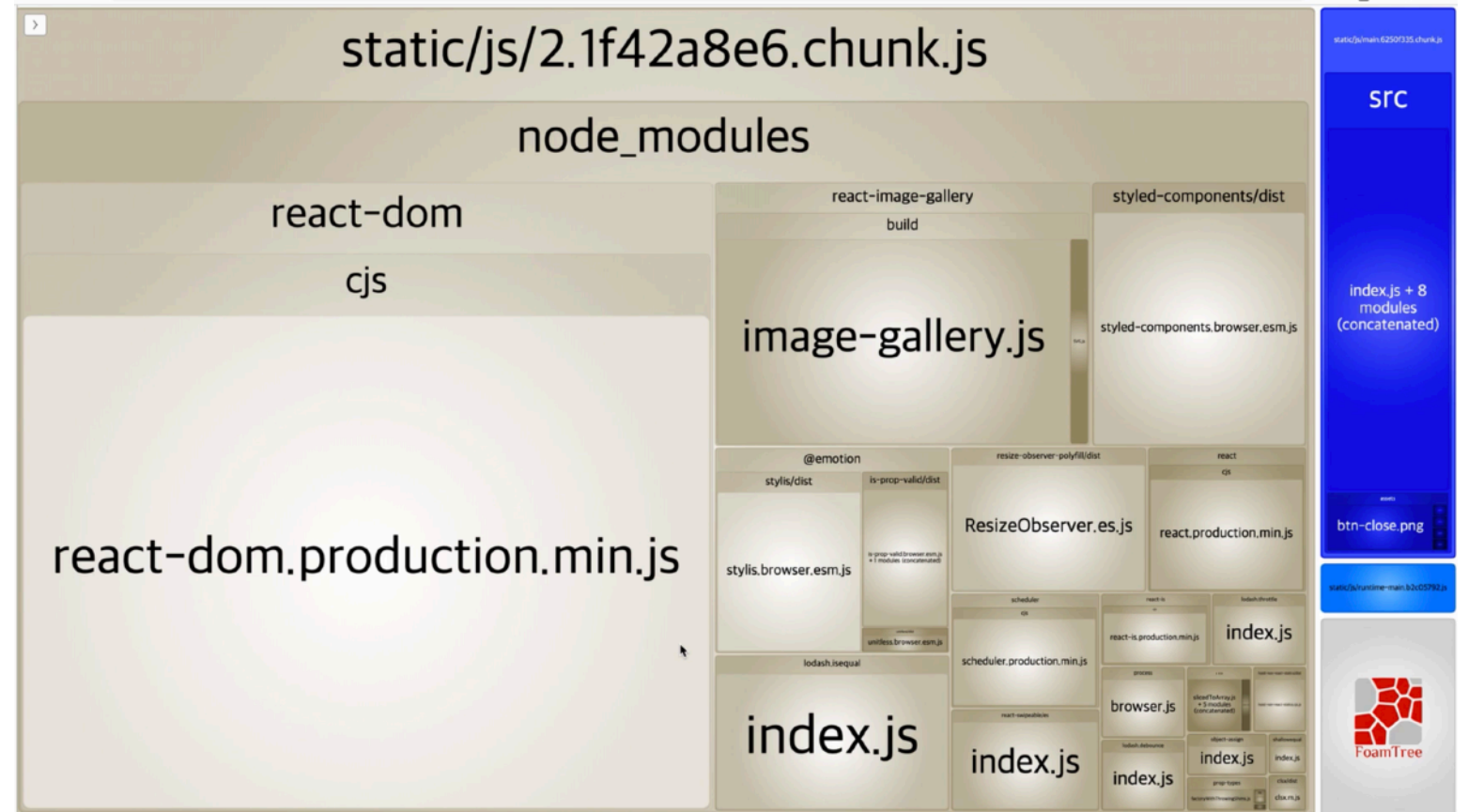
컴포넌트 Lazy Loading  
(Code Splitting)



컴포넌트 Preloading

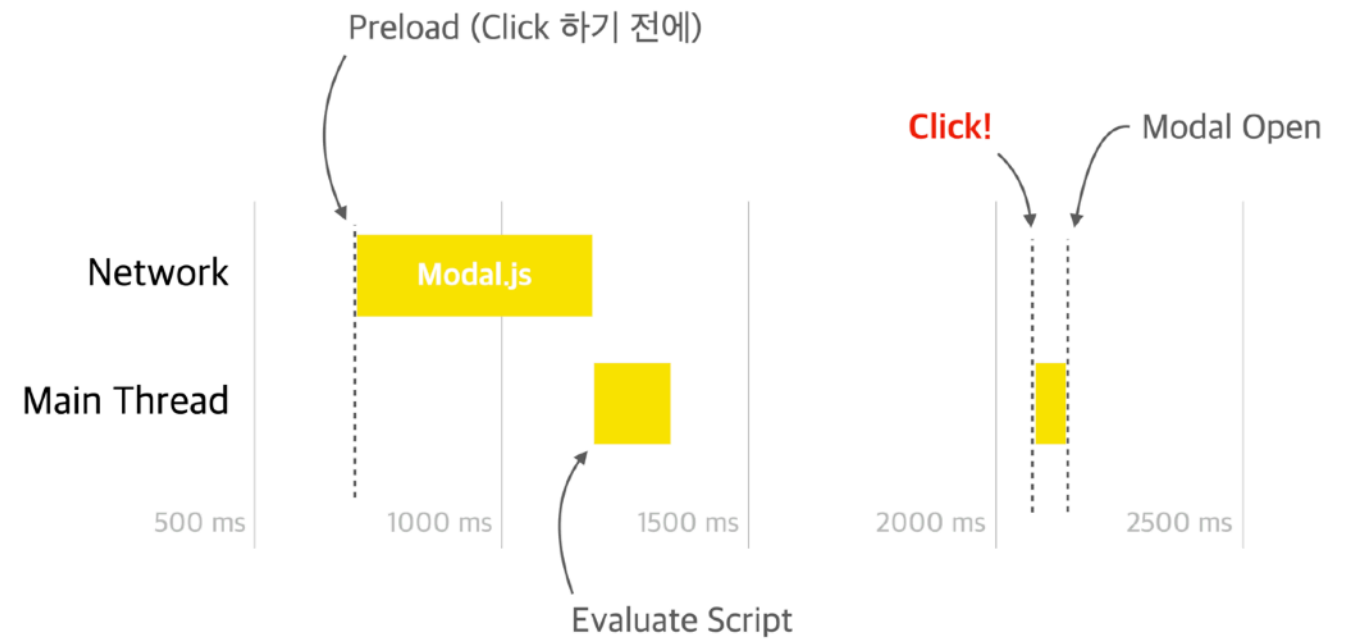
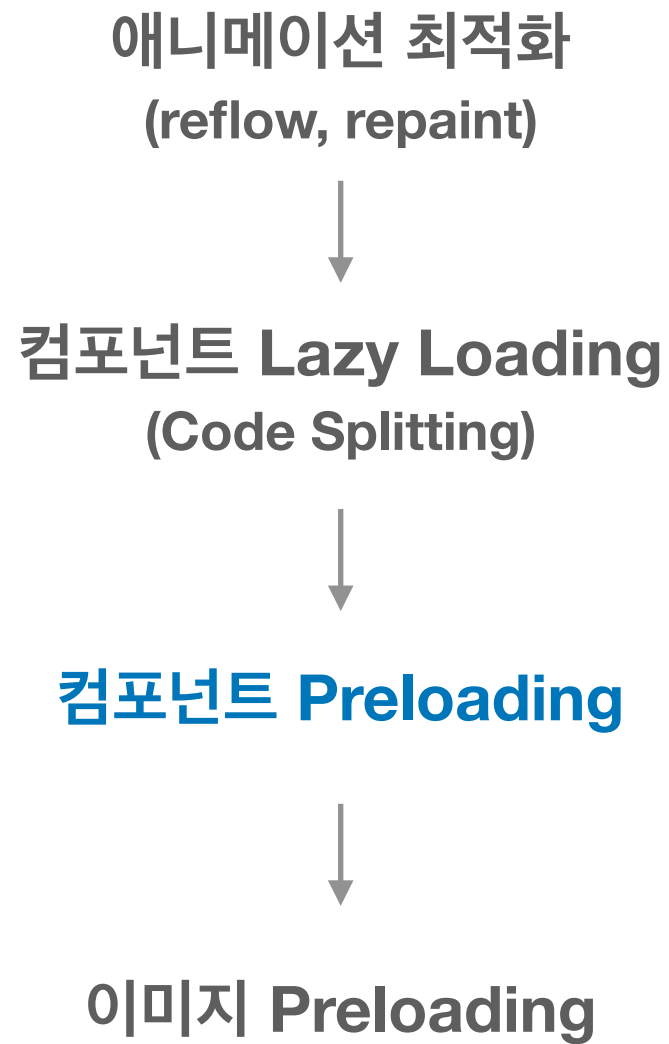


이미지 Preloading



| Name                       | Status | Type   | Initiator   | Size   | Time  | Waterfall |
|----------------------------|--------|--------|-------------|--------|-------|-----------|
| bundle.js                  | 200    | script | (index)     | 7.4 kB | 18 ms |           |
| 3.chunk.js                 | 200    | script | (index)     | 409 kB | 97 ms |           |
| main.chunk.js              | 200    | script | (index)     | 5.8 kB | 19 ms |           |
| main.642b5e08d00a73a911... | 200    | script | (index)     | 1.4 kB | 18 ms |           |
| react_devtools_backend.js  | 200    | script | injectGl... | 154 kB | 9 ms  |           |
| 1.chunk.js                 | 304    | script | bootstr...  | 180 B  | 10 ms |           |
| 2.chunk.js                 | 304    | script | bootstr...  | 179 B  | 9 ms  |           |

# 정리



```
function lazyWithPreload(importFunction) {  
  const Component = React.lazy(importFunction)  
  Component.preload = importFunction  
  return Component  
}
```

# 정리

애니메이션 최적화  
(reflow, repaint)



컴포넌트 Lazy Loading  
(Code Splitting)



컴포넌트 Preloading



이미지 Preloading

```
const img = new Image()  
img.src = 'https://stillm'
```

|  |                              |     |      |            |              |       |
|--|------------------------------|-----|------|------------|--------------|-------|
|  | london-2012.ecf093d9.jpg     | 200 | jpeg | (index)    | 1.5 MB       | 64 ms |
|  | 20-08-2016-Football-Men...   | 200 | jpeg | App.js:... | 143 kB       | 87 ms |
|  | data:image/png;base...       | 200 | png  | react-...  | (memory ...  | 0 ms  |
|  | 12-08-2016-archery-indivi... | 200 | jpeg | react-...  | 164 kB       | 35 ms |
|  | 20-08-2016-Football-Men...   | 200 | jpeg | react-...  | 153 kB       | 48 ms |
|  | 20-08-2016-Golf-Women-...    | 200 | jpeg | react-...  | 81.6 kB      | 55 ms |
|  | 14-08-2016-Golf-Individu...  | 200 | jpeg | react-...  | 103 kB       | 70 ms |
|  | 20-08-2016-Football-Men...   | 200 | jpeg | react-...  | (disk cac... | 10 ms |
|  | 12-08-2016-archery-indivi... | 200 | jpeg | react-...  | 85.6 kB      | 66 ms |

# 2장 끝

수고하셨습니다

