Tip of the iceberg:

# Exploring the Actual Costs of JavaScript

**Presented By**

Oğuz Kılıç

# Oğuz Kılıç

Senior Software Developer - Trendyol

**Linkedin**: oguzzkilic
**Twitter**:   0guzKilic
**Mail**:        oguzzkilic@gmail.com

# The Evaluation of Web Technologies

| 1990 | 1993 | 1995 | 1996 |

WWW

Browsers & HTML

JavaScript

CSS

# The Evaluation of Web Technologies

**2000**

**2005**

**2010**

**2015**

Web 2.0 & Ajax

jQuery

HTML5 & CSS3

SPA & PWA's

# The Evaluation of Web Technologies

| 2020 | 2024 | 2026 | 2030 |

WebAssembly & JAMStack
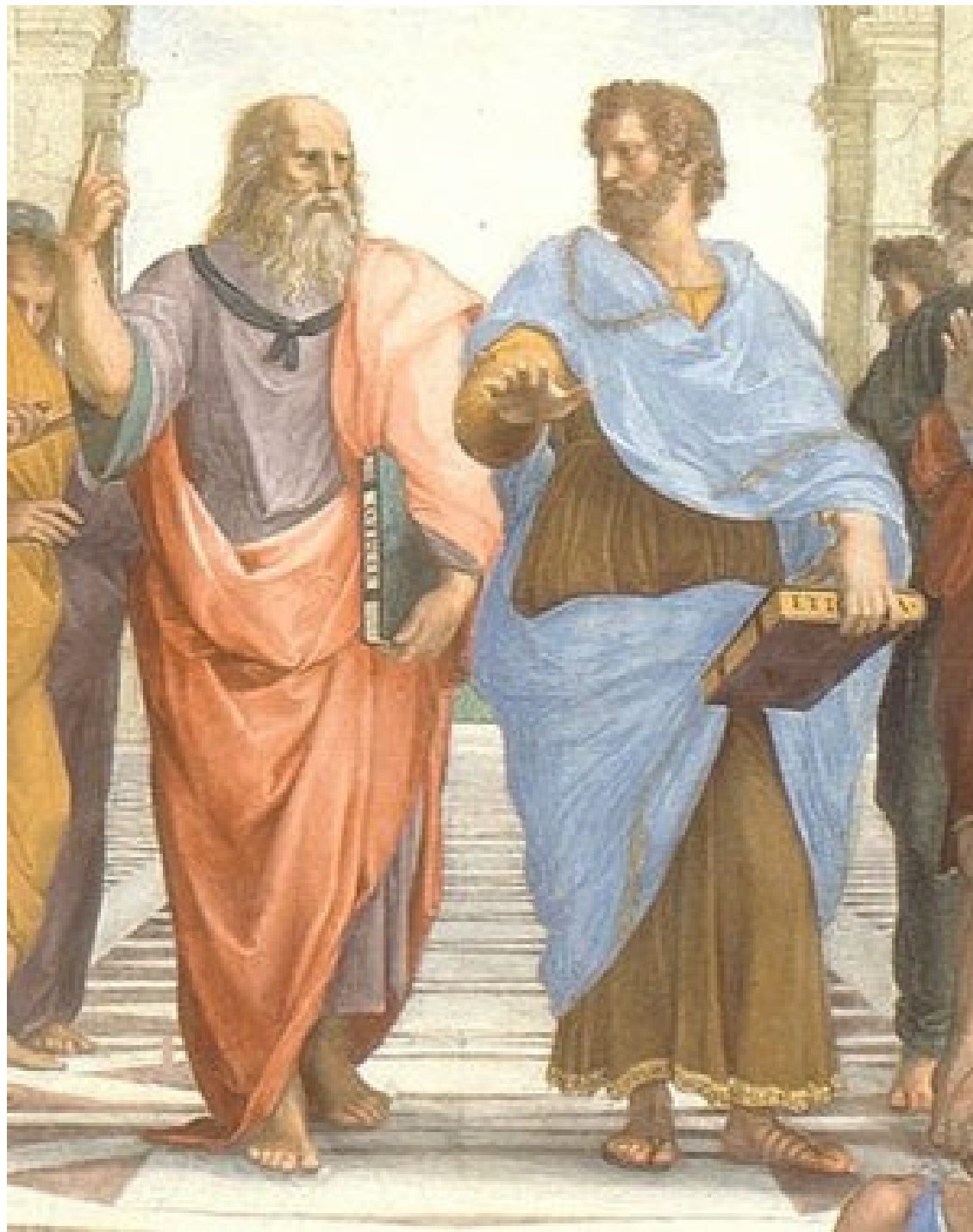
?

?

?

The School of Athens - Raphael

# Modern JS Era

The Modern JavaScript Era is defined by innovative frameworks and technologies that transform web development.

### FRAMEWORKS

Fast and Flexible Development

### SERVER-SIDE JS

Expanded Functionality

### MODERN LANGUAGE FEATURES AND STANDARDS

Innovative Coding Paradigms

### PERFORMANCE

Faster, Efficient Applications

Pieter Bruegel the Elder - The Tower of Babel

# Innovations' Shadowed Challenges

The Modern JavaScript Era, while offering innovative solutions that shape web development, also brings with it complex challenges.
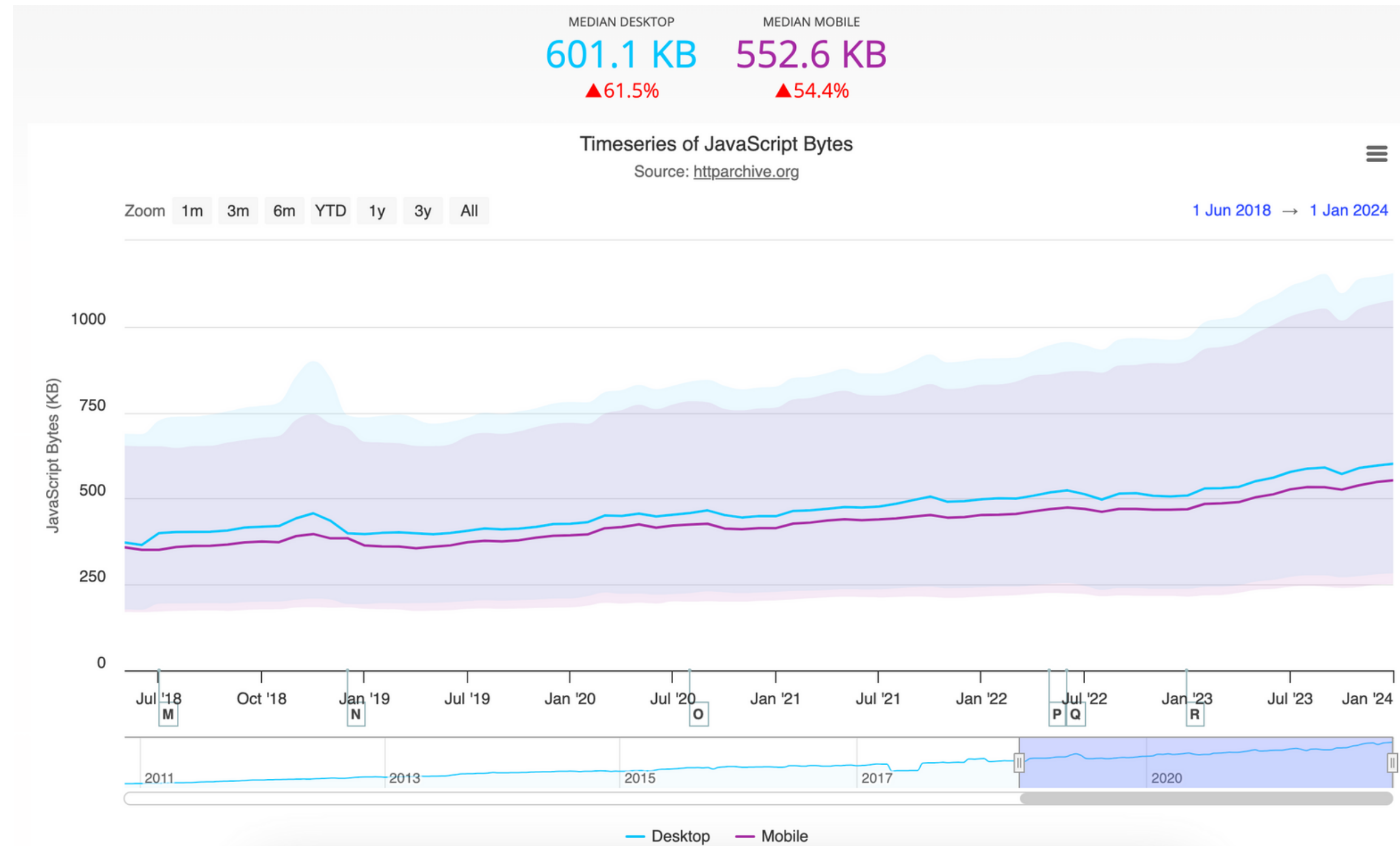
**INCREASING COMPLEXITY**

**PERFORMANCE ISSUES**

**BROWSER COMPATIBILITY**
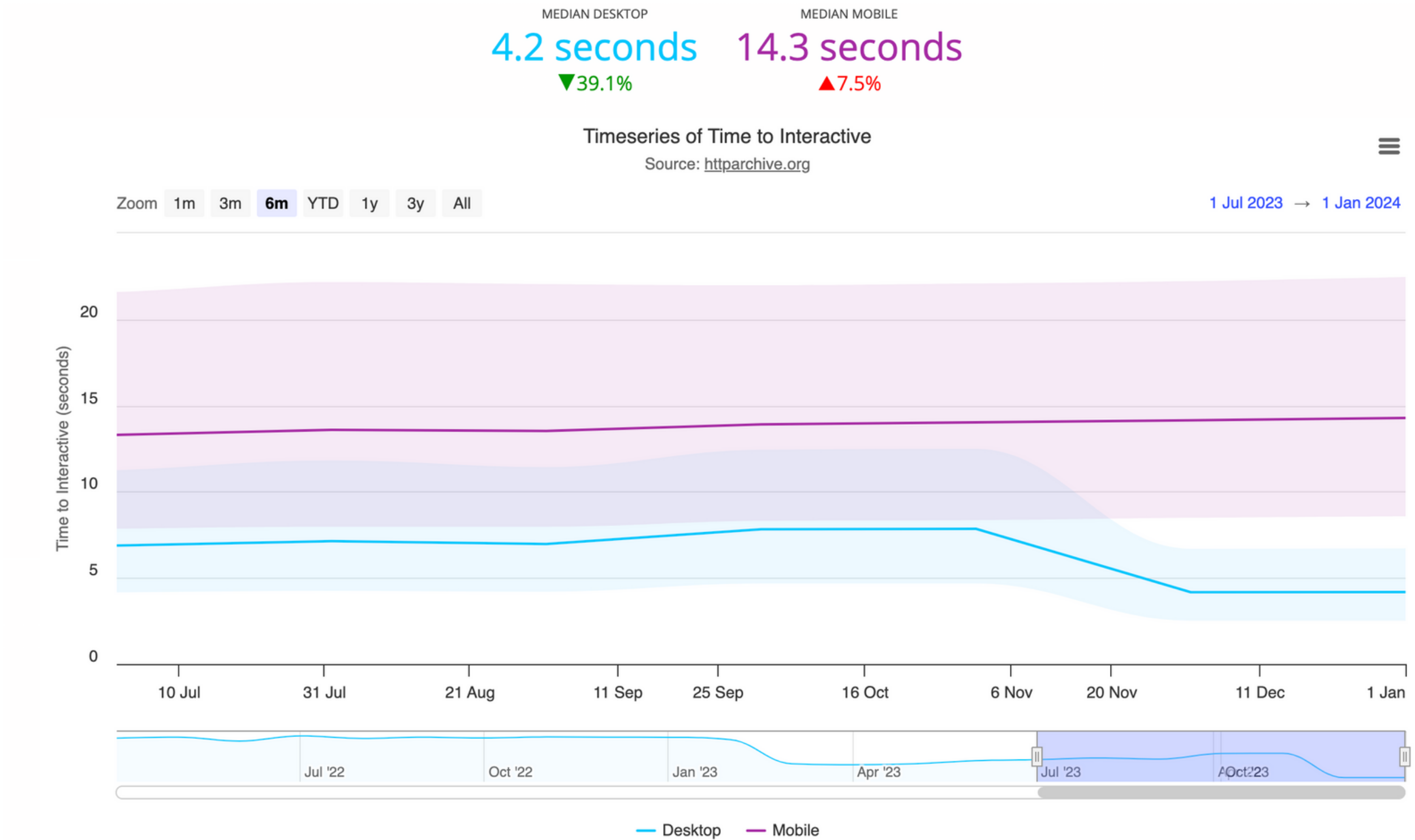
**TOOL AND LIBRARY ABUNDANCE**

# Javascript Bytes

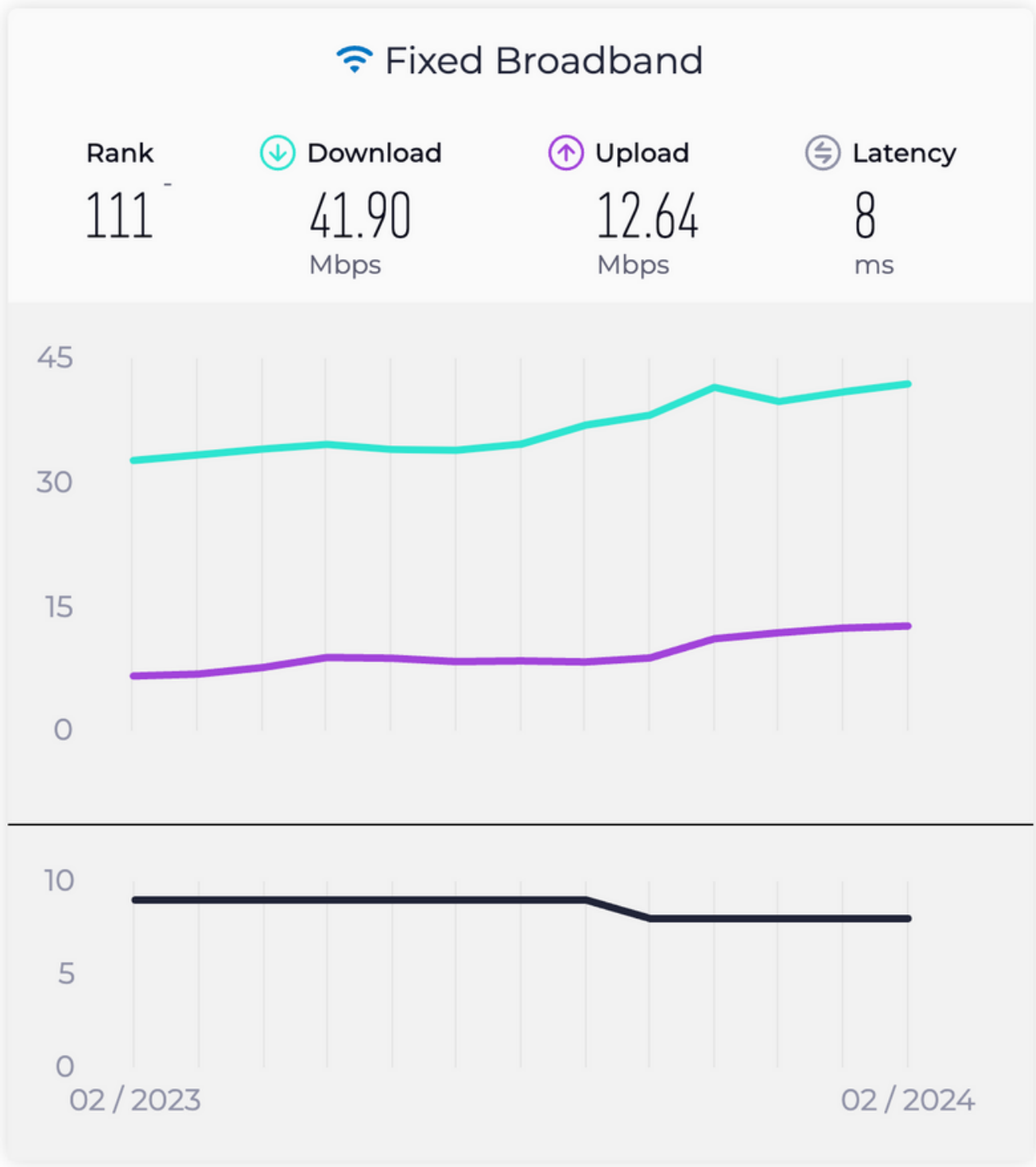The sum of transfer size kilobytes of all external scripts requested by the page.
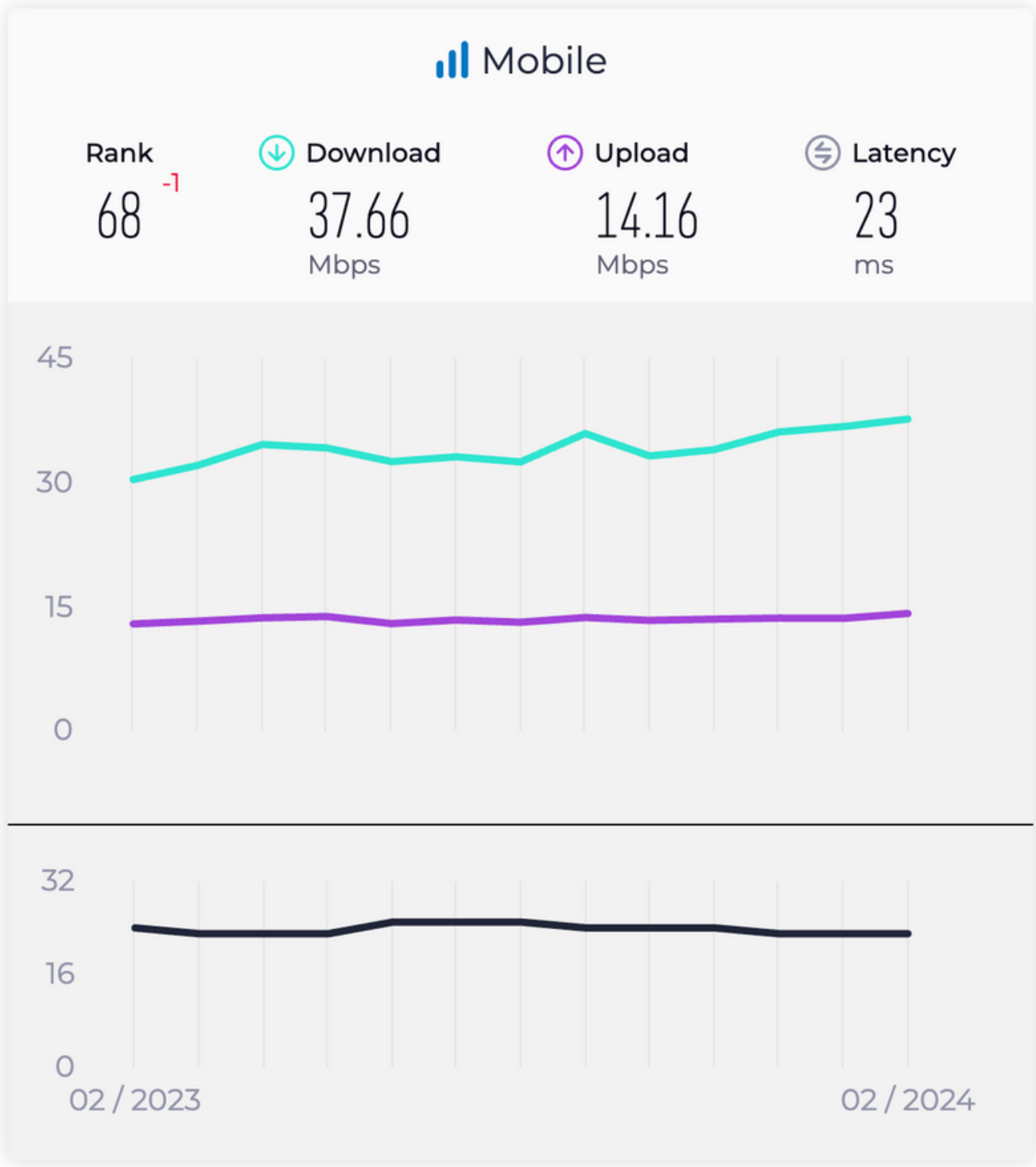
# Time to Interactive

The number of seconds from the time the navigation started until the CPU had at least 5 seconds of quiescence. This metric comes from Lighthouse



MEDIAN DESKTOP
## 4.2 seconds
▼39.1%

MEDIAN MOBILE
## 14.3 seconds
▲7.5%

**Timeseries of Time to Interactive**
Source: httparchive.org

Zoom  1m  3m  **6m**  YTD  1y  3y  All          1 Jul 2023 → 1 Jan 2024

— Desktop  — Mobile

# Turkey Median Country Speeds

## Mobile

| Rank | Download | Upload | Latency |
|------|----------|--------|---------|
| 68 -1 | 37.66 Mbps | 14.16 Mbps | 23 ms |

45

30

15

0

32

16

0

02 / 2023                    02 / 2024

## Fixed Broadband

| Rank | Download | Upload | Latency |
|------|----------|--------|---------|
| 111 - | 41.90 Mbps | 12.64 Mbps | 8 ms |

45

30

15

0

10

5

0

02 / 2023                    02 / 2024

Results are updated mid-month for the previous month. Locations must have at least 300 unique user results for mobile or fixed broadband to be ranked in either category.
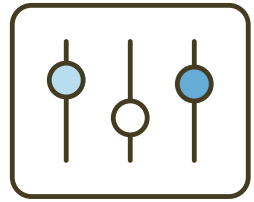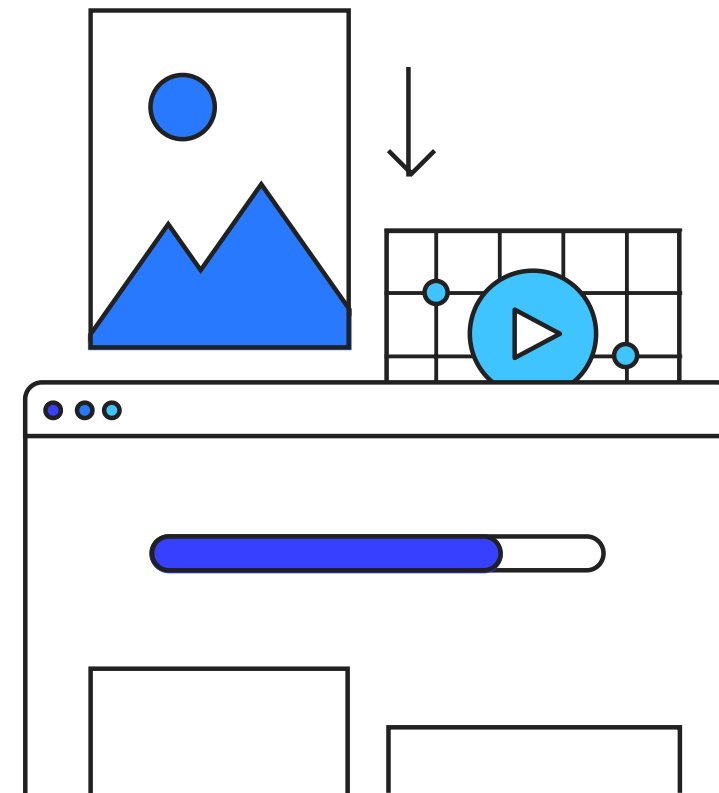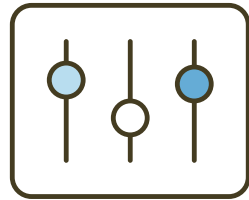
# Small Bundles

Maximizing Efficiency and Performance

**1** **FASTER LOAD TIMES**

Fast and Flexible Development

# Small Bundles

Maximizing Efficiency and Performance
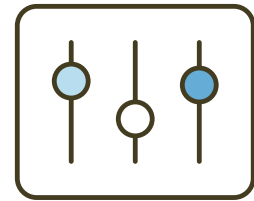
**1** **FASTER LOAD TIMES**
Fast and Flexible Development

**2** **ENHANCED USER EXPERIENCE**
Fast and Flexible Development

# Small Bundles

Maximizing Efficiency and Performance

**1** **FASTER LOAD TIMES**

Fast and Flexible Development

**2** **ENHANCED USER EXPERIENCE**
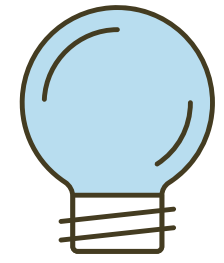
Fast and Flexible Development

**3** **SEO BENEFITS**
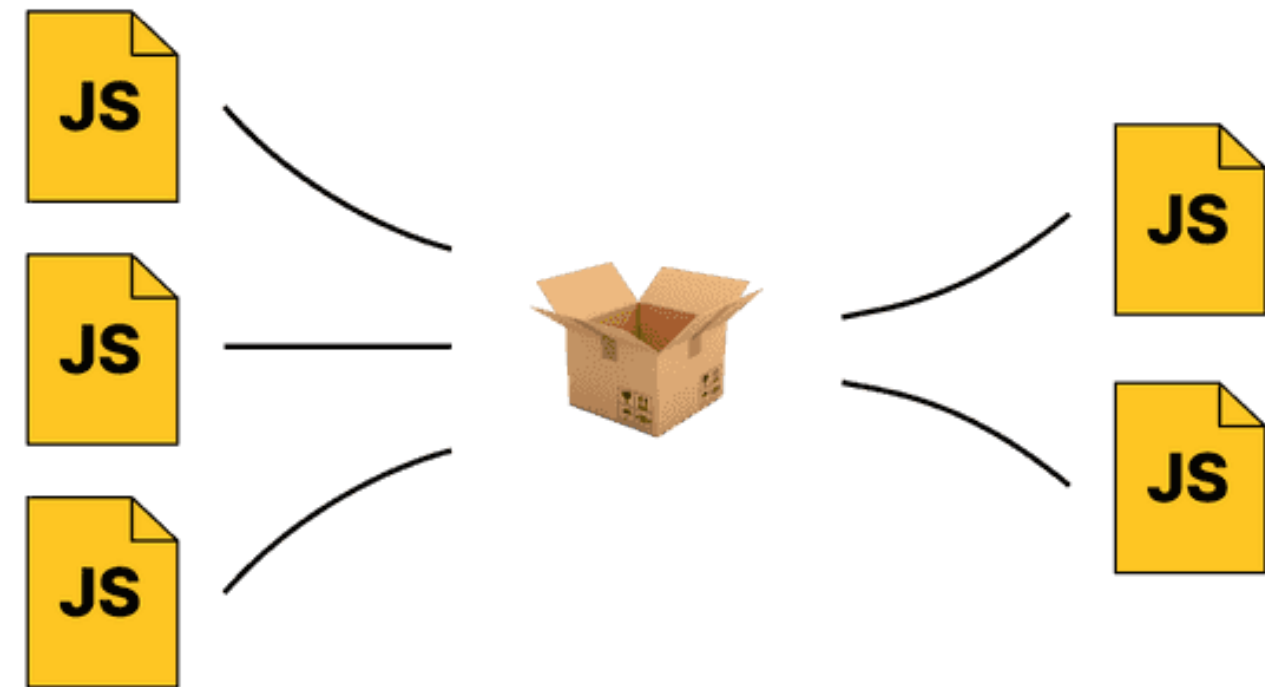
Fast and Flexible Development

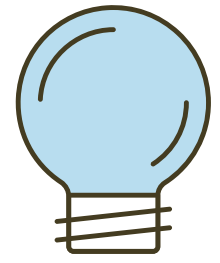# Strategies for Reducing JavaScript Bundle Size

Maximizing Efficiency and Performance

**1** **CODE SPLITTING**
Dynamic loading for efficiency

# Strategies for Reducing JavaScript Bundle Size

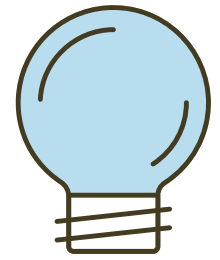Maximizing Efficiency and Performance

**1** **CODE SPLITTING**
Dynamic loading for efficiency

**2** **TREE SHAKING**
 Only keep what you use

# Strategies for Reducing JavaScript Bundle Size

Maximizing Efficiency and Performance

**1** **CODE SPLITTING**
Dynamic loading for efficiency

**2** **TREE SHAKING**
Only keep what you use
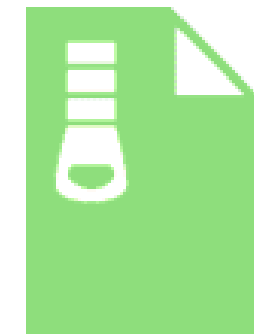
**3** **COMPRESSING**
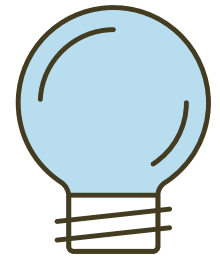Optimize for fast delivery

Uncompressed File

File Size: 65KB

Compressed File

File Size: 13KB

# Strategies for Reducing JavaScript Bundle Size

Maximizing Efficiency and Performance

**1** **CODE SPLITTING**
Dynamic loading for efficiency

**2** **TREE SHAKING**
Only keep what you use

**3** **COMPRESSING**
Optimize for fast delivery

**4** **USING EFFICIENT LIBRARIES**
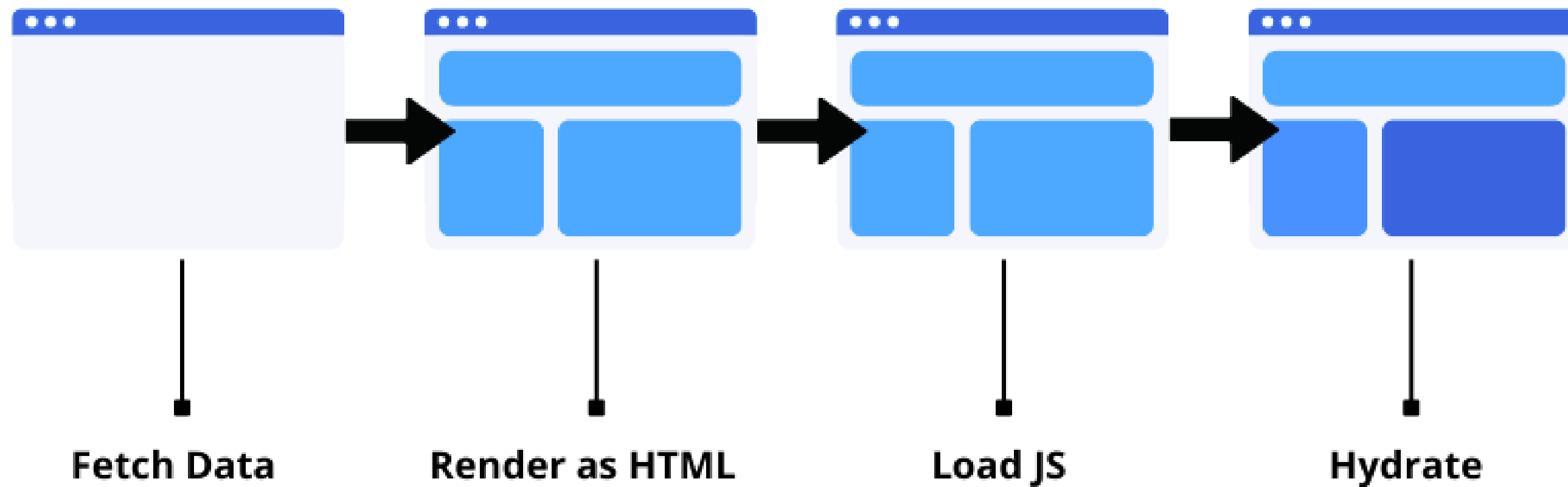Prefer lighter libraries

# PARSE/COMPILE

10% - 30% Time spent in V8 during page load!

# SERVER-SIDE RENDERING

10% - 30% Time spent in V8 during page load!

Fetch Data → Render as HTML → Load JS → Hydrate

# Server-Side Rendering

SSR introduces costs and challenges, particularly concerning server resource utilization, development complexity, and scalability.

**1** **IMPACT ON SERVER RESOURCES**

Fast and Flexible Development

# Server-Side Rendering

SSR introduces costs and challenges, particularly concerning server resource utilization, development complexity, and scalability.

**1** **IMPACT ON SERVER RESOURCES**
Fast and Flexible Development

**2** **DEVELOPMENT AND MAINTENANCE COMPLEXITY**
Fast and Flexible Development

# Server-Side Rendering

SSR introduces costs and challenges, particularly concerning server resource utilization, development complexity, and scalability.

**1**   **IMPACT ON SERVER RESOURCES**

Fast and Flexible Development

**2**   **DEVELOPMENT AND MAINTENANCE COMPLEXITY**
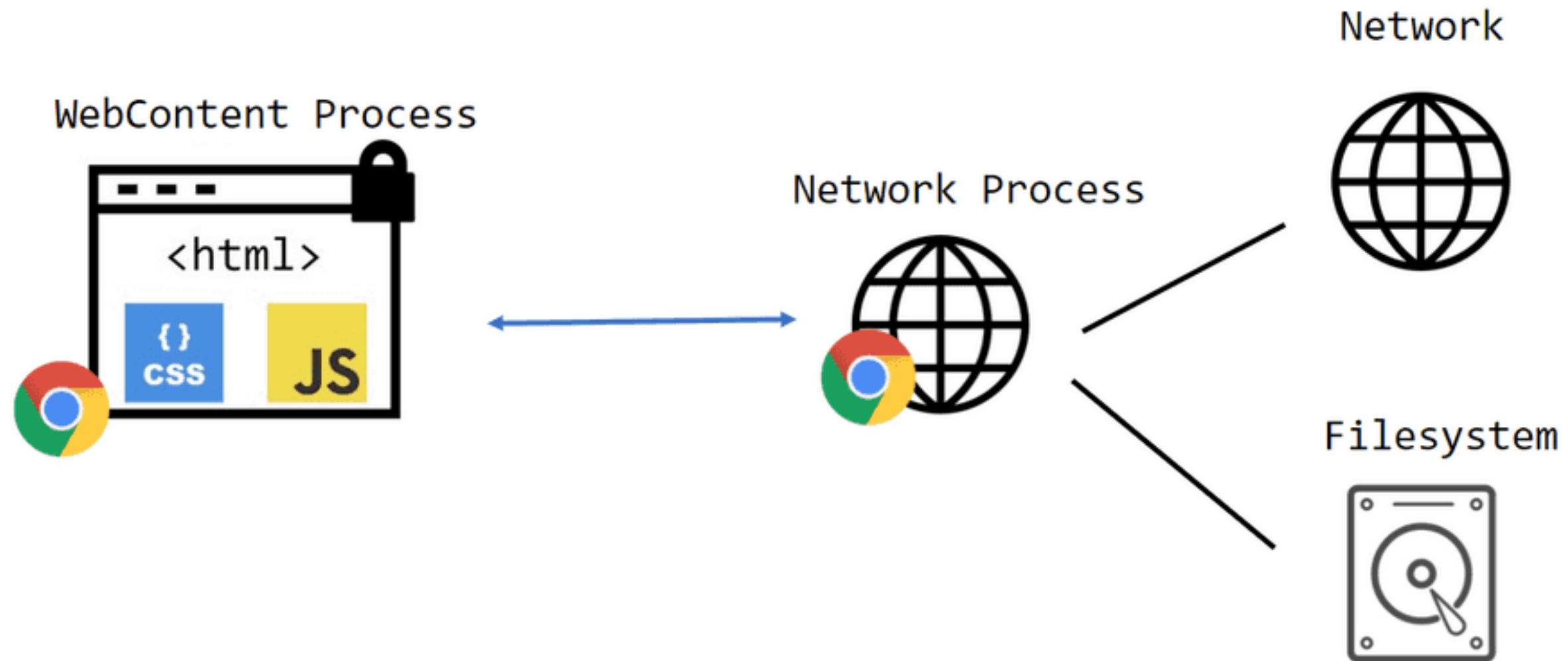
Fast and Flexible Development

**3**   **SCALABILITY AND COST**

Fast and Flexible Development

# NETWORK EFFECT & PERFORMANCE

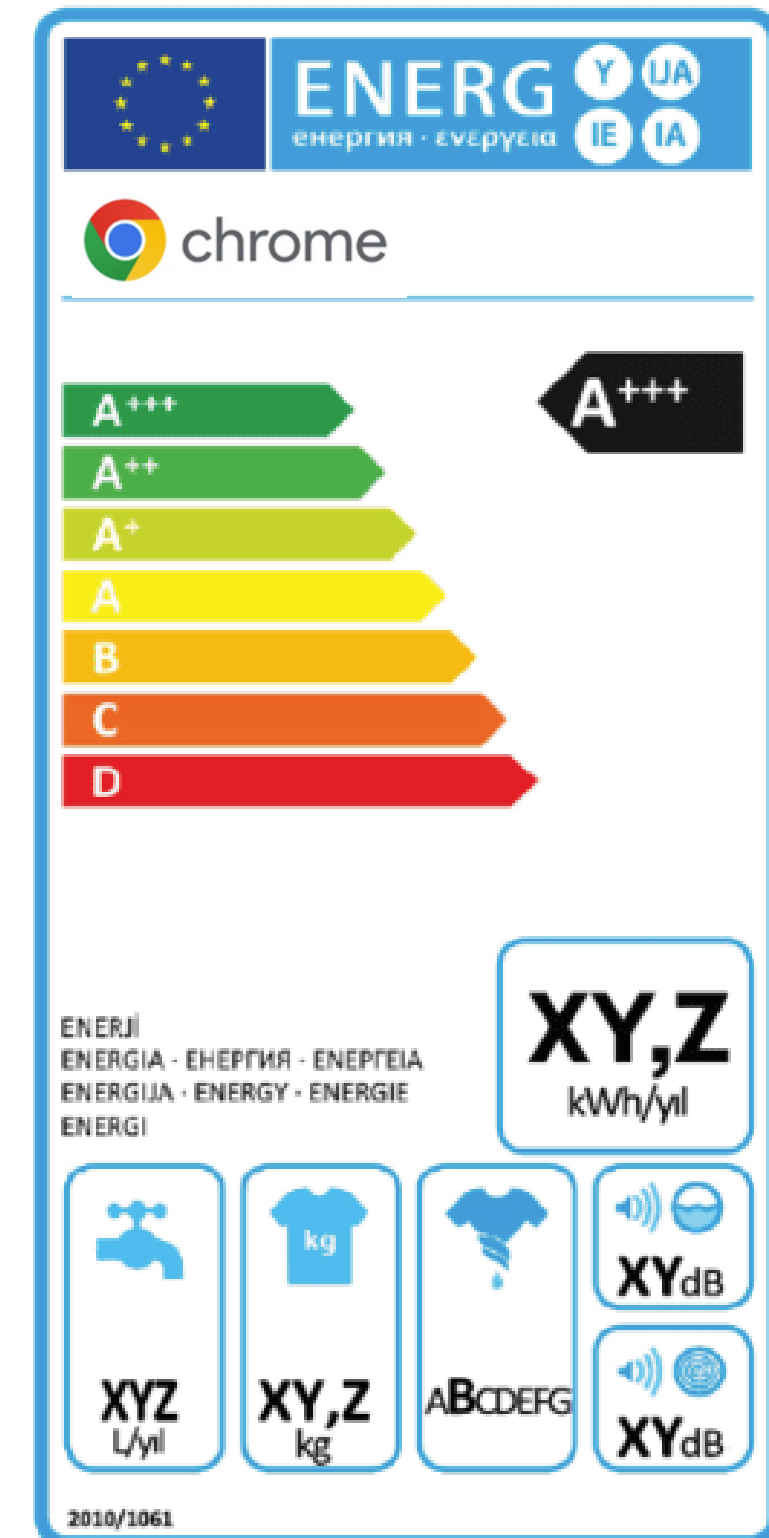Network Effect and the cost of Data Consumption on Performance
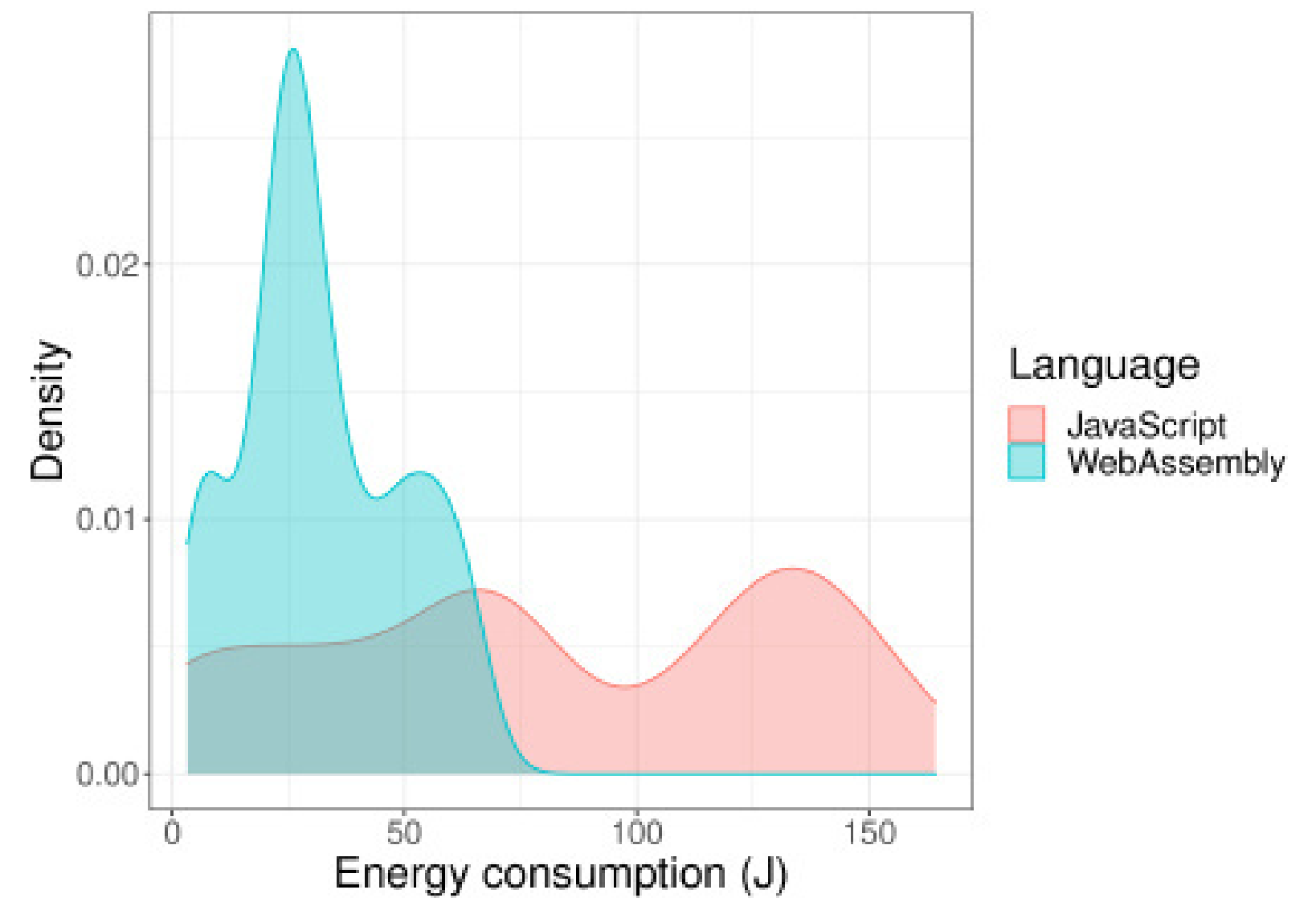
# Engery Consumption and JavaScript

Maximizing Efficiency and Performance

# Engery Consumption and JavaScript

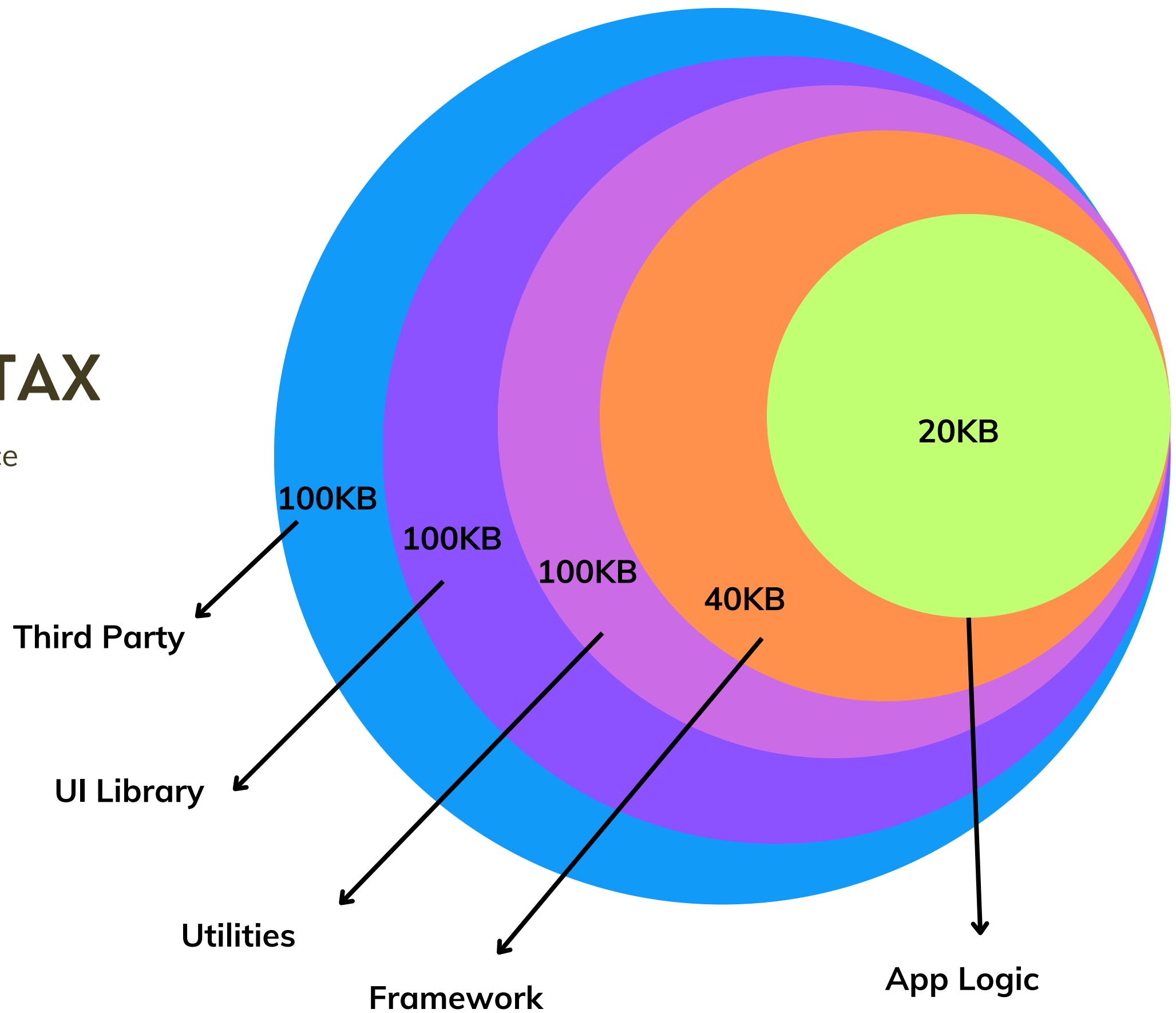Maximizing Efficiency and Performance

THE JAVASCRIPT TAX

Maximizing Efficiency and Performance

100KB → Third Party

100KB → UI Library

100KB → Utilities

40KB → Framework

20KB → App Logic

# Performance Budget

Resources are not unlimited, limit your budget

# Performance Budget

Resources are not unlimited, limit your budget

```json
[
  {
    "path": "/*",
    "timings": [
      {
        "metric": "interactive",
        "budget": 3000
      },
      {
        "metric": "first-meaningful-paint",
        "budget": 1000
      }
    ],
    "resourceSizes": [
      {
        "resourceType": "script",
        "budget": 125
      },
      {
        "resourceType": "total",
        "budget": 300
      }
    ],
    "resourceCounts": [
      {
        "resourceType": "third-party",
        "budget": 10
      }
    ]
  }
]
```

# Performance Budget

Resources are not unlimited, limit your budget

```
lighthouse https://example.com --budget-path=./budget.json
```

# Performance Budget

Resources are not unlimited, limit your budget

**Budgets** — Performance budgets set standards for the performance of your site.

| Resource Type | Requests | Transfer Size | Over Budget |
|---|---|---|---|
| Script | 4 | 249.6 KB | 124.6 KB |
| Total | 28 | 350 KB | 50 KB |
| Third-party | 14 | 31.5 KB | 4 requests |

| Metric | Measurement | Over Budget |
|---|---|---|
| Time to Interactive | 4,540 ms | 1,540 ms |

# Q&A