## 🚀 Frontend Interview Series 32/600 : Web Page Optimization

### Question: What techniques do you use to optimize web page loading performance?

## Answer:

Optimizing web performance is crucial for user experience and SEO. Here are key techniques to improve loading performance:

#### 1. Minimize HTTP Requests

- Combine CSS/JS files
- Use CSS sprites or icon fonts
- Implement lazy loading

#### 2. Optimize Assets

```
// Lazy loading images
const images = document.querySelectorAll('img.lazy');

const imageObserver = new IntersectionObserver((entries, observer) => {
  entries.forEach(entry => {
    if (entry.isIntersecting) {
      const img = entry.target;
      img.src = img.dataset.src;
      img.classList.remove('lazy');
      observer.unobserve(img);
    }
  });
});

images.forEach(img => imageObserver.observe(img));
```

#### 3. Code Optimization

- Minify CSS/JS/HTML
- Tree shaking to eliminate unused code
- Code splitting in modern frameworks

```jsx
// Code splitting in React
import React, { lazy, Suspense } from 'react';

// Lazy load component
const HeavyComponent = lazy(() => import('./HeavyComponent'));

function App() {
  return (
    <div>
      <Suspense fallback={<div>Loading...</div>}>
        <HeavyComponent />
      </Suspense>
    </div>
  );
}
```

**4. Caching Strategies**

- Set appropriate cache headers
- Implement service workers for offline caching
- Use localStorage for application state

**5. Critical Rendering Path Optimization**

- Inline critical CSS
- Defer non-critical JavaScript
- Preload important resources

```html
<!-- Preload critical resources -->
<link rel="preload" href="critical-font.woff2" as="font" type="font/woff2"
crossorigin>

<!-- Inline critical CSS -->
<style>
  /* Critical styles here */
  .header { /* ... */ }
  .hero { /* ... */ }
</style>

<!-- Defer non-critical JS -->
<script src="app.js" defer></script>
```

**6. Use CDNs**

- Distribute content closer to users

**7. Image Optimization**

- Use modern formats (WebP, AVIF)
- Responsive images with srcset
- Proper sizing and compression

```
<picture>
  <source srcset="image.avif" type="image/avif">
  <source srcset="image.webp" type="image/webp">
  <img src="image.jpg" alt="Description" loading="lazy">
</picture>
```

**8. Performance Monitoring**

- Measure Core Web Vitals (LCP, FID, CLS)
- Use Lighthouse for auditing
- Implement Real User Monitoring (RUM)

These optimizations should be applied based on data from performance audits to target the most impactful improvements first.

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