Caching Techniques at Different Layers

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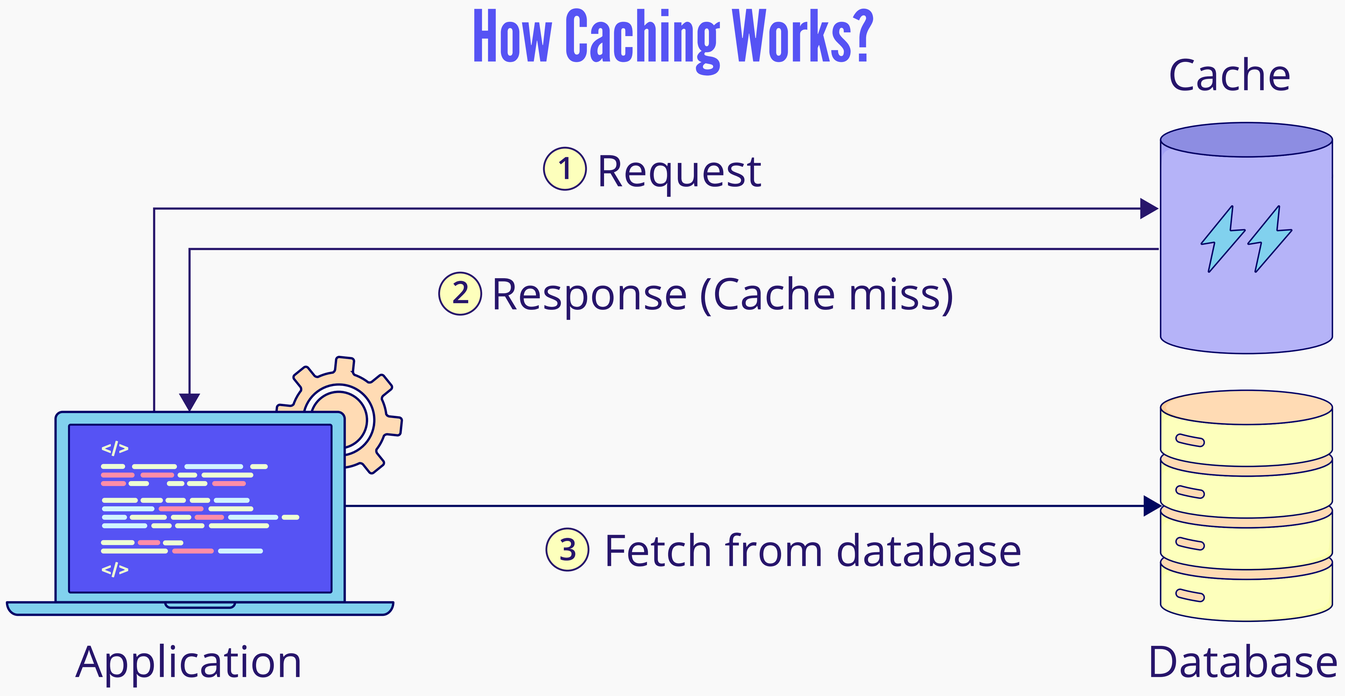
Caching

The process of storing temporary data in a high-speed storage layer to improve system performance.

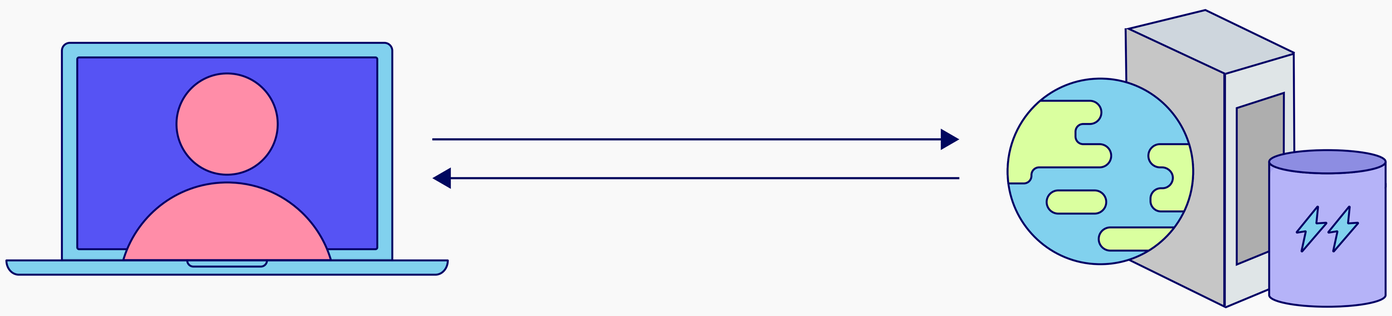
How Caching Works?



Back-End Caching

Web Server Caching

Storing static assets and prerendered HTML pages to reduce server load and improve response times.



Applications:

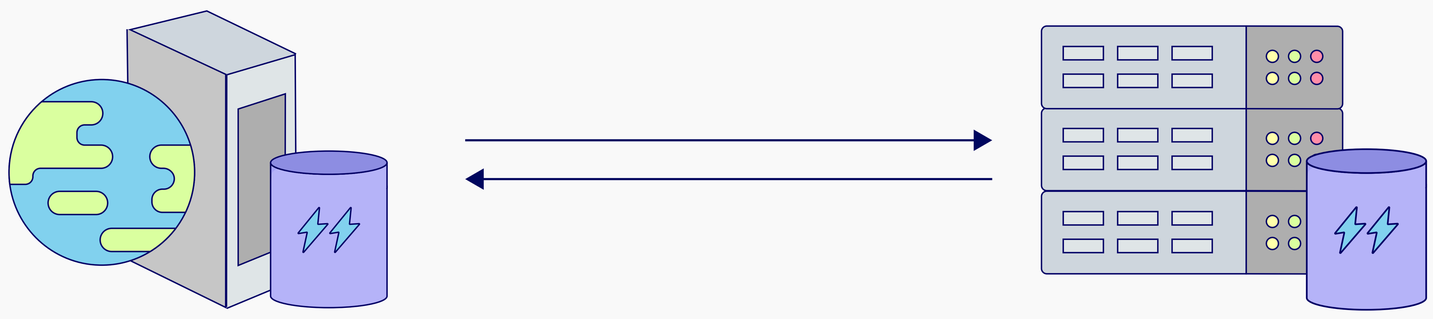
1. Accelerates web application performance by serving cached content.
2. Reduces load on application servers by caching frequently accessed static files or prerendered pages.

Data Cached:

1. Static files
2. Prerendered web pages

Application Server Caching

Storing frequently accessed objects and computation results to speed up data delivery and reduce DB access.



Applications:

1. Improves scalability and responsiveness of applications.
2. Reduces database queries, latency, and server load and enhances user experience.

Data Cached:

1. Session data
2. Frequently used objects
3. Computation results

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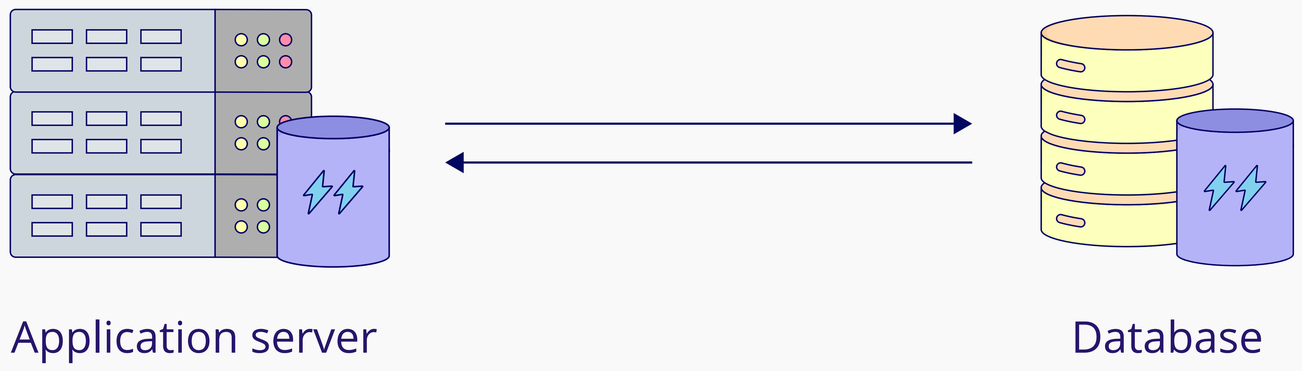
Database Caching

Storing the results of frequently accessed database queries to speed up data retrieval.



Applications:

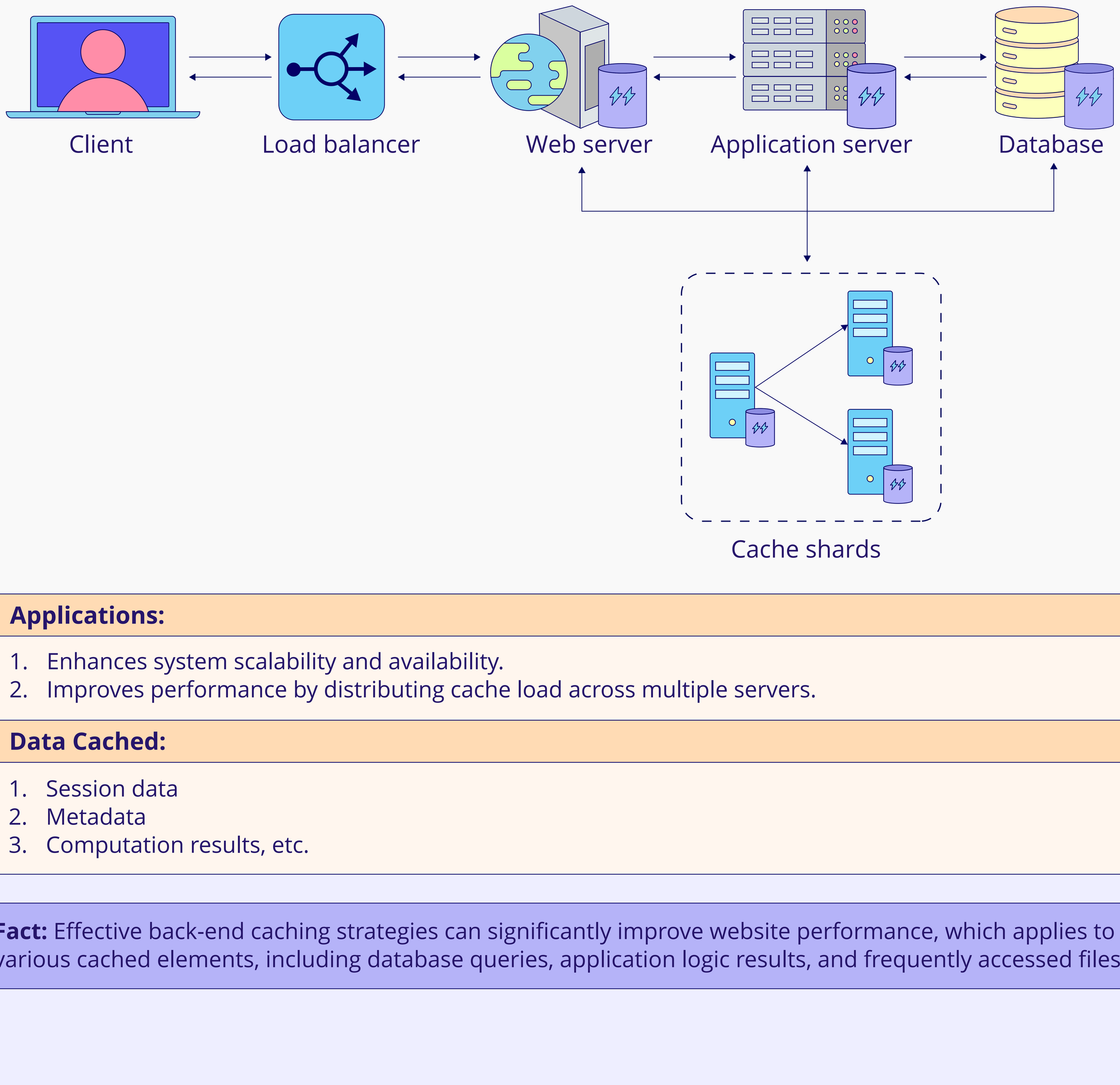
1. Reduces database load and improves overall system performance.
2. Reduces latency for repeated queries.

Data Cached:

1. Query results
2. Metadata

Distributed Caching

Storing frequently accessed data across multiple nodes in a network to improve performance, scalability, and fault tolerance.



Applications:

1. Enhances system scalability and availability.
2. Improves performance by distributing cache load across multiple servers.

Data Cached:

1. Session data
2. Metadata
3. Computation results, etc.

Fact: Effective back-end caching strategies can significantly improve website performance, which applies to various cached elements, including database queries, application logic results, and frequently accessed files.

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Client-Side Caching

Browser Caching

Storing static assets locally on the user's device to speed up page load times for future visits.

Web browser

Web server

Applications:

1. Reduces page load times for repeated visits, improving rendering speed.
2. Eliminates the need for repeated downloads, saving bandwidth.

Data Cached:

1. Cookies
2. Session data
3. Static asset
4. Multimedia content

Fact: Like browsers, other client-side applications and the operating system layer cache data to improve user experience.

Network Caching

Domain Name System (DNS) Caching

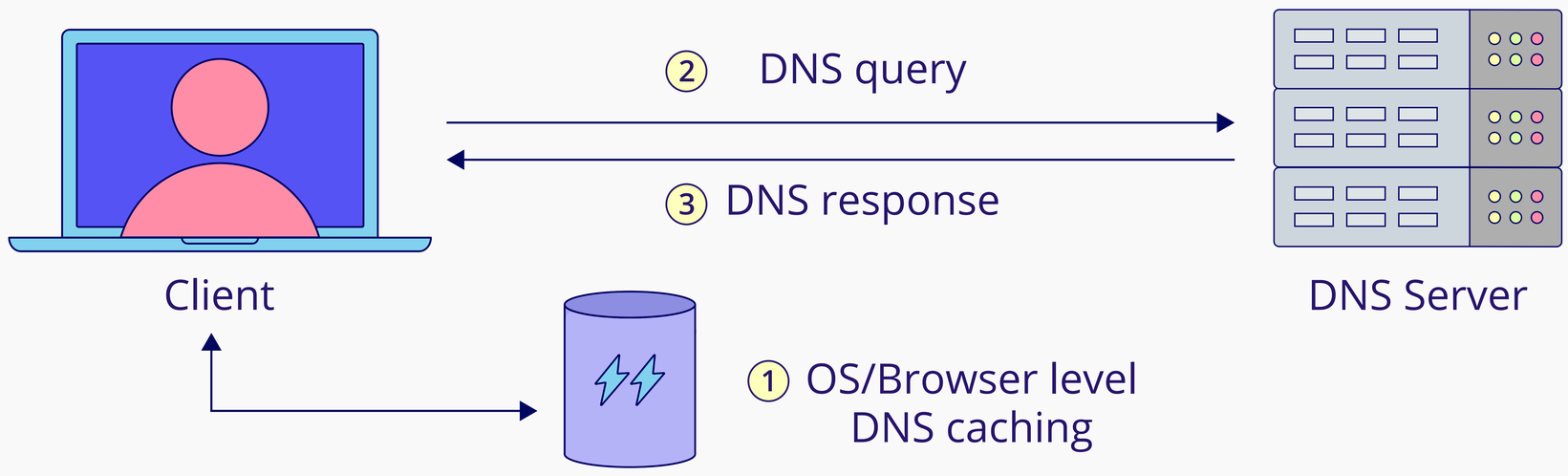
Storing the results of DNS queries to reduce the time needed for future lookups.

Applications:

1. Reduces DNS lookup times and improves network performance.
2. Reduces load on DNS Infrastructure.

Data Cached:

1. DNS query results
2. Resource records (A, AAAA, CNAME, MX, etc.)



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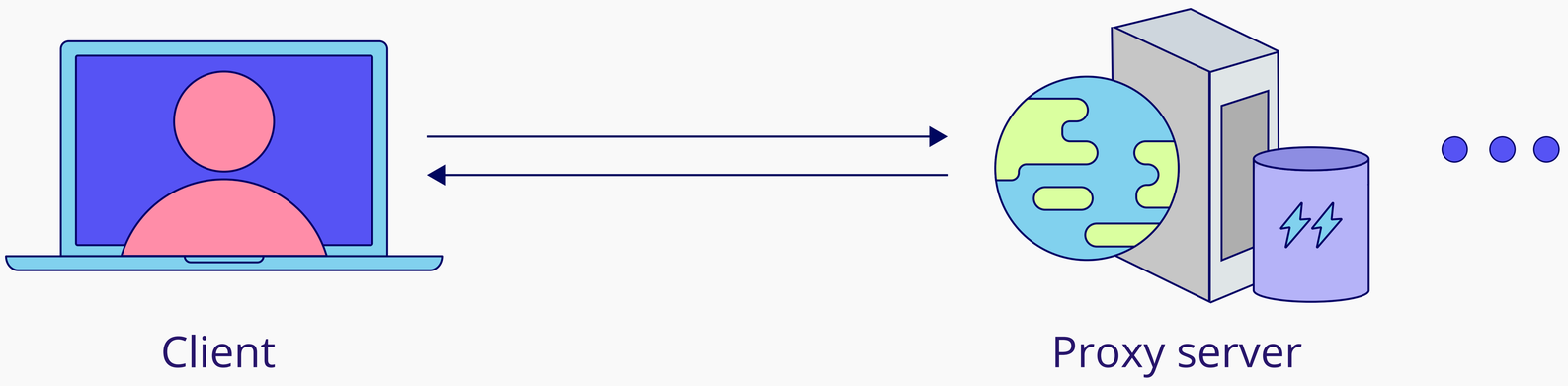
Proxy Server Caching

Storing web content on proxy servers to reduce load times for users behind the proxy.



Applications:

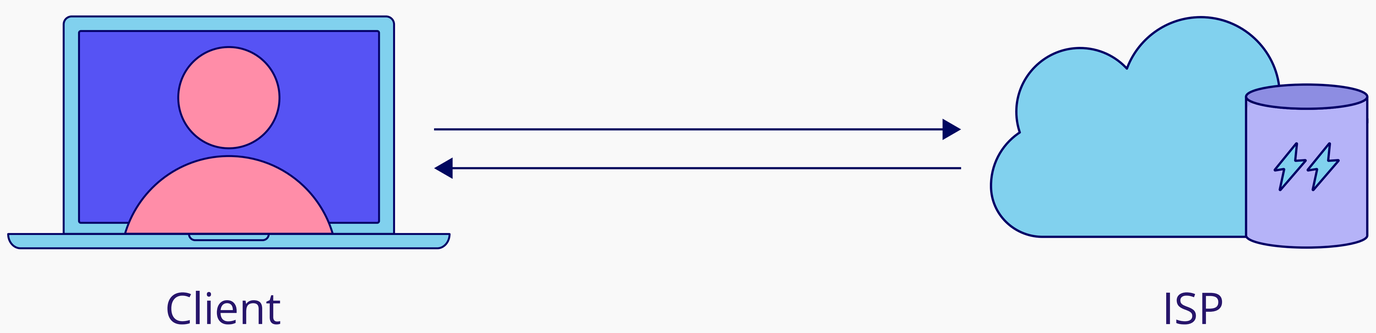
1. Improves response times for users behind the proxy server.
2. Reduces network traffic and optimizes bandwidth usage.

Data Cached:

1. Frequently accessed web content

ISP Caching

Storing frequently accessed web content and other data within the ISP network to improve access speeds.



Applications:

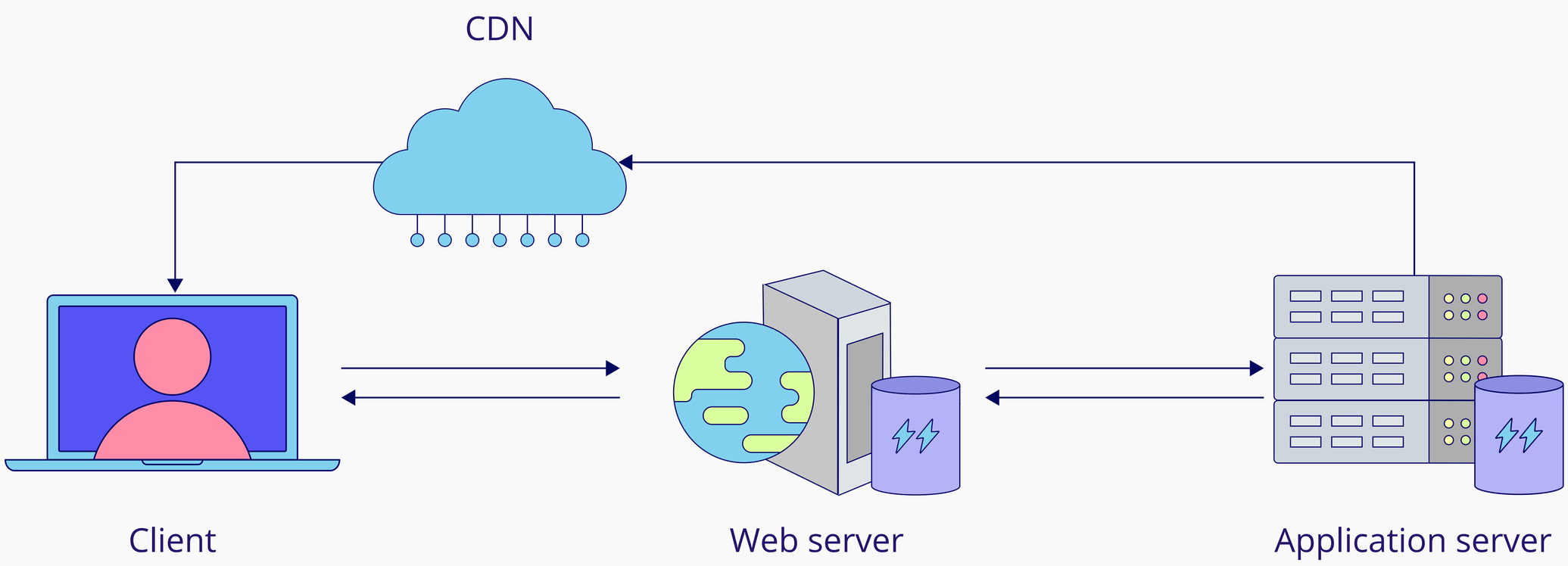
1. Alleviates traffic on the broader internet backbone.
2. Particularly beneficial for remote areas with limited bandwidth during peak internet usage.

Data Cached:

1. Static content
2. Streaming media content
3. DNS records

Content Delivery Network (CDN) Caching

Storing static content on servers distributed globally to reduce latency for users.



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Applications:
1. Enhances content delivery speed for a global audience. 2. Reduces server load and bandwidth usage at the origin by serving content from edge servers.
Data Cached:
1. Images 2. Videos 3. Stylesheets 4. Scripts

Did you know: Netflix has its own CDN to bring its shows closer to you? They partner with internet providers to store Netflix content locally to make it load faster.

Fact: Network caching plays an important role in making web content accessible even in situations of network failures.