Caching in AWS

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1. Understanding Caching:
   - Caching is the process of storing frequently accessed data in a temporary storage area for quick retrieval.
   - Without caching, accessing data may require long trips, causing delays in performance.
2. Benefits of Caching:
   - Caching improves application performance by reducing latency and load on backend systems.
   - It enhances user experience by providing faster access to content.
3. Where to Cache:
   - Caching can be done externally using content delivery networks (CDNs) like CloudFront to serve static content closer to end users.
   - Internally, caching can be applied in front of databases to reduce database load by caching frequently accessed queries.
4. AWS Caching Solutions:
   - CloudFront: External caching solution, a CDN for distributing content globally.
   - ElastiCache: Internal caching solution, provides managed caching service for databases.
   - DAX (DynamoDB Accelerator): Caching solution for DynamoDB to improve database read performance.
   - Global Accelerator: Helps improve global application availability and performance by routing traffic through the AWS global network.
5. Exam Tips:
   - AWS favors caching solutions for improved performance. Look for options that include caching whenever possible.
   - Consider caching everywhere to enhance performance and reduce load on backend systems.
   - Understand the difference between internal and external caching solutions and choose the appropriate one based on requirements.
   - Pay attention to caching terminology and concepts as they may appear in exam questions.
   - Remember to lay down sheets before trimming hedges - a humorous reminder to plan and prepare before taking action.

   Overall, caching plays a crucial role in optimizing application performance and user experience, and understanding caching concepts is essential for AWS certifications.

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1. What is CloudFront:
   - CloudFront is a content delivery network (CDN) provided by AWS.
   - It distributes static content such as images, videos, and applications to edge locations globally, reducing latency and improving performance for end users.
2. Benefits of CloudFront:
   - Improves performance: By caching content at edge locations, CloudFront delivers content faster to end users.
   - Enhances security: CloudFront supports HTTPS connections by default and allows custom SSL certificates for secure content delivery.
   - Supports both on-premises and cloud architectures: CloudFront can be used to cache content from AWS resources as well as non-AWS endpoints.
   - Provides flexibility in content delivery: CloudFront can be configured to cache content based on Time to Live (TTL) settings and supports signed URLs and cookies for restricting access to content.

3. Setting up CloudFront:
    - When creating a CloudFront distribution, you specify the origin domain name (e.g., S3 bucket or load balancer) from which CloudFront fetches content.
    - CloudFront settings include options for HTTPS redirection, signed URLs/cookies, Web Application Firewall (WAF) integration, and custom SSL certificates.
    - CloudFront distributions can be configured to use all edge locations or specific geographic regions for content delivery.
4. Exam Tips:
    - CloudFront is a versatile solution for improving content delivery performance and security.
    - Consider using CloudFront to cache static content, regardless of whether it's hosted on AWS or elsewhere.
    - Understand CloudFront's capabilities for HTTPS support, signed URLs/cookies, and WAF integration.
    - Remember that CloudFront distributions can cache content globally across multiple edge locations, improving access speed for users worldwide.
    - Use CloudFront in conjunction with a WAF for finer control over security policies and protection against web-based attacks.
5. Humorous Reminder:
    - "If you're trying to melt snow while you're on a hike, pour some water into the pot. It'll dramatically reduce the time that it takes for the snow to melt, and you'll save a lot of fuel." - A humorous analogy suggesting efficiency in achieving goals.

Understanding Amazon CloudFront and its features is essential for optimizing content delivery and enhancing user experience, making it a valuable topic for AWS certifications.

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1. What is ElastiCache?:
    - ElastiCache is an AWS managed service that provides caching solutions using open-source technologies like Memcached and Redis.
    - Memcached and Redis are caching solutions that sit in front of databases, caching common queries to reduce read operations from the database.
2. Memcached vs. Redis:
    - Memcached is a simple caching solution without persistence, failover support, or backups. It's suitable for caching only.
    - Redis can function as both a caching solution and a standalone NoSQL database. It offers persistence, failover support, and backups, making it suitable for caching and data storage.
3. What is DAX?:
    - DynamoDB Accelerator (DAX) is an in-memory caching solution for DynamoDB.
    - It dramatically improves database response times by caching frequently accessed data, reducing response times from milliseconds to microseconds.
4. When to use ElastiCache vs. DAX:
    - DAX is specifically designed for DynamoDB and provides in-memory caching for it.
    - ElastiCache, particularly Redis, can be used for various use cases, including caching for relational databases like RDS and as a standalone NoSQL database.
5. Exam Tips:
    - Always consider adding a caching layer to your architecture for improved performance.
    - Understand the differences between Memcached and Redis, and when to use each based on requirements like persistence, failover support, and backups.
    - Remember that DAX is exclusively for DynamoDB and provides significant performance improvements.

- Redis can serve as both a cache and a standalone database, offering more flexibility compared to Memcached.
- Keep your understanding high-level for the exam, focusing on which caching solution to choose based on the database type and requirements.
- Be aware of the specific features of each caching solution, such as failover support and backups, as they may be relevant to exam scenarios.

6. Humorous Reminder:
   - "If you're ever trying to build an emergency shelter, don't forget to build a floor. Most people underestimate how much heat the ground will draw from your body while you're trying to sleep." - A humorous analogy emphasizing the importance of considering all aspects of a solution.

Understanding ElastiCache, DAX, and their respective use cases is crucial for designing efficient and scalable AWS architectures, making them essential topics for AWS certification exams.

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1. What is Global Accelerator?:
   - AWS Global Accelerator (GA) is a networking service designed to improve the performance and availability of your applications by routing traffic through AWS's global network infrastructure.
   - It uses Anycast IP addresses to optimize traffic routing and improve user experience worldwide.
2. Key Concepts:
   - Accelerator: A component of Global Accelerator that directs and optimizes user traffic by routing it to the most suitable AWS endpoints.
   - Listeners: Responsible for processing inbound connections based on specific ports and protocols.
   - Endpoints: The actual AWS resources (e.g., load balancers, EC2 instances) to which Global Accelerator directs traffic.
3. High-Level View:
   - Global Accelerator provides static Anycast IP addresses for your accelerators, acting as fixed entry points for all client traffic.
   - Two types of accelerators are available: standard and custom routing. Standard accelerators route traffic to the healthiest and closest endpoint, while custom routing allows for direct mapping of traffic to specific EC2 instances.
4. Architecture Overview:
   - Global Accelerator leverages edge networking locations via the CloudFront network to optimize traffic delivery.
   - Traffic from users worldwide is automatically routed to the most optimized endpoint, ensuring high performance and reliability without major architectural changes.
5. Exam Tips:
   - Consider using Global Accelerator for scenarios related to IP caching to optimize traffic and reduce latency.
   - Understand the default provision of Anycast IP addresses and their significance in routing and optimizing traffic.
   - Recognize the benefits of Anycast IP traffic and how it enhances application performance and availability.
   - Be aware that Global Accelerator primarily handles TCP and UDP traffic, making it suitable for gaming applications, IoT messaging, etc.
   - Differentiate between Global Accelerator and CloudFront: CloudFront focuses on content caching and distribution via HTTP/HTTPS, while Global Accelerator is tailored for optimizing network traffic via TCP/UDP.

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1. Four Questions to Ask:
    - Can it be cached? Consider if caching can benefit the architecture by improving performance, reducing costs, or addressing technical issues.
    - How is content updated in the cache? Understand how Time-to-Live (TTL) settings dictate how long data remains in the cache.
    - Does caching provide benefits beyond speed? Evaluate if caching solutions offer additional advantages such as security enhancements.
    - Does the caching solution help with anything besides speed? Recognize that caching can address various technical challenges beyond just performance optimization.
2. Exam Tips for CloudFront:
    - CloudFront is essential for adding HTTPS security to static websites hosted on S3 buckets.
    - When comparing solutions, prioritize the one with caching options.
    - Focus on understanding where caching solutions should be placed in the architecture.
3. Exam Tips for Global Accelerator:
    - Global Accelerator is ideal for addressing IP caching issues.
    - Understand its role in optimizing traffic and reducing latency.
    - Recognize its benefits for applications requiring low latency and high availability.
4. Database Cache Exam Tips:
    - When encountering "in-memory database," think of Redis or DynamoDB.
    - Favor DynamoDB over Redis when given the option.
    - Redis offers more features and supports backups, unlike Memcached and DAX.
5. General Tips:
    - Remember that caching solutions should not be the source of truth for data; prefer permanent data storage solutions like RDS or DynamoDB.
    - Understand the distinctions between caching solutions and their specific use cases.

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