CDN

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Content Delivery Network (CDN)

What is CDN?

- A **content delivery network or content distribution network** (CDN) is a geographically distributed network of proxy servers and their data centers.
- **CDN** is an umbrella term spanning different types of content delivery services: video streaming, software downloads, web and mobile content acceleration, licensed/managed CDN, transparent caching, and services to measure CDN performance, load balancing, multi-CDN switching and analytics and cloud intelligence.
- A CDN allows for the quick transfer of assets needed for loading Internet content including HTML pages, JavaScript files, stylesheets, images, and videos.
- The popularity of CDN services continues to grow, and today the majority of web traffic is served through CDNs, including traffic from major sites like Facebook, Netflix, and Amazon.

What are the benefits of using a CDN?

- **Improving website load times** - By distributing content closer to website visitors by using a nearby CDN server (among other optimizations), visitors experience faster page loading times. As visitors are more inclined to click away from a slow-loading site, a CDN can reduce bounce rates and increase the amount of time that people spend on the site. In other words, a faster a website means more visitors will stay and stick around longer.
- **Reducing bandwidth costs** - Bandwidth consumption costs for website hosting is a primary expense for websites. Through caching and other optimizations, CDNs are able to reduce the amount of data an origin server must provide, thus reducing hosting costs for website owners.
- **Increasing content availability and redundancy** - Large amounts of traffic or hardware failures can interrupt normal website function. Thanks to their distributed nature, a CDN can handle more traffic and withstand hardware failure better than many origin servers.
- **Improving website security** - A CDN may improve security by providing DDoS mitigation, improvements to security certificates, and other optimizations.

CDN Usecases

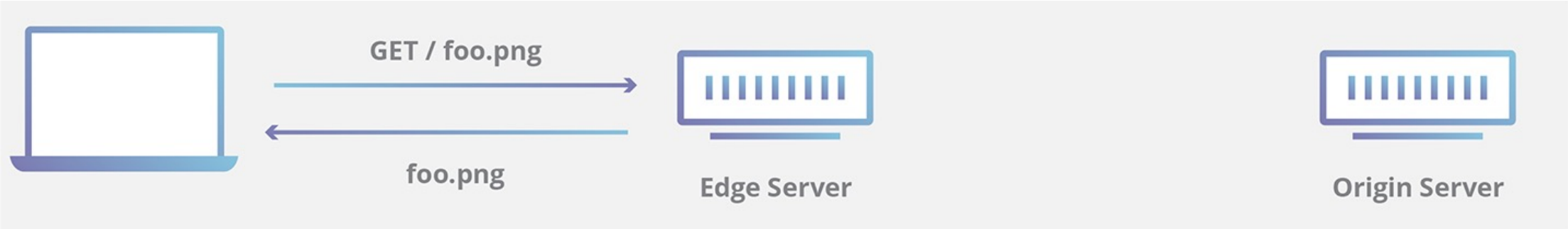
- Static Asset Caching
- Live and On-Demand Video Streaming
- Security and DDoS Protection
- API Acceleration
- Software Distribution

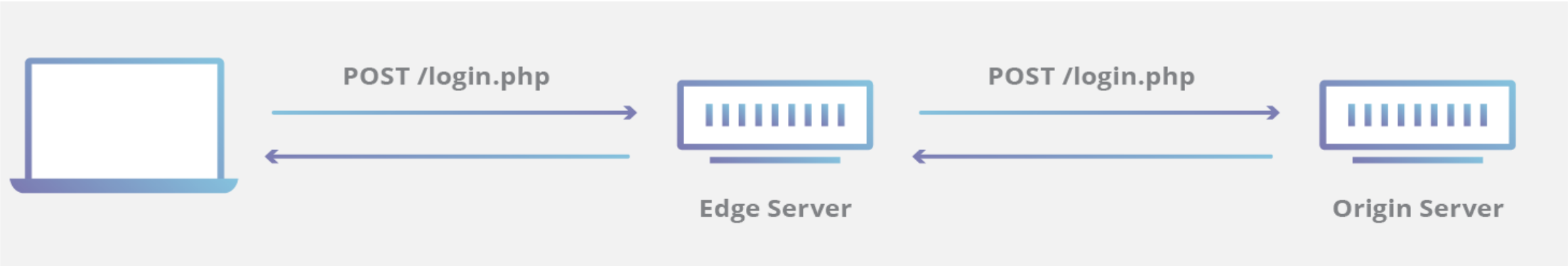
What is an Origin Server?

- The purpose of an **origin server** is to process and respond to incoming Internet requests from Internet clients.
- The concept of an origin server is typically used in conjunction with the concept of an edge server or caching server.
- At its core, an origin server is a computer running one or more programs that are designed to listen for and process incoming Internet requests.
- An origin server can take on all the responsibility of serving up the content for an Internet property such as a website, provided that the traffic does not extend beyond what the server is capable of processing and latency is not a primary concern.

What is a CDN edge server?

- A CDN **edge server** is a computer that exists at the logical extreme or “edge” of a network. An edge server often serves as the connection between separate networks.
- A primary purpose of a CDN edge server is to store content as close as possible to a requesting client machine, thereby reducing latency and improving page load times.


GET / foo.png
foo.png
Edge Server
Origin Server


POST /login.php
POST /login.php
Edge Server
Origin Server

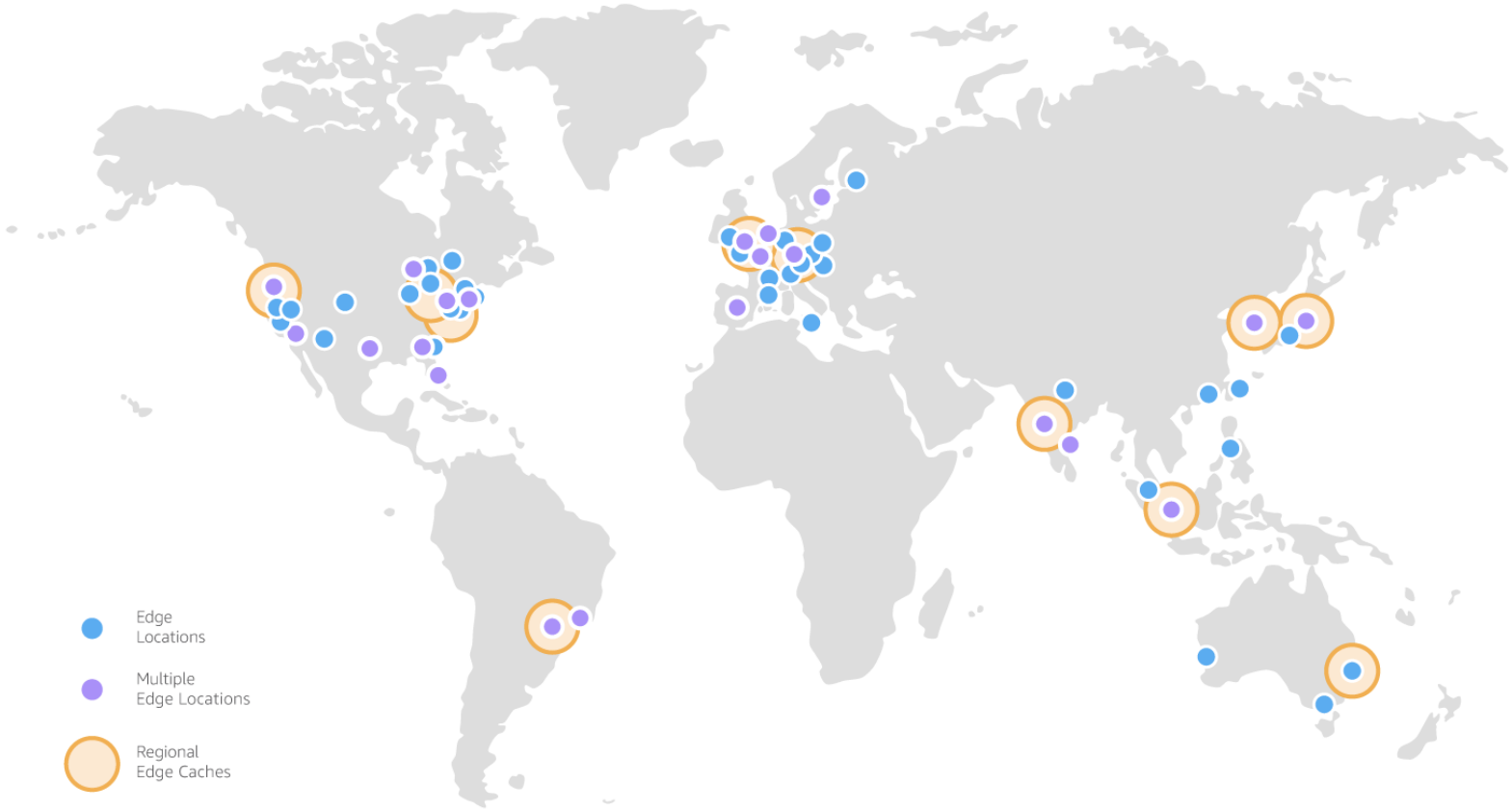
What is Anycast?

- Anycast is a network addressing and routing method in which incoming requests can be routed to a variety of different locations or “nodes.”
- In the context of a CDN, Anycast typically routes incoming traffic to the nearest data center with the capacity to process the request efficiently.
- Selective routing allows an Anycast network to be resilient in the face of high traffic volume, network congestion, and DDoS attacks.

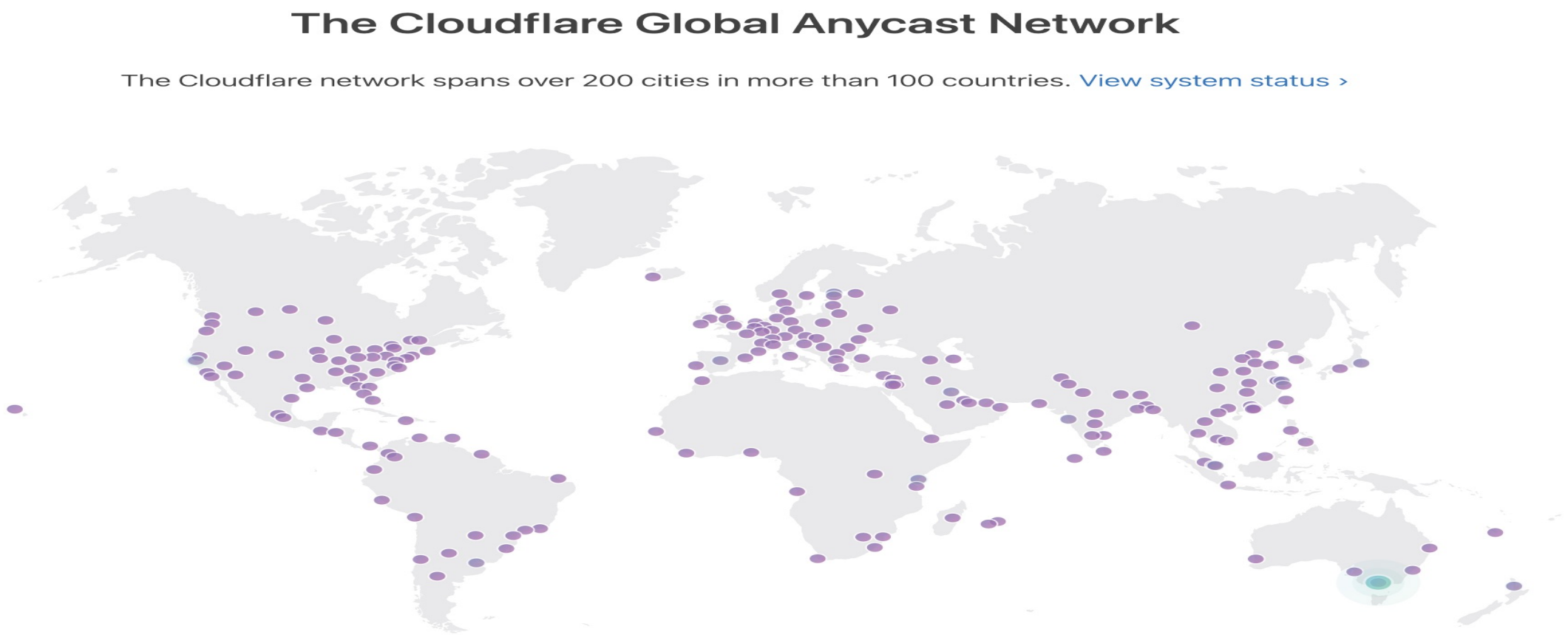
How CDN Works

- At its core, a CDN is a network of servers linked together with the goal of delivering content as quickly, cheaply, reliably, and securely as possible.
- In order to improve speed and connectivity, a CDN will place servers at the exchange points between different networks.
- These Internet exchange points (IXPs) are the primary locations where different Internet providers connect in order to provide each other access to traffic originating on their different networks.
- By having a connection to these high speed and highly interconnected locations, a CDN provider is able to reduce costs and transit times in high speed data delivery.

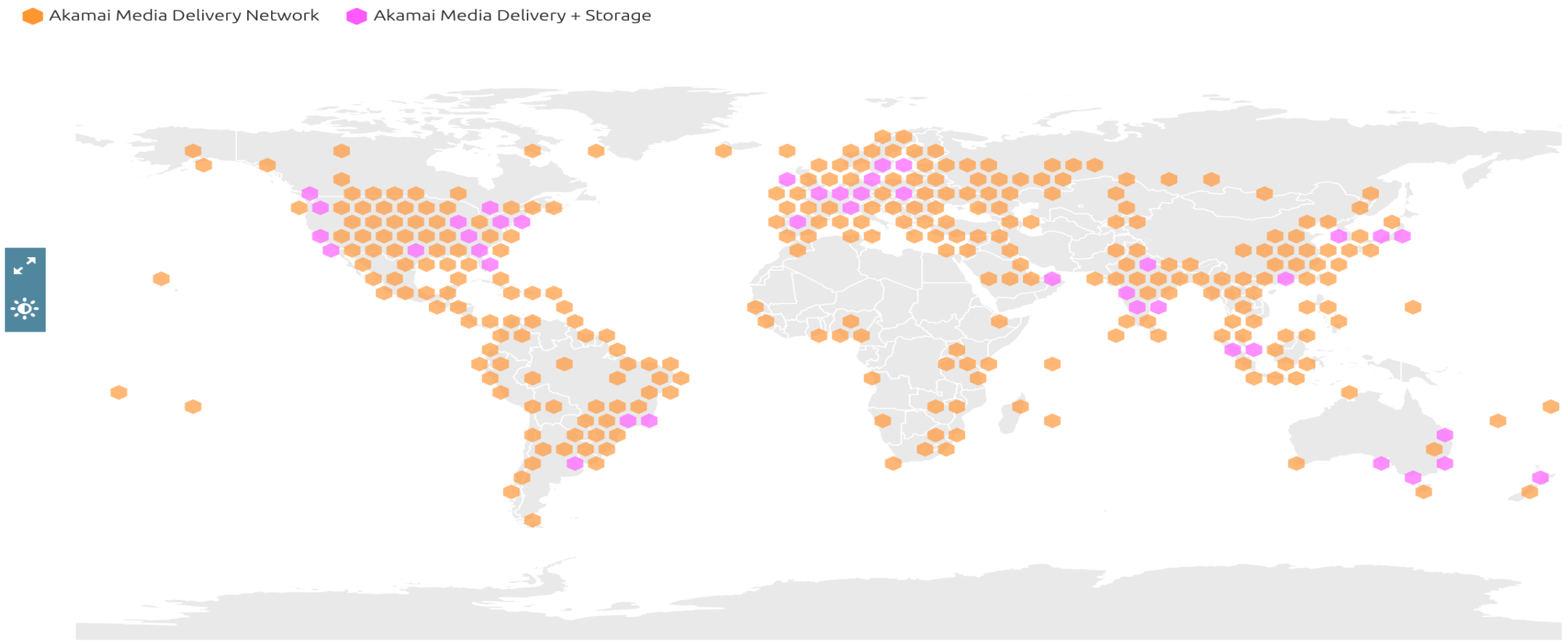
The Amazon CloudFront Global Edge Network



The Cloudflare Global Anycast Network



Akamai Media Delivery Network Map



Type of HTTP requests are supported by Amazon CloudFront

- GET
- HEAD
- POST
- PUT
- PATCH
- DELETE
- OPTIONS

Note: Amazon CloudFront does not cache the responses to POST, PUT, DELETE, and PATCH requests – these requests are proxied back to the origin server.

Latency - How does a CDN improve website load times?

When it comes to websites loading content, users drop off quickly as a site slows down. CDN services can help to reduce load times in the following ways:

- The globally distributed nature of a CDN means reduce distance between users and website resources. Instead of having to connect to wherever a website's origin server may live, a CDN lets users connect to a geographically closer data center. Less travel time means faster service.
- CDNs can reduce the amount of data that's transferred by reducing file sizes using tactics such as minification and file compression. Smaller file sizes mean quicker load times.
- CDNs can also speed up sites which use TLS/SSL certificates by optimizing connection reuse and enabling TLS false start.

Reliability and Redundancy - How does a CDN keep a website always online?

Uptime is a critical component for anyone with an Internet property. Hardware failures and spikes in traffic, as a result of either malicious attacks or just a boost in popularity, have the potential to bring down a web server and prevent users from accessing a site or service. A well-rounded CDN has several features that will minimize downtime:

- Load balancing distributes network traffic evenly across several servers, making it easier to scale rapid boosts in traffic.
- Intelligent failover provides uninterrupted service even if one or more of the CDN servers go offline due to hardware malfunction; the failover can redistribute the traffic to the other operational servers.
- In the event that an entire data center is having technical issues, Anycast routing transfers the traffic to another available data center, ensuring that no users lose access to the website.

Additional Resources

See Lecture Page