Assignment 2
CS654A Software Architecture
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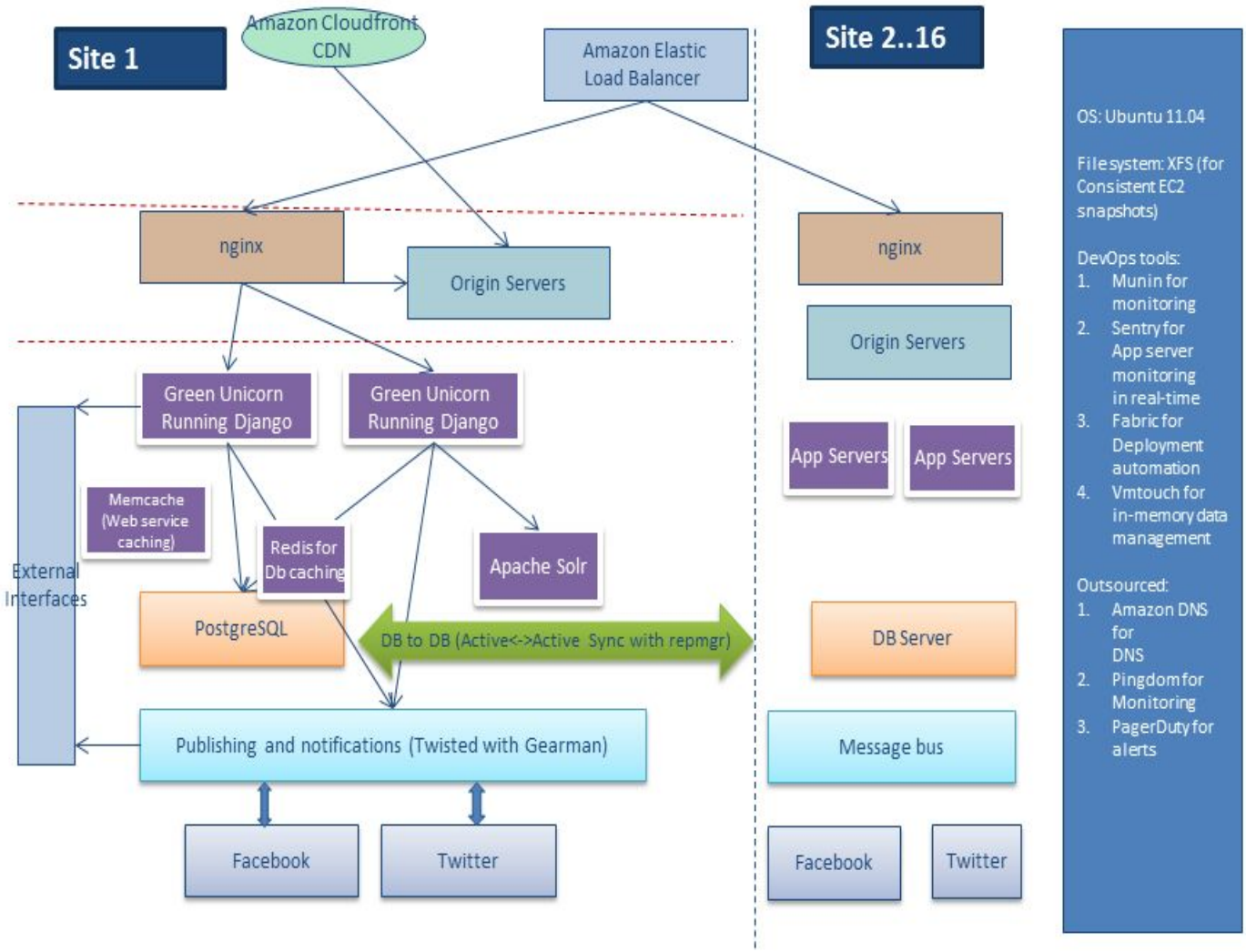
Comments on Instagram Architecture

Instagram

Instagram is an exclusive multimedia sharing app (photos and videos) along with a social network component that enables its users to captures photos/videos and share them on different social networking platforms like Facebook, Twitter, Flickr, etc. The application currently has over 150 million active monthly users as of 2013. Its original architecture was on Amazon AWS before it was acquired by Facebook in 2012.

Architecture Diagram



Comments

The diagram above depicts the software architecture behind Instagram. The diagram represents the process view since it shows various components of the architecture with stress on how the components and processes communicate with one another. It provides an insight in the non functional requirements of the system namely concurrency, performance and scalability. The diagram does not show how the end user interacts with the system and does not give any idea about the design and functional requirements of the system, thus it does not resemble a logical view. The network and the underlying hardware including, the topology and communication, is not stressed upon and the diagram does not provide any idea on where the components of the system reside and thus does not represent the physical view.

The software architecture diagram depicts different logical components of the system namely, the content delivery network (CDN), the load balancer, nginx web server, the database (Postgresql) and the cache (memcache DB), etc.

Like most websites, Instagram serves static content along with dynamic content. The Amazon cloudfront CDN caches some of the static content and serves those requests immediately. The elastic load balancer distributes the requests among the ec2 instances (100) so as to balance the load. The incoming request on an instance is interpreted and handled by the nginx webserver which is capable of handling 10000 connections at a time. It is ideal for non linear scalability both in terms of number of simultaneous connections as well as number of requests per second. It provides a system with high concurrency, high performance and low memory usage.

Instagram uses Postgresql as its primary database for storing essential user data and the metadata. The database is sharded across different machines owing to the size of the database. Django, python based backend app server, is used to handle server side requests since it provides for horizontal scaling. All of the static content of the app including the images uploaded by the user is stored in Amazon S3. The application uses memcache DB and Redis for caching. Memcache db provides support for distributed memory cache that can be used to store objects in RAM thus reducing number of calls to external data source(database). Memcache serves as the web service cache and caches the response of recently incoming requests whereas Reddis serves as the database cache and caches the response of recent database queries. Such queries are used in managing user sessions and powering the user news feed. Twisted is a python based networking module that manages communication with the API's provided by social networking websites including Facebook, Twitter, etc. It also pushes notifications for real time update to the user.

The combination of the above components provide for lower latency, high scalability and high reliability system that is ideal for a CPU intensive system as that of Instagram.

References

1. Instagram Engineering Blog:

http://instagram-engineering.tumblr.com/post/13649370142/what-powers-instagram-hundreds-of-instances
2. Wordpress blog on Instagram Architecture: https://bhaskaruni.wordpress.com/2012/12/27/instagram-architecture/