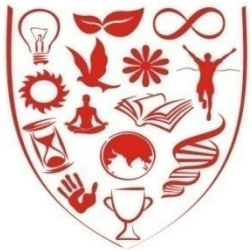
Cloud computing



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Cloud Outages

- Cloud Computing has become increasingly essential to the live services offered and maintained by many companies.
- Its infrastructure should attend to unpredictable demand and should always be available (as long as possible) to end-clients.
- However, assuring high availability has been a major challenge for Cloud providers.

Examples of Cloud Service Outages

- we describe four (certainly among many) examples of Cloud services outages that occurred in 2014 and 2015.

- Dropbox:
- Their databases have one master and two replica machines for redundancy, and full and incremental data backups are performed regularly.
- However, on January 10th, 2014, during a planned maintenance scheduled intended to upgrade the Operating System on some machines, a bug in the script caused down service.
- To restore it, they performed the recovery from backups within three hours.

Examples of Cloud Service Outages

- Google Services
- Some Google services, such as Gmail, Google Calendar, Google Docs, and Google+, were unavailable on January 24th, 2014, for about 1 hour.
- According to Google Engineer, Ben Treynor, "an internal system that generates configurations - essentially, information that tells other systems how to behave - encountered a software bug and generated an incorrect configuration. The incorrect configuration was sent to live services over the next 15 minutes, caused users' requests for their data to be ignored, and those services, in turn, generated errors".
- Consequently, they decided to add validation checks for configurations, improve detection, and diagnose service failure.

Examples of Cloud Service Outages

- Google Apps
- The Google Apps Team schedules maintenance on data center systems regularly and some procedures involve upgrading groups of servers and redirecting the traffic to other available servers.
- However, due to a miscalculation of memory usage, on March 17th, 2014 the new set of backend servers lacked of sufficient capacity to process the redirected traffic.
- These backend servers could not process the volume of incoming requests and returned errors for about three hours.

Examples of Cloud Service Outages

- Verizon Cloud
- Verizon Cloud[4] is a Cloud provider that offers backup and synchronization data to its clients.
- On January 10th, 2015 Verizon provider suffered a long outage of approximately 40 hours over a weekend.
- The outage occurred due to a system maintenance procedure which, ironically, had been planned to prevent future outages.

High Availability

- HA is the ability of a system or system component to be continuously operational for a desirably long length of time
- Availability can be measured relative to "100% operational" or "never failing."

- In information technology (IT), a widely-held but difficult-to-achieve standard of availability for a system or product is known as "five 9s" (99.999 percent) availability.

High Availability

- A service provider will typically provide availability metrics in their service level agreements (SLAs).

- Since system maintenance and planned downtime are a part of life, an HA system or system component is not expected to be available 100% of the time.

High Availability

Availability	Failure	Failure / Downtime in Days	Failure / Downtime in Hours	Failure / Downtime in Minutes
99	100-99= 1%	**3.65**	87.6	5256
99.9	100-99.9=0.1%	0.365	**8.76**	525.6
99.99	100-99.99=0.01%	0.0365	0.876	**52.56**
99.999	100-99.999=0.001%	0.00365	0.0876	**5.256**
100	0%	0	0	0

8.76 Hours = 8Hrs 45 Mins

52.56 Mins = 52 Mins 33 Secs

5.256 Mins = 5 Mins 15 Secs

High Availability

- If the service level agreement for availability is 99.999%, the end user can expect the service to be unavailable for the following amounts of time:

Time Period	Time system is unavailable
Daily	0.9 seconds
Weekly	6.0 seconds
Monthly	26.3 seconds
Yearly	5 minutes and 15.6 seconds

Calculating HA

- Typically, an availability percentage is calculated as follows:

- Availability = (minutes in a month - minutes of downtime) * 100/minutes in a month

How to Achieve HA

- Eliminate single points of failure, or any node that would impact the system as a whole if it becomes dysfunctional.

- Ensure that all systems and data are backed up for simple recovery.

- Use **load balancing** to distribute application and network traffic across servers or other hardware. A popular example of a load balancer is HAProxy.

How to Achieve HA

- Continuously monitor the health of backend servers.
- Distribute resources geographically in case of power outages or natural disasters.
- Implement reliable crossover or failover In terms of storage, a redundant array of independent disks (RAID) or storage area network (SAN) are common approaches.

How to Achieve HA

- Set up a system that detects failures as soon as they occur.
- Design system parts for high availability and test their functionality before implementation.
- Backup components should be built into the infrastructure of the system. For example, if a server fails, an organization should be able to switch to a backup server. To obtain redundancy in a component, IT organizations should follow an N+1, N+2, 2N, 2N+1 strategy.

Charging Models

- When the term cloud computing was first coined, the general idea was that cloud computing would lower costs.
- To the consumer, with interim or short term needs, it is possible that cloud service could provide a lower cost.
- However, for the producer, with the need to invest in excess capacity and deliver the cloud service, it is an expensive undertaking.

Charging Models

- Due to this reason, the producer needs to strategically decide the charging model for the service offering.

- There are two types of charging models which are popularly used by Cloud service provider:

1. Utility Model(Pay per use)
2. Subscription Model

Utility Model

- Consumer is charged on the quantity of cloud services usage and utilization.
- This model is similar to traditional electricity charges.
- For example, a consumer uses secured storage to support its private work documentation. The consumer is charged $0.50 for every 10 gigabytes of storage that is used.

Subscription Model

- Here the consumer is charged based on time-based cloud services usage.
- For example, the consumer is charged a yearly fee for a dedicated storage of 10 gigabytes to host the company Web site.
- This model provides predictable cost outlay and provides a steady stream of revenue for the services provider.

THANK YOU!!!