

CAS 781: Data Center Design Assignment 4

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Question 4 (Solmaz)

a)

- Larger file sizes
- Failure tolerance is higher than the DFS. It's built for failures.
- File changes made via mutation rather than overwriting.
- Has one central master.

b) Heartbeat messages are essential for master-chunk server connection. With heartbeat, master can detect failures in chunks and can repair these with failed chunks replicas. Also it's useful for synchronization of chunks and its replicas. It's also used for re-replication and rebalancing operations.

c) Like other chunk machines, master machine has a replica as well. If primary master shuts down, the shadow master will take the lead for read-only operations. In this time, primary master can restart quickly.

Question 3 (Zhewei)

- **Challenges:**
- Dynamic power. Green energy depends on the weather and clouds. Therefore, data center has to adjust its power usage for energy generation/weather. Match power demand to power supply.
- The other challenge for power supply/demand adjustment is workload managements. If we have more than one data centers across the different locations, we have to determine the workload management based on each locations weather (energy supply probability).
- Heterogeneous workloads. Time and the space for workloads are not certain.
- **Solutions:**

- sCloud can dynamically adjust the workload and migrate the jobs across the all data centers.
- sCloud tries to meet the QoS requirements. For that, it predicts the green energy supplement and monitors the workload/performance of the servers.
- With the prediction and workload data, it can replace/migrate the current tasks and it can assign new tasks to available recourses.

Question 6 (Parshia)

- **Container-Based Provisioning (CBP)**
- It uses round method for integer capacity provisioning
- Uses estimated number for provision machines
- Uses first-fit for task scheduling
- **Container-Based Scheduling**
- It looks for feasible placement in physical machines
- Uses statistics for allocation
- Schedules task without causing capacity violation
- CBP's calculation time is lower than the CBS
- CBS's calculation results are better than the CBP
- In most cases CBS results are better than the CBP
- For the first 2-4 hours CBP results could be as good as CBS but later its performance decreases.

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