

Distributed Storage Exam January 2018

Alex Justesen Karlsen, 201404623

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Additional Questions to Prepare For Exam

Aside from questions focused on the mini-project and the class slides, the students can use the following questions to prepare for the examination.

- How does NFS and AFS operate? How is the design different in these two file systems? What are the consequences of these design choices on performance, e.g., how sensitive are they to network disruptions? Consider your mini-project design and argue about similarities to the two file systems.
- Describe the principle of RAID. How do you store files? What is a stripe? How does RAID0 and RAID1 work? What is the minimum number of disks to be able to use RAID1? Describe the difference between RAID5 and RAID6. Finally, for RAID0, RAID1, RAID5 and RAID6 consider the trade-off of reliability and redundancy overhead.
- What is an MDS code? What is a Reed-Solomon code? What constructions of RS codes are you familiar with? What practical systems do you know that have used them?
- What is a finite field? Why is it important in distributed storage systems? Where is it used?
- Why do we need regenerating codes? What are the MBR and MSR points? What is exact repair and functional repair? How do regenerating codes outperform RS codes in distributed storage systems? Are they both MDS codes?
- Describe the design principles and basics behind HDFS. What does it mean that HDFS is a write-once-read-many file system and why is this advantageous? What is a namenode and a data node? What is a block and how big are they?
- Describe the write operations in OpenStack Swift and HDFS. From a perspective of reliability: which procedure is better at managing and signalling disruptions during the storage process to the system user? which is better for handling losses after successfully finishing the write process and distributing the data to multiple devices? From a perspective of data injection: which procedure is better to increase write speed from the system's user? Why do we see discrepancies between OpenStack Swift and HDFS (consider their purposes)?
- When generating replicas, consider: what is a copyset? what are the advantages and disadvantages of using a random selection of devices compared to the mincopysets strategy discussed in class? Is HDFS using a purely random selection of devices for storing replicas? What is OpenStack Swift's strategy?
- What is object storage? What is an object (what are its parts)? What is a container? How do you interact with an object storage system compared to a file system? How do you access an object? What is the advantage and use of object storage?
- Describe data deduplication and what benefits does it provide. Does it provide additional reliability to a storage system? What is block-level data deduplication? What is inline and post-process deduplication? What would be the consequence of having no fingerprints/hashes to identify blocks in data deduplication?