Dayu: Fast and Low-interference Data Recovery in Very-large Storage Systems

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Overview of Data Recovery Protocol

• Basic idea: replicate data chunks and re-replicate lost chunks

• Responsibility of the recovery protocol:
  • Schedule the source, the destination, and the bandwidth for re-replicating each lost chunk

• Goals of scheduling: high quality and high speed
  • High quality: Achieve fast and low-interference recovery
  • High speed: The scheduling algorithm should not become the bottleneck
Observations from a Production System

• Target system:
  • AliCloud’s distributed storage system: Pangu
  • Deployed on a datacenter with approximately 3500 nodes

• Observations:
  • Very-large scale
  • Tight time constraint
  • Imbalanced resources
  • Dynamic foreground traffic

• Challenge: the scheduling algorithm needs to compute a large and complex problem within seconds
Existing Approaches

• Simple and decentralized scheduler
  • E.g. GFS, HDFS, Azure, RAMCloud, Sparrow, etc
  • High speed but low quality

• Sophisticated and centralized scheduler
  • E.g. CAR, PPR, Mirador, DH-HDFS, Firmament, etc
  • High quality but low speed
Dayu: High-quality and high-speed Recovery

- Evaluation result:
  - 2.96x recovery speed with only 3.7% increase in tail latency
  - Can scale to the cluster of 25K nodes
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Coming soon.

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