A Novel Repairable Fountain Codes Scheme Based on Partial Duplication Technique

Anan Zhou

Wuhan University <https://orcid.org/0000-0003-3800-8254>

Benshun Yi (✉ yibs@whu.edu.cn)

Wuhan University <https://orcid.org/0000-0002-2818-9357>

Mian Xiang

Hubei Minzu University

Laigan Luo

Wuhan University

Research Article

Keywords: Heterogeneous distributed storage network, repairable fountain code, partial duplication technique, communication cost

Posted Date: June 29th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-591678/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Distributed storage system (DSS) is an emerging paradigm which provides reliable storage services for various source data. As the fault-tolerance scheme for DSS, erasure codes are required to provide redundancy service with high fault-tolerance and low cost. However, the existing coding scheme cannot provide these requirements well. Thus, it becomes an important yet challenging issue to find a code for storing various source data with high fault-tolerance and low cost. In this paper, a novel construction of repairable fountain codes with unequal locality is proposed by combining with partial duplication technique, namely the PD-ULRFC scheme. We construct a multi-tier heterogeneous storage network, where data core, processing units and storage nodes collaboratively store and transmit data. Moreover, the proposed PD-ULRFC scheme can reduce the repair and download cost by sacrificing a little extra storage occupation. Furthermore, the expressions of the repair cost and download cost are derived to analyze the performance of PD-ULRFC scheme. The simulation results demonstrate that the PD-ULRFC scheme significantly outperforms other redundant schemes in communication cost saving.

Full Text

This preprint is available for [download as a PDF](#).