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Optimization of Dynamic Spot-Checking for Collusion Tolerance in Grid Computing

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Abstract – Grid computing provides a paradigm for performing computationally intensive tasks by shared resources in a parallel and distributed manner. These shared resources, however, can be misused by malicious users to sabotage running applications of others in some competing environments. Voting-based techniques are commonly applied to resist the sabotage. These techniques become ineffective in systems subject to collusion attacks, where malicious resources collectively sabotage a task by returning identical incorrect outputs. To tackle the collusion attacks the spot-checking technique has been utilized, in which spotter jobs with known correct outputs are sent to randomly-chosen resources to estimate their credibility based on a comparison of returned results and the correct outputs. This paper aims to maximize effectiveness of the spot-checking technique (i.e., minimize the wrong output probability) while satisfying constraints on the expected overhead through optimizing assignment procedure parameters. These parameters include the number of deployed spotter jobs, the number of resources examined by each spotter job, and the number of resources assigned to execute the genuine task. Different from existing research that has assumed fixed values for the latter two parameters, this paper models a novel

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