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Debugging Compute Clusters with Techniques from Functional Programming and Text Stream Processing

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Monitoring is an indispensable tool for the operation of any large installment of grid or cluster computing, be it high energy physics or elsewhere. Usually, monitoring is configured to collect a small amount of data, just enough to enable detection of abnormal conditions. Once detected, the abnormal condition is handled by gathering all information from the affected components. This data is processed by querying it in a manner similar to a database.

This contribution shows how the metaphor of a debugger (for software applications) can be transferred to a compute cluster. The concepts of variables, assertions and breakpoints that are
used in debugging can be applied to monitoring by defining variables as the quantities recorded by monitoring and breakpoints as invariants formulated through these variables. It is found that embedding fragments of a data extracting and reporting tool such as the UNIX tool *awk* facilitates concise notations for commonly used variables since tools like *awk* are designed to process large event streams (in textual representations) with bounded memory. Additionally, it is found that a functional notation similar to both the pipe notation used in the UNIX shell and the pointfree style used in functional programming simplifies the combining of variables that commonly occur when formulating breakpoints.

Consider for promotion

Yes

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