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Explicit state representation and the ATLAS event data model: theory and practice

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In anticipation of data taking, ATLAS has undertaken a program of work to develop an explicit state representation of the experiment's complex transient event data model. This effort has provided both an opportunity to consider explicitly the structure, organization, and content of the ATLAS persistent event store before writing tens of petabytes of data (replacing simple streaming, which uses the persistent store as a core dump of transient memory), and a locus for support of event data model evolution, including significant refactoring, beyond the automatic schema evolution capabilities of underlying persistence technologies. ATLAS has encountered the need for such non-trivial schema evolution on several occasions already.

This paper describes the state representation strategy (transient/persistent separation) and its implementation, including both the payoffs that ATLAS has seen (significant and sometimes surprising space and performance improvements, the extra layer notwithstanding, and extremely general schema evolution support) and the costs (additional and relatively pervasive additional infrastructure development and maintenance). The paper further discusses how these costs are mitigated, and how ATLAS is able to implement this strategy without losing the ability to take advantage of the (improving!) automatic schema evolution capabilities of underlying technology layers when appropriate.

Implications of state representations for direct ROOT browsability, and current strategies for associating physics analysis views with such state representations, are also described.

Submitted on behalf of Collaboration (ex, BaBar, ATLAS)

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