

# 11. Persistence

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This section will describe possible implementations of persistence in Joule. The trade-offs between these implementations remain largely unexplored for Joule, though much of the territory is known for other related systems such as FCP and Actors.

## 11.1. Page-Based Persistence

This section will describe a persistence implementation at the level of pages of virtual memory. The design of this system is based on the persistent virtual memory system in KeyKOS. In page-level persistence, changed memory pages get checkpointed to persistent store at regular intervals, saving the entire execution state of the machine.

## 11.2. Server-Based Persistence

This section will describe a persistence implementation at the level of servers. In server-level persistence, changed servers write themselves to persistent store at regular intervals.

## 11.3. Replay-Based Persistence

This section will describe a persistence implementation in terms of logging messages passed and the internal non-deterministic choices made by servers in order to replay the actions of the system and reconstitute its state.

