JVuSched is a new end-to-end cluster scheduling system that robustly exploits job runtime predictions. Using runtime knowledge allows it to more effectively pack jobs with diverse time concerns (e.g., deadline vs. latency) and placement preferences on heterogeneous cluster resources. A natural set of questions, then, ask how accurate runtime knowledge is, and what happens when it is imperfect. JVuSched introduces new techniques to mitigate the effects of real mis-prediction profiles. Experiments with workloads derived from a Google cluster trace show that JVuSched matches the end-to-end performance of a hypothetical oracular predictor with perfect job runtime information, while outperforming state-of-the-art schedulers afforded the same prediction accuracy. JVuSched reduces SLO miss rate, increases cluster goodput, and improves or matches latency for best effort jobs.