Lessons from the past, challenges ahead, and a path forward

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Programming models for exascale systems must address the pressing problems of managing massive parallelism, energy consumption, and faults. In addition, heterogeneity is here to stay and must be managed by programming models as well. These challenges provide a new backdrop for addressing issues that have received most attention by parallel programming models over the years: partitioning, data movement, latency, and synchronization. The need to support complex application structures, e.g. coupled models, adds an additional wrinkle. It is tempting to insulate application developers from such issues by using very high level programming models and letting compilers and runtime systems bridge the gap to a target architecture. However, past experience with high level models offers a cautionary tale. This talk will consider lessons from past efforts implementing High Performance Fortran as well as PGAS models. Based on these lessons, this talk will offer some thoughts about a path forward.