This paper presents a novel hardware resource allocation technique for hardware/software partitioning. It allocates hardware resources to the hardware data-path using information such as data-dependencies between operations in the application, and profiling information. The algorithm is useful as a designer's/design tool's aid to generate good hardware allocations for use in hardware/software partitioning. The algorithm has been implemented in a tool under the LYCOS system. The results show that the allocations produced by the algorithm come close to the best allocations obtained by exhaustive search.