We present a numerical method for pricing Bermudan options on a large number of underlyings. The asset prices are modeled with exponential time-inhomogeneous jump-diffusion processes. We improve the least-squares Monte Carlo method proposed by Longstaff and Schwartz introducing an efficient variance reduction scheme. A control variable is obtained from a low-dimensional approximation of the multivariate Bermudan option. To this end, we adapt a model reduction method called proper orthogonal decomposition (POD), which is closely related to principal component analysis, to the case of Bermudan options. Our goal is to make use of the correlation structure of the assets in an optimal way. We compute the expectation of the control variable by either solving a low-dimensional partial integro-differential equation or by applying Fourier methods. The POD approximation can also be used as a candidate for the minimizing martingale in the dual pricing approach suggested by Rogers. We evaluate both approaches in numerical experiments.