Mobile Ad-hoc Network (MANET) is used for wireless communication, in that mobile nodes forms a communication without infrastructure. In the wireless communication, Routing has been the most decisive area of research in ad hoc network. The prominent type of MANET protocol is DSR protocol. Dynamic Source Routing (DSR) is used for the effective route discovery. The DSR protocol is incorporated with Branch and Bound algorithm for the optimal route discovery. The proposed algorithm, Modify DSR with Modify Branch and Bound aims at increasing the energy utilizing level in Discover Routing, Packet forwarding and Collision avoidance. It helps to progress the efficiency of the energy level in MANET. One of the chief impact of this research work is to ensure Packet forwarding with efficient utilization of Energy attributes in MANET. Performance metrics like End to end Delay, Packet Delivery Ratio (PDR), Nodes Energy, Network Life time, Routing Overhead and Throughput has used for the evaluation of performance of the proposed algorithm.