Threshold Jumping and Wrap-Around Scan Techniques toward Efficient Tag Identification in High Density RFID Systems

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Abstract

With the emergence of wireless RFID technologies, the problem of Anti-Collision has been arousing attention and instigated researchers to propose different heuristic algorithms for advancing RFID systems operated in more efficient manner. However, there still have challenges on enhancing the system throughput and stability due to the underlying technologies had faced different limitation in system performance when network density is high. In this paper, we present a Threshold Jumping (TJ) and a Wrap-Around Scan (WAS) techniques, which are query tree based approaches, aiming to coordinate simultaneous communications in high density RFID environments, to speedup tag identification, to increase the overall read rate and to improve system throughput in largescale RFID systems. The main idea of the Threshold Jumping is to limit the number of collisions. When the number of collisions exceeds a predefined threshold, it reveals that tag density in RF field is too high. To avoid unnecessary enquiry messages, the prefix matching will be moved to next level of the query tree, alleviating the collision problems. The method of setting frequency bound indeed improves the efficiency in high density and randomly deployed RFID systems. However, in irregular or imbalanced RFID networks, inefficient situation may happen. The problem is that the prefix matching is performed in single direction level-order scheme, which may cause an imbalance query tree on which the right subtree

always not been examined if the identification process goes to next level before scan the right sub-tree due to threshold jumping. By scanning the query tree from right to left in alternative levels, i.e., wrap-around, this flaw cold be ameliorated. To evaluate the performance of proposed techniques, we have implemented the TJ and the WAS method along with the query tree protocol. The simulation results show that the proposed techniques provide superior performance in high density environments. It is shown that the TJ and WAS are effective in terms of increasing system throughput and minimizing identification delay.

Keyword：Tag anti-collision . Query tree .Wrap-around