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PERFORMANCE MODELLING OF CALL CENTERS WITH SKILL-BASED ROUTING

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Skill-based routing (SBR) is a sophisticated protocol feature of the call center telephone switch that minimizes the staff but increases agent utilization. According to Gans, Koole, and Mandelbaum, "... the technology has raced ahead of the managers' and academic's understanding of how it may best be used, and the characterization of effective strategies for skill-based routing is an open question at all levels of (the) capacity planning hierarchy..."

We model a SBR call center environment as an $M/M/C/K$ queue with non-preemptive priorities, where the skill set for each agent is predefined. Agents have a single priority skill but may also have a secondary skill and a tertiary skill if not more. We have developed a discrete-event stochastic simulation to analyze this system.

We have also developed two new methods for optimally designing the classical $M/M/C/K$ queue to hold both the steady state blocking probability and the probability of delay (exceeding a specified threshold value) below given tolerance values. One method is an exact search algorithm that uses stochastic ordering results. The other method is asymptotic and achieves optimization by a using heavy traffic analysis. Both methods are compared to industry-accepted practices.

Finally, we develop a heuristic approach to calculating the number of call center agents and telephone lines needed in an SBR environment. We compare our approach to both the known industry-accepted methods and our own simulations.