The Internet Erlang Formula

This paper presents a robust and efficient algorithm for evaluating multi-service multi-rate queueing systems, including finite buffer systems and loss systems. Vint Cerf listed in 2007 seven research problems concerning the Internet. This paper responds to the second problem: an Internet Erlang Formula. The algorithm derived is based on reversible models and thus insensitive to service time distributions. For buffer-less systems we get the classical multi-rate teletraffic models. As the simplest special case we get the classical recursion formula for Erlang-B. The performance of the algorithm is \( O(N \cdot k) \) where \( N \) number of services, and \( k \) is the total number of servers and buffers in basic bandwidth units. The memory requirement is \( O(N \cdot d) \) where \( d \) is the maximum requested bandwidth in basic bandwidth units.