This paper investigates how the throughput of a general fork/join queueing network with blocking behaves as the number of nodes increases to infinity while the processing speed and buffer space of each node stay unchanged. The problem is motivated by applications arising from distributed systems and computer networks. One example is large-scale distributed stream processing systems where TCP is used as the transport protocol for data transfer in between processing components. Other examples include reliable multicast in overlay networks, and reliable data transfer in ad hoc networks. Using an analytical approach, the paper establishes bounds on the asymptotic throughput of such a network. For a subclass of networks which are balanced, we obtain sufficient conditions under which the network stays scalable in the sense that the throughput is lower bounded by a positive constant as the network size increases. Necessary conditions of throughput scalability are derived for general networks. The special class of series-parallel networks is then studied in greater detail, where the asymptotic behavior of the throughput is characterized.