II Summary

This literature assignment can be divided into two parts. The first part is on queueing theory in general (chapters 1 and 2) and the second part attempts to find performance parameters for Erlang-k single server type models (chapter 3).

The first part can be found throughout many introductory books on the subject of queueing and on the Internet. Queueing theory is developed to get more insight into waiting lines and times. Why do these occur? What can someone do to change this phenomenon? The real-world phenomenon can be described by a queueing model. We may completely understand the queueing model, because it is a simplified system that exists only in the idealized world of mathematics. It may have precise formulas that describe it completely. By contrast, our understanding of a real-world system is always imperfect. Real-world systems are complex, messy, and mysterious. For that reason, it will never be true that a queueing model exactly represents a real-world system. The art of applying queueing theory consists in deciding which models to use with which systems, and how to perform the correspondence between the queueing model and the real-world system.

The performance parameters are an easy way to see if a queueing model performs the way it should. Are waiting times of customers too long? This question can be answered by looking at one of the performance parameters (W_q). If the mean waiting time in the queue (W_q), the mean waiting time in the system (W), the expected number of customers in the queue (L_q), the expected number of customers in the system (L) and the probability that the system is empty (P_0) are known, it can be decided to change a certain queueing aspect (for example the number of servers). If one of the performance parameters can be found, the others can easily be found through Little's law. Chapter 1.3.2 explains the performance parameters for a general queueing model; Chapter 3 explains these parameters for a number of Erlang-k queueing models.

The second part is more difficult to find in books and on the Internet. The Erlang-k distribution is a distribution that is equal to multiple (k) exponential probability distributions. This is explained in chapter 2.2 and 2.3. If k equals 1, the Erlang-k distribution is equal to the exponential distribution. If k goes to infinity, the Erlang-k distribution is equal to the degenerate distribution. Both the exponential distribution and the degenerate distribution are easy to use distributions in queueing theory. However, the area in between (the Erlang-k distribution) is very difficult to use in queueing theory. The performance parameters for some Erlang-k queueing models are found in the literature and explained in some detail. However performance parameters for queueing models with an Erlang-m interarrival time distribution and an Erlang-k service time distribution (with m>2 and k>2) are not found in other literature.

The literature assignment is concluded with some recommendations towards new researches. These should mainly direct their attention towards simulating the queueing models.