Long-range dependence has been shown to be an ubiquitous feature in aggregate network traces. The degree of long-range dependence is measured by the Hurst parameter. Several techniques have been proposed for estimating this Hurst parameter. In this thesis, we demonstrate the drawbacks of these estimators in the presence of non-stationarities and discuss how some recently developed tools can be used for working around some of these drawbacks.
Simulations are a widely used technique in the study of network architectures and protocols. Such simulation studies require generating synthetic sequences. These synthetic data sets must possess similar features as the original trace. In this thesis, we present a novel technique for generating traffic traces from a given trace. The technique is based on the use of the stationary bootstrap algorithm in the wavelet domain. The traces generated by our technique have been shown to be capable of capturing the Hurst parameter and the probability distribution function of the parent trace. In addition, we also demonstrate the superiority of our technique over existing algorithms.
The final part of the thesis is aimed towards detecting a change in the Hurst parameter of a data set. This is based on detecting a change in the variance of the wavelet coefficients of the given data set. If a change in the variance of the wavelet coefficients is detected on more than one level, then a change in the Hurst value is signalled.