This paper examines some of the most important contributions regarding bus transit control and optimisation from a modelling perspective. It provides guidelines for designing simulations of this type and points to the need of a qualitatively and quantitatively correct model that is validated and can serve as a benchmark testing platform for the numerous optimisation strategies that researchers present. It examines a case study about a bus line in Singapore and uses smart card data to extract the parameters needed in order to construct the model, while discussing the methods and challenges of this process. Consequently, the simulation is calibrated and validated in order to ensure maximum accuracy of its outputs.