

# **Core Probability Model: Efficient macroscopic sensitivity modelling**

**Conceptual design**

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## **Abstract**

In this contribution a new development in probability, reliability and sensitivity modelling is presented. The Core Probability Model (CPM) is a full probabilistic model for modelling variations in capacity and traffic demand in macroscopic traffic flow. The CPM extends a base model, such as the Cell Transmission Model (CTM), by considering each traffic variable as a discrete stochastic variable denoted as a probability distribution of values for each traffic variable in time and space. Traffic is propagated along a link using the base model and through a larger network with the application of probability merging algorithms at the nodes. Due to the incorporation of probability in the core of traffic propagation, the necessity for multiple simulations diminishes, as the CPM makes use of a one-shot approach. This leads in theory to a shorter simulation time and computational load. Another major advancement is the explicit handling of spatiotemporal dependence. Furthermore the use of complete probability distributions allows for a detailed overview of variable probabilities at any given time and place in the model with a greater degree of accuracy. In this contribution the conceptual design of the CPM is given along with a description of the main issues it tackles.

## **Keywords**

Stochastic traffic flow modelling, Macroscopic traffic flow models, probabilistic modelling