

# High-performance process algebra: from stationary to fluid in fifteen years

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## Abstract

Performance Evaluation Process Algebra (PEPA) [1] is fifteen years old this year. This talk will survey the work done on PEPA in this period to advance the analysis capabilities of the PEPA tools. During this period the PEPA tools have progressed from limited Markovian analysers such as the PEPA Workbench [2] computing only the stationary distribution through to sophisticated modelling environments such as the PEPA Eclipse Plug-in [3] and powerful analysis tools such as IPC [4, 5] computing transient and passage-time results.

Two particularly important developments in the story of PEPA will be treated in greater depth. The first is the use of *stochastic probes* to query PEPA models [6] and evaluate passage-time distributions over PEPA models. Extensions of stochastic probes allow more complex queries to be posed by specifying locations in the model [7] or states of interest [8] in the passage.

The second is the use of *fluid-flow approximation* [9] to circumvent the state-space explosion which cripples Markovian modelling. The use of fluid-flow approximation allows large-scale PEPA models to be analysed at negligible computational cost, enabling the analysis of Internet-scale phenomena such as peer-to-peer computing [10] and Internet worms [11].

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