An analytical approach for dimensioning mixed traffic networks

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Abstract

We present an analytical method for analyzing and dimensioning a network based communication architecture. The method is based on the classic (σ, ρ) network calculus. We use a TDMA approach for creating logically separated networks which makes statistical methods possible for calculations on Best Effort traffic, and supports implementation of Guaranteed Bandwidth services by using Virtual Circuits with Looped Containers.

1 Introduction

Our method is used for dimensioning mixed traffic networks, where (σ, ρ) calculus [1] is used for describing all data flows in the application and for modeling Guaranteed Bandwidth services. For the Best Effort services, we use statistical methods for performance calculations, for example latency [2]. We implement the Guaranteed Bandwidth service by using Virtual Circuits with Looped Containers [3]. The basis for traffic separation is a TDMA approach, where the timeslots are divided between different Traffic Flow Gropus. The method is iterative, and consists of 5 steps:

1. Define Data Flows using (σ, ρ) notation
2. Define logically separated networks. This makes statistitical analysis of Best Effort traffic possible, as well as providing Guaranteed Bandwidth service.
3. Calculate required buffer sizes for the (σ, ρ) data flows using (σ, ρ) models of Guaranteed Bandwidth services
4. Calculate performance of the Best Effort traffic using (σ, ρ) models of Best Effort traffic budget combined with deflection factors [2]
5. Map the resources on to the network using manual mapping or use an existing method, for example [4].

2 Conclusion

Using (σ, ρ) data regulators for shaping traffic flows combined with (σ, ρ) models of the network components makes it possible to analytically find feasible design solutions. We show how to calculate the maximum buffer requirement for Guaranteed Bandwidth traffic, and how to apply statistical methods for calculation of Best Effort performance.

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