XXXV SALÃO de INICIAÇÃO CIENTÍFICA

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Autor	DIEGO CARDOSO NUNES
Orientador	ALBERTO EGON SCHAEFFER FILHO

The network has limited resources. When the rate of incoming packets surpasses the network's capability of delivering them, the network becomes congested, which may lead to a *congestion collapse*. Congestion control mechanisms tackle this problem by limiting the rate at which end hosts send data to the network, aiming to avoid congestion collapse and to ensure a fair sharing of the communication channels. Even though *fairness* is a well-explored concept within the literature, just proving that an algorithm is fair is not sufficient to completely prevent the adverse behaviors of congestion control strategies: it is essential to also think about the *safety* of those systems. *Safety* is a more comprehensive concept than *fairness*, encompassing not only how the network resources are shared but also the multiple hazards that a bad-behaving congestion control agent may impose on the network. In this work, we aim to fill this gap by presenting a formal definition of *safety* in congestion control, allowing the design of safety-oriented congestion control systems that are more efficient in keeping the stability of the network and can deal better with congestion hazards. Using our formalization, we designed SafeNetCC, a solution that uses network knowledge to provide safety mechanisms for potentially unsafe congestion controls. SafeNetCC uses In-Band Network Telemetry and P4 to collect statistics about the packets' path, such as bottleneck bandwidth, number of competing flows, and queuing information, allowing the system to monitor the safety conditions of the network and respond to safety violations. The collected data is processed at the end hosts using eBPF modules to interact directly with the Linux kernel, thus our solution is not tied to any specific congestion control. The system is being implemented and will be tested in an emulated context using Mininet.