

# Time-based Updates in OpenFlow: A Proposed Extension to the OpenFlow Protocol

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## Abstract

Software Defined Networking (SDN) defines a network architecture in which the control plane is managed by a logically centralized controller, and thus configuration updates occur frequently. We have recently introduced an approach that uses time-based configuration updates, allowing to simplify complex update procedures and to minimize transient effects caused by configuration changes. This paper proposes an extension to the OpenFlow Protocol that allows time-triggered configuration updates.

## 1 Introduction

Software Defined Networking (SDN) defines a clear distinction between the data plane and the control plane; on the data plane, forwarding decisions are taken locally at each switch in the network, while the control plane is managed by a logically-centralized controller, overcoming the need for complicated distributed control protocols and providing network operators with powerful and efficient tools to control the data plane.

The centralized approach in SDN introduces various challenges in terms of performance and consistency. The controller is required to routinely perform frequent network configuration updates. Thus, update procedures must be as simple as possible, avoiding complex and stateful processes in the controller. Moreover, the controller must take care to minimize network anomalies during update procedures, such as packet drops or misroutes caused by temporary inconsistencies.

Time-based configuration [1] can be a useful tool that enables an entire class of coordinated and scheduled configuration procedures. Time-triggered configuration allows coordinated network updates in multiple devices; a controller can invoke a coordinated configuration change by sending update messages to multiple switches with the same scheduled execution time. A controller can also invoke a time-based sequence

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