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 con-
figuration updates occur frequently. We have recently introduced an approach that
uses time-based configuration updates, allowing to simplify complex update pro-
cedures 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 pro-
viding network operators with powerful and efficient tools to control the data plane.

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

Time-based configuration \[ \text{[1]} \] can be a useful tool that enables an entire class of
coordinated and scheduled configuration procedures. Time-triggered configuration al-
lows coordinated network updates in multiple devices; a controller can invoke a coordi-
nated 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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