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HETEROGENEOUS WIRELESS: THROUGHPUT GUIDANCE IN A MULTI-PATH ENVIRONMENT

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ABSTRACT

Embodiments presented herein relate to throughput guidance within a multipath environment. In a proxy deployment, the proxy function may be responsible for combining the plurality of throughput guidances received over individual paths. For example, an approach to combining throughput guidances using functions such as SUM (), MAX (), or AVG () may be employed according to a proxy policy definition.

DETAILED DESCRIPTION

Multi-path systems may involve a plurality of simultaneously-active paths that use a variety of wireless technologies. These multi-path systems may require policies to be defined in terms of how each of the multiple paths should be used. For example, paths can be used for resilience, to enhance user interactions by lowering latency, or can be combined to increase aggregated throughput. However, a standard is needed for instrumenting these links.

Embodiments presented herein relate to the combination of TCP throughput guidance to enable access networks to convey information regarding the throughput that is estimated to be available at a down link path for a given TCP connection. In a multipath TCP (MP-TCP) setting, the throughput guidance operates on a per-subflow basis. An MP-TCP proxy may be defined as the logical TCP endpoint for the throughput guidance. The MP-TCP proxy may recover throughput guidance from a plurality of paths that are associated with different subflows. The MP-TCP proxy may then determine an optimal

policy for scheduling downlink packets to user equipment (UE). Policies may also take into account indicated throughput guidances.

In the next release of Hotspot 2.0, a standard for public-access Wi-Fi, three new Access Network Query Protocol (ANQP) elements are defined, and a new Advice of Charge element is included. As per the latest Wi-Fi Alliance specification, a mobile device can request Advice of Charge information about charges related to hotspot access. The specification defines the text that describes an Advice of Charge plan offered in accordance with an advertised service. The wording of this element and the currency for the plan is provided by fields in the Advice of Charge ANQP element.

This schema definition may be augmented to include information that can be used in TCP options populated by a device. This definition would enable a consuming proxy to be aware of the achievable throughput on each access path, as well as any tariffing of data over each path. Thus, optimal scheduling policies may then be defined.

Thus, throughput guidance within a multipath environment may be achieved using a proxy function. In a proxy deployment, the proxy function will be responsible for combining the plurality of throughput guidances received over individual paths. For example, the approach to combining could be SUM (), MAX (), or AVG (), according to a proxy policy's definition.