

Path Aware Networking RG  
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B. Trammell  
Google Switzerland GmbH  
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## Current Open Questions in Path Aware Networking draft-irtf-panrg-questions-05

### Abstract

In contrast to the present Internet architecture, a path-aware internetworking architecture has two important properties: it exposes the properties of available Internet paths to endpoints, and provides for endpoints and applications to use these properties to select paths through the Internet for their traffic. This document poses questions in path-aware networking open as of 2019, that must be answered in the design, development, and deployment of path-aware internetworks. It was originally written to frame discussions in the Path Aware Networking proposed Research Group (PANRG), and has been published to snapshot current thinking in this space.

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**Commenté [BMT1]:** The reader does not know at this stage what this « path aware interworking » is about so introducing the concept first would be helpful.

**Commenté [BMT2]:** Do you assume that the arch does not apply to enterprise networks or other « non-Internet » cases?

**Commenté [BMT3]:** I don't parse this sentence.

**Commenté [BMT4]:** This seems to cover both directions. Is the conflict between paths selected by each of the endpoints managed by the architecture?

**Commenté [BMT5]:** The previous sentence uses « path-aware interworking ». is this the same concept?

**Commenté [BMT6]:** This is another variant of the same concept.

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1. Introduction to Path-Aware Networking

In the current Internet architecture, the interdomain network layer provides an unverifiable, best-effort service: an application can assume that a packet with a given destination address will eventually be forwarded toward that destination, but little else. A transport layer protocol such as TCP can provide reliability over this best-effort service, and a protocol above the network layer such as IPsec AH [RFC4302] or TLS [RFC5246] can authenticate the remote endpoint. However, no explicit information about the path is available, and assumptions about that path sometimes do not hold, sometimes with serious impacts on the application, as in the case with BGP hijacking attacks.

By contrast, in a path-aware internetworking architecture, endpoints have the ability to select or influence the path through the network used by any given packet, and the network and transport layers explicitly expose information about the path(s) or patho-available between two endpoints to those endpoints and the applications running on them, so that they can make this selection.

Path selection provides transparency and control to applications and users of the network. Selection may be made at either the application layer or the transport layer. Path control at the packet

Commenté [BMT7]: What is an « interdoamin network layer » ?

Commenté [BMT8]: This one is obsoleted. Please use RFC8446.

Commenté [BMT9]: Isn't this similar to source routing ?

Commenté [BMT10]: Consider adding a pointer to the draft-irtf-panrg-path-properties.

Commenté [BMT11]: So point to multipoint communications are out of scope. If so, please clarify.

Commenté [BMT12]: That is ?

level enables the design of new transport protocols that can leverage multipath connectivity across maximally-disjoint paths through the Internet, even over a single physical interface. When exposed to applications, or to end-users through a system configuration interface, path control allows the specification of constraints on the paths that traffic should traverse, for instance to confound passive surveillance in the network core.

Mis en forme : Surlignage

We note that this property of "path awareness" already exists in many Internet-connected networks in an intradomain context. Indeed, much of the practice of network engineering using encapsulation at layer 3 can be said to be "path aware", in that it explicitly assigns traffic at tunnel endpoints to a given path within the network. Path-aware internetworking seeks to extend this awareness across domain boundaries without resorting to overlays, except as a transition technology.

For purposes of this document, "path aware networking" describes endpoint discovery of the properties of paths they use for communication, and endpoint reaction to these properties that affects ~~routing~~ forwarding and/or transmission; note that this can and already

Commenté [BMT13]: How this affects routing ?

does

happen to some extent in the current Internet architecture. Expanding on this definition, a "path aware internetwork" is one in which endpoint discovery of path properties and endpoint selection of paths used by traffic exchanged by the endpoint are explicitly supported, regardless of the specific design of the protocol features which enable this discovery and selection.

Research into path aware networking covers any and all aspects of designing, building, and operating path aware internetworks or the networks and endpoints attached to them. This document presents a collection of research questions to address in order to make a path aware Internet a reality.

## 2. Questions

Realizing path-aware networking requires answers to a set of open research questions. This document poses these questions, as a starting point for discussions about how to realize path awareness in the Internet, and to direct future research efforts within the Path Aware Networking Research Group.