
Path Aware Networking PRG

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Wednesday 19 July 2017 — IETF 99 — Prague

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Agenda

- Intro / Note Well / Agenda (you are here) 10m, Chairs
 - A Decade of Path Awareness 20m, Olivier Bonaventure
 - SCION: A Path-Aware Internet Architecture 20m, Adrian Perrig
 - Discussion and Next Steps? 30m, Chairs
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Why are we here?

We identified a common theme of *path awareness* in a lot of research on the edge of standardization in the IETF:

- multipath transport protocols (MPTCP, future QUIC)
- hybrid access approaches (BANANA BoF, MPTCP)
- emerging path control approaches (SFC, v6 SR, DETNET)
- dynamic interface/transport selection (MIF, v6 multihoming, TAPS)
- work on path signaling (IAB stackevo, PLUS, ALTO)

Exploring this theme seems like a job for a new RG.

What's so interesting about path aware networking?

In the control plane, of course, all routing is “path aware”.

We're interested in how this extends to the edge.

- **Endpoint(*)** discovery of paths
- Explicit association of properties to paths by **endpoints**
- Explicit **endpoint** selection of paths

This is happening anyway. We should be explicit about it.

*tunnels have endpoints, too

Underlying hard problems

- Conflict of interest: Host's and network's idea of "best path" may conflict.
 - Scheduling: more degrees of freedom when you have path awareness.
 - Temporal aspects: selection of paths, discovery of properties, and control inputs at different timescales.
 - Path property semantics and dissemination algorithms.
 - Privacy: path-awareness at endpoints can foil eavesdropping; path selection might be fingerprintable.
 - Trust: in path properties
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Proposed Research Group Charter: Preamble

The Internet architecture assumes a division between the end-to-end functionality of the transport layer and the properties of the path between the endpoints. The path is assumed to be invisible, homogeneous, singular, with dynamics solely determined by the connectivity of the endpoints and the Internet control plane. *Endpoints have very little information about the paths over which their traffic is carried, and no control at all beyond the destination address.*

Increased diversity in access networks, and ubiquitous mobile connectivity, have made this architecture's assumptions about paths less tenable. Multipath protocols taking advantage of this mobile connectivity begin to show us a way forward, though: if endpoints cannot control the path, at least they can determine the properties of the path by choosing among paths available to them.

This research group aims to support research in bringing path awareness to transport and application layer protocols, and to bring research in this space to the attention of the Internet engineering and protocol design community.

Proposed Research Group Charter: Scope

- communication and discovery of information about the properties of a path on local networks and in internetworks, exploration of trust and risk models associated with this information, and algorithms for path selection at endpoints based on this information.
 - algorithms for making transport-layer scheduling decisions based on information about path properties.
 - algorithms for reconciling path selection at endpoints with widely deployed routing protocols and network operations best practices.
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Proposed Research Group Charter: Schedule

Path awareness is a theme across several subfields of networking research, many of which are relatively standards-adjacent. Therefore:

- Meet at 2-3 IETF meetings per year
 - Aim for at least one workshop colocated with a related academic conference (e.g. SIGCOMM)
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Questions

- Do we have the scope right?
 - Are there things that we are missing?
 - Are there things that we want to do but shouldn't?
 - Is there interest/energy to start a new RG in this space?
 - What should we plan for an agenda in Singapore?
 - Are there documents the RG should aim to publish?
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