

Vertical and Horizontal End-to-End Arguments – A Taxonomy for Today's Internet

Objective

Saving a forty year old design principle that was based on the implicit assumption that functions in the hosts and functions at the application layer coincided



Problem

The economically and technically sensible common ground has vastly grown – a categorical application of the end-to-end principle has become increasingly non-sensical

Internet 1.0

- flaky packet routing
(“best effort” IP service)

Internet 2.0

- (de facto) QoS commitments
- “low level” application level functions
(caching, filtering, access control, etc.)
- “high level” application level services
(IMAP, Google Wave, gateways, etc.)

Solution

Introducing a taxonomy and framework that distinguishes explicitly between, and allows for different conclusions from:

(1) **vertical** end-to-end arguments along the network protocol layer stack and

(2) **horizontal** end-to-end arguments stretching across different stake-holders and administrative domains

IP

Vertical implication: An irreducible minimum functionality at a globally shared common layer

ALS, NAT, DPI – no structural harm

Horizontal implication: Variety, redundancy, and competition in application level functions on explicit and implicit behalf of end users best furthers their utility and unlike the vertical end-to-end reasoning need not inflict externalities upon others

Crucial Points

- Minimality at a shared internet layer does not and need not imply minimality in the network nodes/hosts between two end points.
- The former – by definition – needs to hold a monopoly, while the latter – also by definition – do not, and should not.
- While the vertical end-to-end argument calls for a categorical application, the horizontal one allows for far greater variety in the means aimed at best serving the ultimate end user objectives (sovereignty, empowerment, “innovation”, etc.).