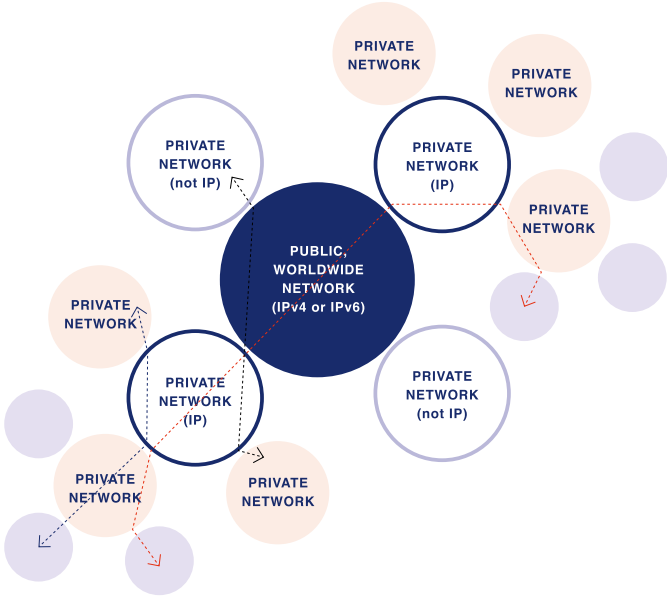# A NEW LOCATION LAYER FOR THE TCP/IP PROTOCOL STACK

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The main goal of the work described in the paper was to develop a mechanism for allowing end-hosts on any IP network, public or private, to address each other without limitations. The key feature that we explored is a novel hierarchical routing mechanism, inspired by the source routing and route recording concepts. With our hierarchical routing mechanism, we imagine the Internet to evolve hierarchically (see Fig. 1), from an IPv4 or IPv6 public backbone to several private leaf networks, each of which with a focused purpose, possibly interconnected by intermediate, private mid-size networks.

For achieving this goal, the paper presents a new location layer for the TCP/IP protocol stack, placed between the network and transport layers. Its purpose is to enable the deployment of addressing bridges over IP. Such bridging enables a seamless routing between heterogeneous addressing domains, such as public/private IPv4 and IPv6 networks.

The location layer adds flexible addressing, location and routing facilities for IP packets. It allows any IP host to become a Locator Node between an IP host and some "addressable entity", which can also be another IP host or an object without IP address, such as a person or a given content. Addresses handled by the Locator Nodes are flexible data structures that use a stacking paradigm to memorize routes or entity identifiers (e.g. a latitude-longitude position, a phone number or a content hash). The paper proposes a simple meta-structure for implementing location layer headers, without imposing specific policies to manage the activities of Locator Nodes.

With the location layer, endpoints are identified within a new, wide and location-free identification space. Such identifiers (Endpoint Unique Identifiers) are handled on the context of the location layer, i.e., by Locator Nodes (see Fig. 2). This enables an effective separation between endpoint identification and location, which is an advantage for addressing mobile or replicated entities.
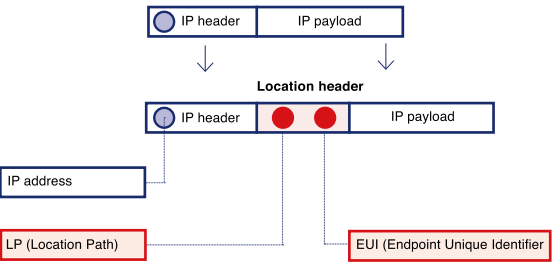
FIGURE 1

Hierarchical Internet vision, with a central, IPv4 or IPv6 public backbone and many hierarchies of private networks, using IP or not. The diagram shows three interactions among pairs of endpoints, both located in leaf, private networks, and a hierarchical traffic routing between them passing through a public or private IP network, indirectly accessible to both entities.

FIGURE 2

Diagram showing the placement of the Location Header and the fields used to identify and locate an endpoint: the Endpoint Unique Identifier for endpoint identification, the IP address (of a Location Node) and the Location Path for endpoint location (through the Location Node).