

Abstract

A mesh network is a self-healing, dynamic and usually wireless network with high bandwidth utilization, where nodes can freely move around within the topology, and where nodes completely independent of any centralized service.

Session Initiation Protocol (SIP) supplies a standardized way of establishing connections for many purposes, primarily Voice over Internet Protocol (VoIP) telephone calls. However, SIP relies a great deal on the existence of servers to locate other users. Servers are less appropriate to use on mesh networks. Neither does SIP does leverage any of its advantages; hence, it is not suitable providing a SIP service in a mesh network.

Our objective is to find and implement a concept which extends the functionality of the routers in a mesh network, thus minimizing the changes required on the end hosts.

Scalable Source Routing (SSR) is a routing approach which adds a Chord-like P2P overlay to any physical network such as a mesh network. Unlike other overlays (such as the ones created by P2PSIP), the routing mechanisms also considers physical distance which results in increased performance.

Linyphi is an implementation of SSR, which is designed to run on Linux based routers, such as the Linksys WRT54GL. SSR is used to route packets between the routers in a network, while IPv6 is used between the routers and the end hosts, thus enabling the end hosts to take advantage of SSR without any modifications.

In our solution, we will implement a SIP proxy which is to run together with Linyphi on the routers. To store the SIP addresses and locations of the SIP users, we will implement a DHT, which takes advantage of the SSR overlay.

Some other approaches were considered. The P2PSIP approach is a concept of replacing the SIP servers with a Distributed Hash Table (DHT). This DHT is contained within the SIP clients, thus no standard SIP clients can be used. This approach also adds a P2P overlay on

top of any other network, which causes performance of this approach to be dependent on the underlying layers. Using a P2P underlay would add even more overhead.

Skype uses flooding to find nearby users, which is very resource requiring, and it also uses a proprietary and closed protocol which prevents it from being investigated.

Linyphone uses an approach which is very similar to the one we chose; however, it differs from our solution in that it is designed to be run completely on the end hosts and requires them to run special software.

We were able to produce a functional application, albeit with several problems. The most severe was the unsatisfying performance: When testing our solution, we learned that the current version of Linyphi does not perform well on the Linksys devices. A new, faster version of Linyphi is under construction, and we believe it may again be extended using the same basic concept of an added SIP proxy and DHT.